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(54) **Method of sliver feeding in production of fancy yarn and spinning unit for performing it**

(57) The method of sliver feeding from staple fibre material in production of fancy yarn on spindle-less rotor machines with sliver feeding using the feed roller to the stripping roller, which combs out the individual fibres from the sliver and then the spinning rotor spins them into yarn, characterised by the fact that in case of each and any change of the yarn spinning profile there is - on a short term basis in the time interval of 0,01 - 0,9 second - suddenly increased in at least 10% above the operation speed of sliver feeding, while the section of the sliver

fed in accelerated speed is separated from sections spun by operation speed in at least one location - at the beginning or in the end by reversing the sliver feeding on the basis of speed exceeding the operation speed of feeding.

The spinning unit of the spindle-less spinner for performing the method, including an independently driven feed roller, has got a driving unit (11) of the feed roller (3) drive connected with the sensor (10) of the yarn (13) break and a programmable control unit (12).

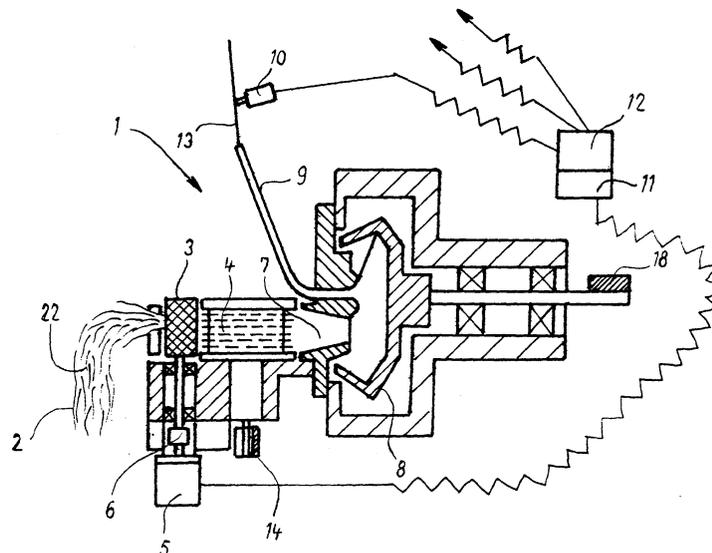


Fig. 1

DescriptionTechnical Field

[0001] The invention concerns the method of sliver feeding in production of fancy yarn on spindle-less rotor machines with sliver feeding by a feed roller to the stripping roller, stripping individual fibres from the sliver that are consequently used at the spinning rotor for yarn spinning plus spinning units for this method performance.

The Contemporary State of the Art

[0002] In case of known spindle-less spinners, the sliver feeding from staple fibres is performed using a feed roller, to which the sliver is pressed using so called table. The side of the table adjacent to the feed roller is covered with an extremely smooth surface with low friction in relation to the fibre material, while - on the other hand - the feed roller is covered with high-friction surface caused by corrugation or other type of roughing - that means that while turning, it takes along the fibre material which is supplied in a constant speed to the stripping roller and in the location of a contact with the stripping roller, the yarns from the sliver are combed out in so called combing zone and then they are transported - usually by air via transport channel - to the spinning unit, where yarn is spun from the fibres. The feed roller is usually turned by a central drive via a clutch that is disconnected in case of any break. The clutch connects at the time of spinning on.

[0003] This is the procedure in case of standard yarn production. So called fancy yarn is requested for production of fashionable goods. There are several types of fancy yarns. One of them is characterised by the fact that there are sudden increases or reductions of the yarn diameter in regular or irregular intervals - it is a kind of an artificial fault, in other words these are local changes of the length weight of the yarn. Then, such yarn creates characteristic patterns in the fabric or knitted fabric, depending on structure and "fault" character.

[0004] There is known the production method of such yarn production on annular machines, based on the fact that there is suddenly changed the speed of the last passage of the draught through various - e.g. cam mechanisms. Similar oscillations in yarn diameter may be reached in a similar way on the feed rollers of the spindle-less machines. But up to now requested quality of yarn in final product has not been reached. Even sudden changes of sliver feeding speed - due to the time requirements referring combing out and final combing (these processes show significant persistence reaching even several seconds) and due to influences of so called cyclic joining on the collection surface of the rotor - lead only to gradual changes of the final product, without any significant optical effects. This is an analogy to the electric oscillating signal, transferred via a filtration element

of large capacity, where the signal is smoothed and the waving in the output is only minimal.

Subject of the invention

[0005] The task of the invention is to significantly reduce the effects of such filtration in case of sliver feeding at spindle-less spinners and to allow high-quality spinning of fancy yarns even on spindle-less rotor machines, corresponding with quality of fancy yarns produced on annular machines.

[0006] The task is - to a significant level - solved by using the method of fancy yarn production on spindle-less spinners with feeding of a sliver of staple fibre material or staple or a mixture of the materials, by the feed roller to the stripping roller, where individual fibres are combed out of the sliver and consequently spun in the spinning rotor into the yarn, in compliance with this invention, the base of which includes mainly the fact that in case of any change of the yarn spinning profile, there occurs a short term sudden increase - in the time interval of 0,01 - 0,9 second - of the sliver supply in at least 10% above the operation speed, while the sliver section fed in higher speed is separated from sections spun under operation speed in at least one place - at the beginning or in the end - by reversing the sliver feed in the time interval of 0,01 - 0,9 second by a speed that exceeds the operation speed of feeding.

[0007] For the effect to be created it is important for the change of the yarn diameter at the beginning and in the end of the effect to be as sudden as possible, while it is necessary to take into consideration the fact that every mechanism has some short, but measurable start-up times. For the effect to be as apparent as possible it is important to feed to the rotor the maximal possible quantity of material at once, because the yarn is permanently and continuously pulled back. That is why it is suitable for the increased speed of sliver feeding to be as high as possible and to exceed in 110% - 400% the operation speed, meaning the sliver speed during steady-state spinning, i.e. during standard spinning.

[0008] It seems purposeful for the transient features, mainly the final combing of yarns, to be significantly suppressed by the reversing to be faster. That is why there is always selected the maximal speed of feeding, performed by the feed roller during reversing, in the extent of 110% - 400% of the operation speed of feeding. But it is not allowed for the spinning to be interrupted during reversing. That means that the reversing time must be short and it is not allowed to be of excessive size.

[0009] That is why it seems purposeful for the limit value to be the area of return, characterised as 90% of the average staple length - sliver returning should not exceed the above stated size.

[0010] So as to reach more significant change of the yarn profile, it is advantageous for the sliver movement reversing to be completed with short-time interruptions of sliver feeding in the time interval of 0,01 - 0,9 second.

[0011] So as to emphasise the changes of yarn profile it seems purposeful for the sliver section supplied in higher speed to be fed repeatedly, while the sections are separated by interrupted sliver feeding in the interval of 0,01 - 0,9 second.

[0012] Taking into consideration further processing it seems purposeful for the sliver sections fed in operation speed and the sliver sections fed in increased speed to be selected in variable lengths.

[0013] Fancy yarn may be advantageously produced on spinning unit of a spindle-less spinner, based on the fact that the control unit of the feed roller is connected with the yarn break sensor and programmable control unit.

List of figures in drawings

[0014] The invention will be explained in detail while using drawings, showing in Fig. 1 a simplified scheme of the spinning unit, Fig. 2 showing the course of sliver feed speed when creating the fancy yarn with sliver movement reversing, Fig. 3 shows the course of sliver feeding when the high-speed fed section is separated at the beginning of its creation from sections fed in operation speed by feed reversing and - in the end - by a delay in feeding; Fig. 4 shows the course of sliver feeding when creating the strengthening in steps.

Description of samples

[0015] The invention will be explained on the basis of using a schematically drawn spinning unit 1 of the spindle-less spinner, which - as it can be seen in Fig. 1 - includes the feed roller 3 driven directly by step electric engine 5 or via electro-magnetic clutch 6. The feed roller 3 is continued by a stripping roller 4 driven by a belt 14, inter-connected with channel 7 with the spinning rotor 8. The spinning rotor 8 is driven by a belt 18. The output from the spinning rotor 8 is performed by a tube 9, followed by the break sensor 10. The break sensor 10 is connected with the control unit 11 of the drive of the feed roller 3, controlling the operation of the step electric engine 5 in case of individual drive or the electro-magnetic clutch 6 in case of central drive. The control unit 11 is also connected with a programmable control unit 12, which is also connected with other not-shown controlled units of the spinning unit 1. In case of central drive, the drive is equipped with a suitable reversing box or every spinning unit 1 is equipped with a reversing and speed box, which is well known and it is not shown as well as the other parts that are not necessary for the invention explanation - like e.g. the drawing-off, wind-up and spinning units.

[0016] The spinning unit 1 - when continually producing the yarn 13 - feeds the sliver 2 by a constant speed and after its unification the air arranges transport to the spinning location rotor, where spinning into yarn 13 is performed. The production of fancy yarn 13 character-

ised by changes in profile of the yarn 13 regularly or irregularly distributed along its length, will be explained by using schemes with time data marked on the horizontal axis and feed roller 3 revolution speed data marked on the vertical axis, the total time of the effect is marked L_{ef}, permanent operation speed V_p, increased speed V_{max}, reversing speed V_r, V_r', V_r'', V_r''', reversing time L_{r1} at the beginning of accelerated feed and reversing time in the end of the sliver 2 feed supply in an accelerated speed. In the course of spinning, the sliver 2 is fed by operation speed V_p, i.e. under permanent - i.e. standard case. In case of requested effect creation by sudden switch over of the time of mechanisms start-up by step increase of the feed roller 3 speed to accelerated speed V_{max}, there is - so as to suppress the transition features and to reach a significant change in the yarn 13 profile - for a short period corresponding with the time interval of 0,01 - 0,9 second reversed the sliver 2 feed by changing the direction of the feed roller 3 - the speed V_r, which means at least partial pull off of the fibre fringe in the end of the sliver 2 from the reach of the stripping roller 4. During the following rapid movement of the sliver 2 towards the stripping roller 4 in the time interval of 0,01 - 0,9 second by the speed V_{max}, which is purposeful to be selected in 110 - 400% higher than the operation speed V_p, the fibre fringe in the end of the fed sliver 2 suddenly reaches the stripping roller 4, which takes from sliver 2 by fierce initial combing a large quantity of fibres 22, that are stored as a group on the collection surface of the spinning rotor 8 and so it helps to create more significant effect. It is not possible to select to extensive sliver 2 return during reversing, as breaking could occur. It was test-proved, that for reaching the intended effect it is enough for the sliver 2 not to return in the course of reversing in more than 10% of the average staple length. Due to practical reasons, the reversing time L_{r1} is set within the range of 0,01 - 0,9 second, depending on reversing speed V_r, which should be as high as possible and it is advantageously selected at least twice higher in comparison with the operation speed V_p. The materials that can be reversed to a bigger extent are an exception, while - from the point of view of resulting effect - any more extensive reversal of the sliver 2 does not bring any other positive effects. Effect termination for limitation of final combing and other transition features - if it is to be apparent - is performed by reversing the sliver 2 feeding for the period of L_{r2}. This sliver 2 reversal is appropriately affected by all and any facts stated in the course of reversing description at the beginning of the effect creation. The length of the effect L_{ef} - i.e. the length where the change of the yarn 13 profile is directly performed - follows the term of duration of the sliver 2 feeding in an accelerated speed V_{max} and the yarn 13 strengthening that occurs follows the extent of accelerated speed V_{max}. It is apparent that the accelerated speed V_{max} is different for individual spinning types, depending on character of fibres 22 used. Also the strengthening can not be selected at will.

The strengthening is set mainly by mechanic features of fibres 22 and by their ability to withstand the increased load when pulling the strengthened section of the yarn 13 from the spinning rotor 8. Exact setting of accelerated speed V_{max} within the above stated range must be tested, so as the spinning process is not interrupted by breaks and so as the yarn 13 obtained is of high quality.

[0017] On the basis of practical tests it was established that the length of the effect is slightly higher than corresponding to L_{ef} - such length increase is caused by the diameter of the spinning rotor 8, as the bigger diameter of the rotor 8 is, the bigger is the influence. That is why it is suitable to use the smaller diameter types for spinning.

[0018] The appearance of the final effect may be significantly affected by control of the individual stages of feeding and by reversing the sliver 2. For example the scheme 2 shows the course of sliver 2 feeding for reaching a gradual setting of the effect. For this purpose there has been used only the final combing of fibres 22. In case of this procedure, after the V_{max} interval the sliver 2 feed stops for a period of L_p in the extent of time interval of 0,01 - 0,9 second. It is also possible to create more complicated effects, e.g. in the course of feeding as per scheme No. 3. The scheme shows an example of the effect course with two differently following strong profiles of the yarn 13, when the sliver 2 is fed by various and mutually accelerated speeds V_{max}' and V_{max}'' and reversing is also performed by different speeds V_r' , V_r'' and V_r''' , while one reversing V_r'' is included between the accelerated speed V_{max}' and V_{max}'' .

[0019] On the basis of the above-stated samples of fancy yarn 13 production it is apparent that combination of accelerated speed V_{max} , speed V_r , reversing, respectively time delay L_p may be used for reaching various effects that can be distributed along the yarn 13 in a regular or irregular way and the effects may be identical or they may be alternatively selected using programming of the programmable control unit 12.

Industrial applicability

[0020] The invention is designed for spinning on spindle-less rotor spinners.

Claims

1. Method of sliver feeding from staple fibre material in production of fancy yarn on spindle-less rotor machines with sliver feeding using the feed roller to the stripping roller, which combs out the individual fibres from the sliver and then the spinning rotor spins them into yarn, **characterised by** the fact that in case of each and any change of the yarn spinning profile there is - on a short term basis in the time interval of 0,01 - 0,9 second - suddenly increased in at least 10% above the operation speed of sliver

feeding, while the section of the sliver fed in accelerated speed is separated from sections spun by operation speed in at least one location - at the beginning or in the end by reversing the sliver feeding on the basis of speed exceeding the operation speed of feeding.

2. Method according to point 1, **characterised by** the fact that in individual sections of sliver feeding in an accelerated speed, the speed of sliver feeding falls within the range of 110% up to 400% of the operation speed of sliver feeding.
3. Method according to point 1, **characterised by** the fact that the speed during the sliver feed reversing falls within the range of 110% - 400% of the operation speed of sliver feeding.
4. Method according to point 1 or 2, **characterised by** the fact that in the course of reversing the sliver reverses in the length corresponding with maximally 90% of the average length of staple fibres.
5. Method according to point 1, **characterised by** the fact that the sliver movement reversing is completed with a short-term interruption of the sliver feeding in the time interval of 0,01 - 0,9 second.
6. Method according to point 1 up to 5, **characterised by** the fact that the section of accelerated sliver feeding is performed repeatedly, while the sections are separated from each other by interruption of feeding in the interval of 0,01 - 0,9 second.
7. Method according to any of the points 1 up to 3, **characterised by** the fact that the sliver sections fed in operation speed and the sliver sections fed in accelerated speed are selected in variable lengths.
8. The spinning unit of the spindle-less spinner for performing the method, including an independently driven feed roller and **characterised by** the fact that its driving unit (11) of the feed roller (3) drive is connected with the sensor (10) of the yarn (13) break and a programmable control unit (12).

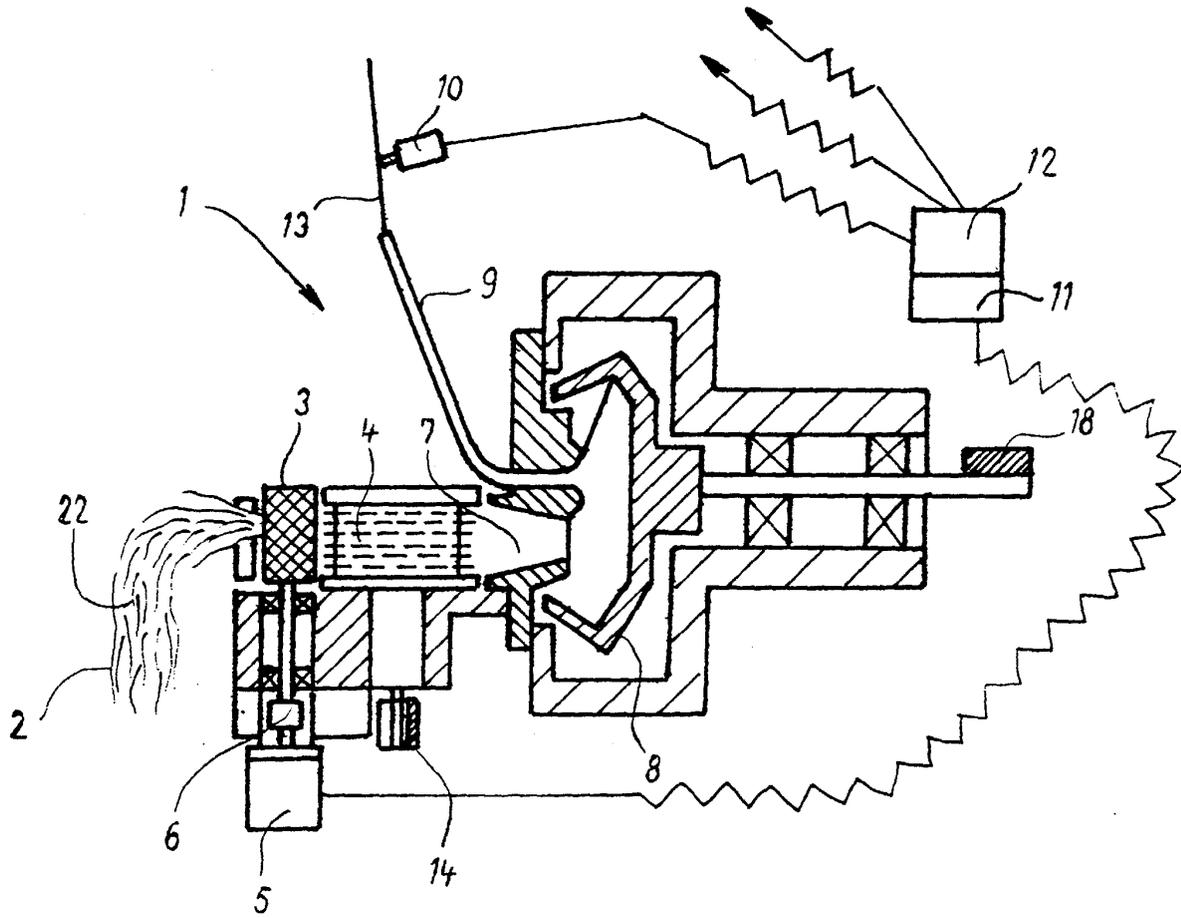


Fig. 1

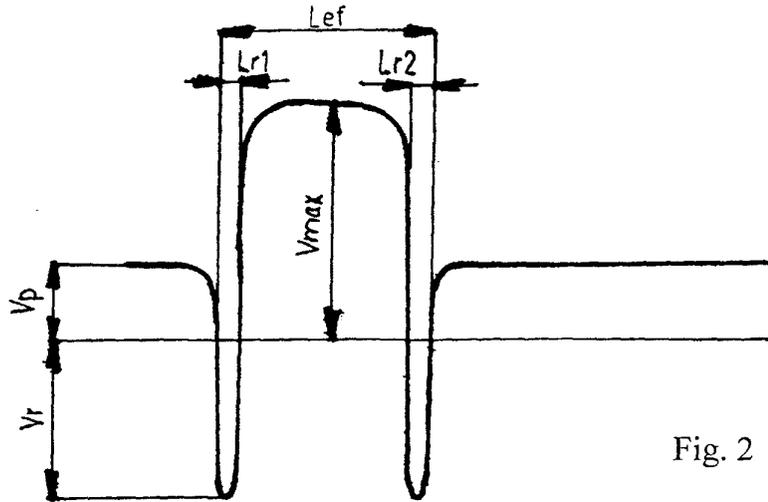


Fig. 2

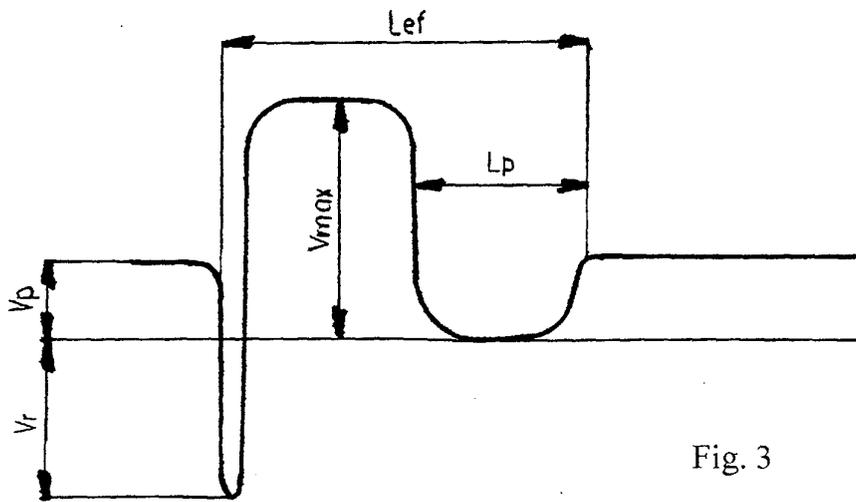


Fig. 3

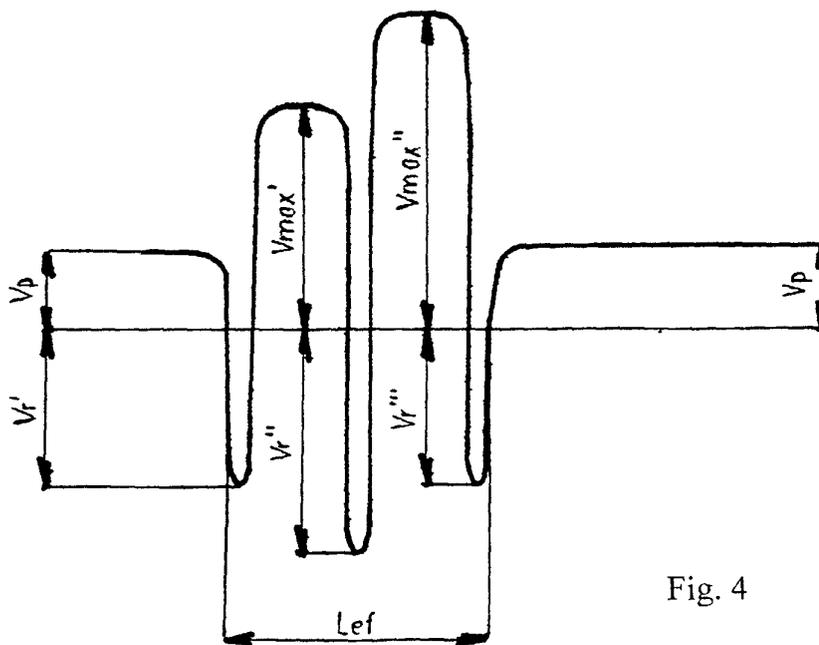


Fig. 4