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(54) **METHOD OF PRODUCING A STAPLE FIBER YARN**

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ABSTRACT

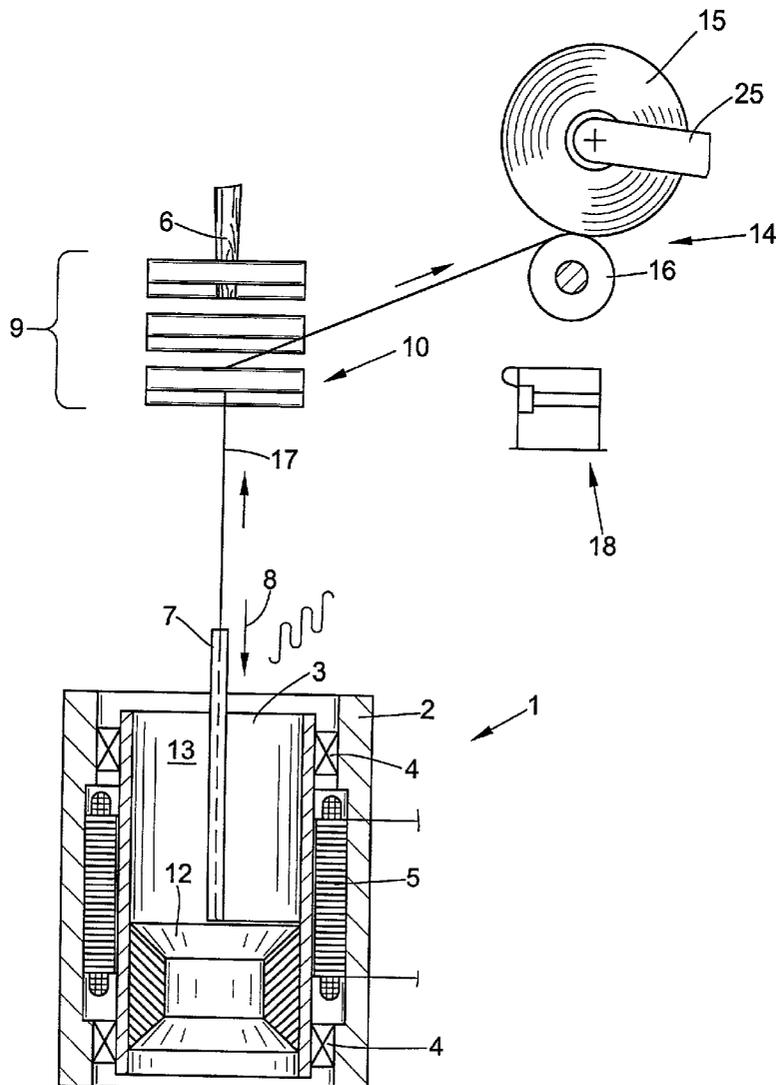
A method of centrifugally spinning a staple fiber yarn (17) comprising, in a first stage, drawing a feed material (6) by a drafting device (9) into a partially twisted yarn (11); and delivering the partially twisted yarn into a spinning centrifuge (3) via an axially shiftable yarn guidance tube (7); and in a second stage, further twisting the partially twisted yarn (11) into a finished yarn (17) while winding it onto a cheese (15). Before completion of the first stage, a yarn end from the cheese (15) is placed in the drafting device (9) onto the feed material and joined to the partially twisted yarn (11), the feed material (6) is separated, the yarn direction is changed and the partially twisted yarn (11) from the centrifuge (3) is withdrawn in the second stage from the centrifuge (3) and wound onto the cheese (15).

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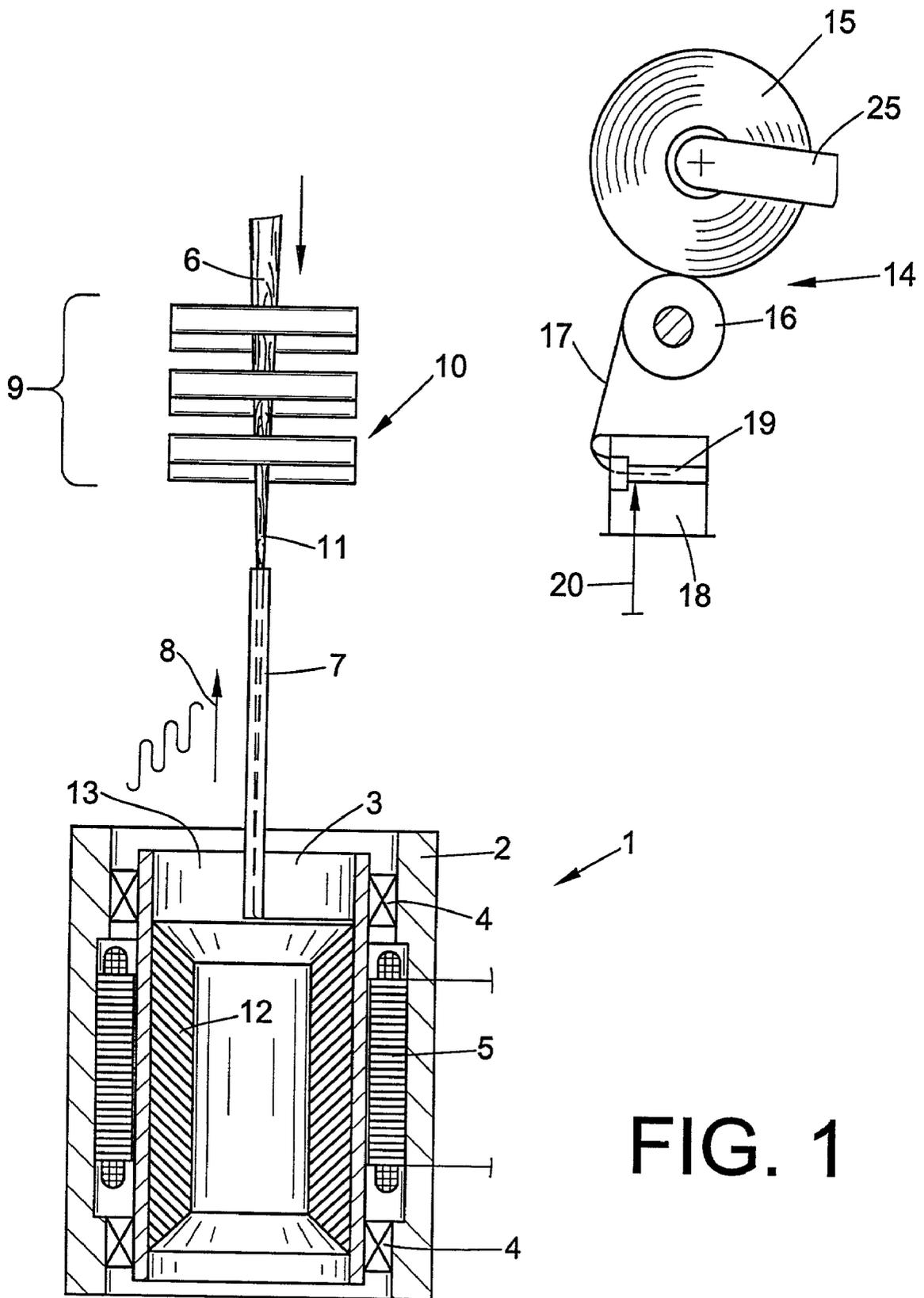


FIG. 1

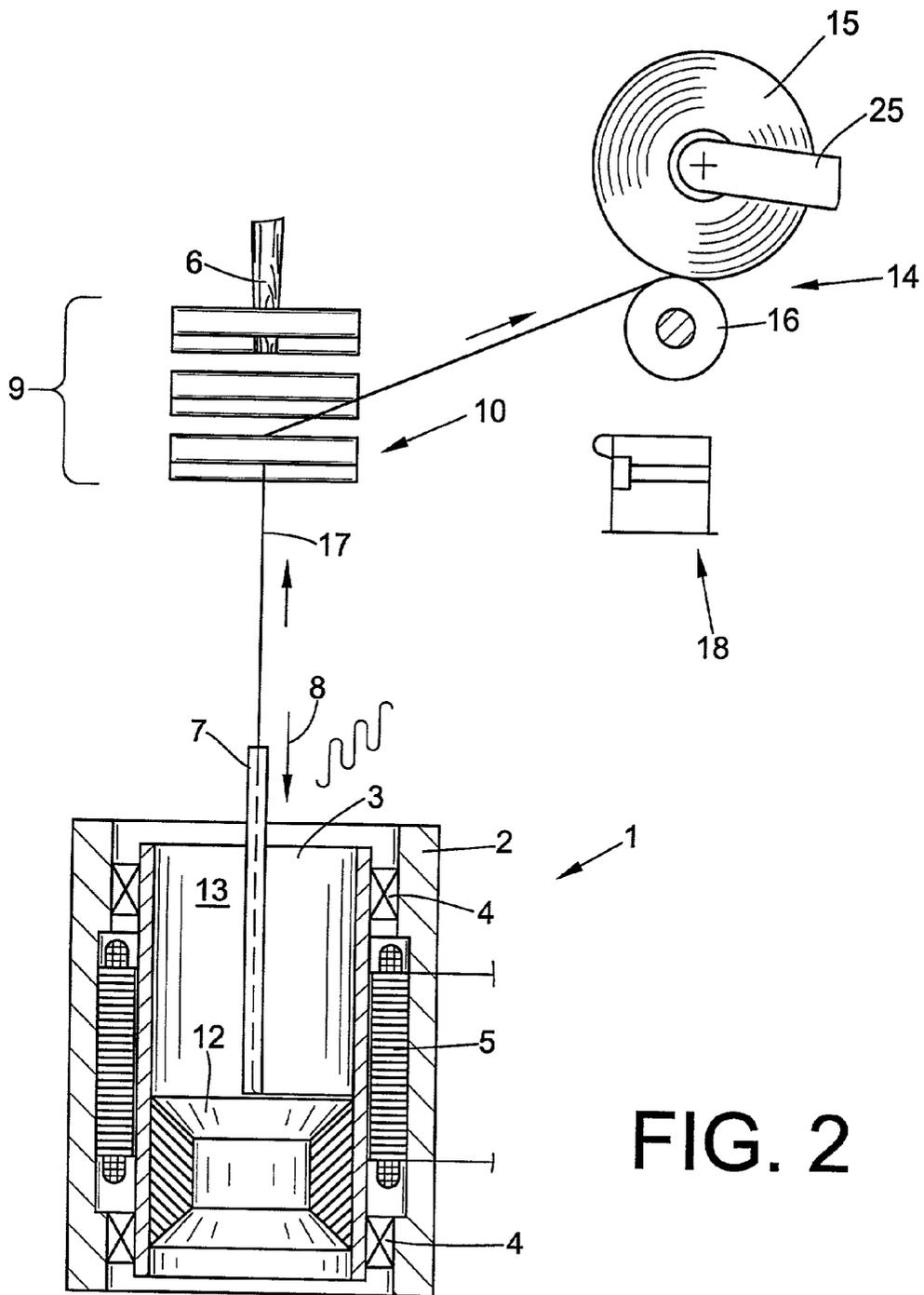


FIG. 2

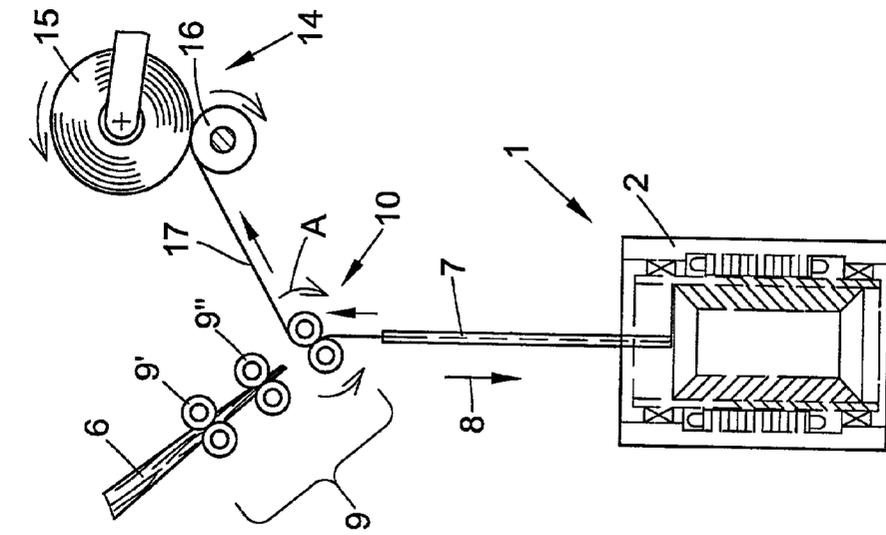


FIG. 3a

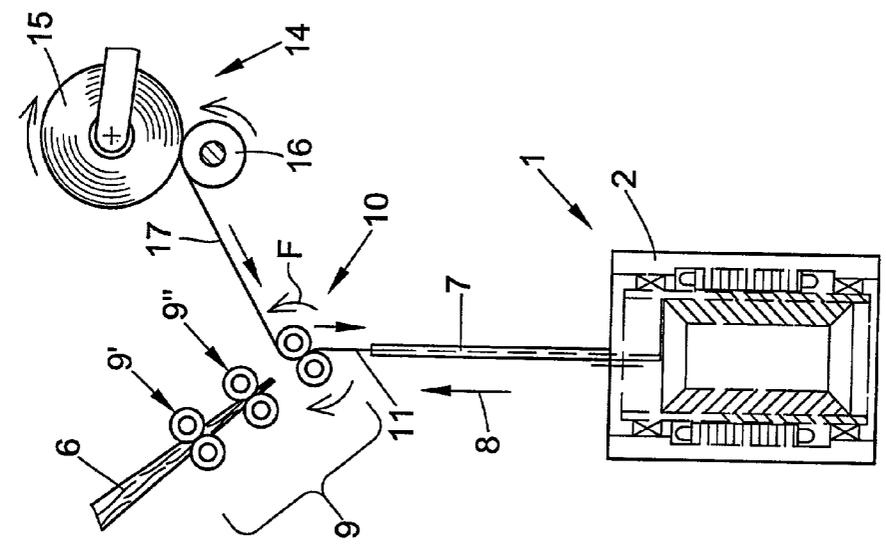


FIG. 3b

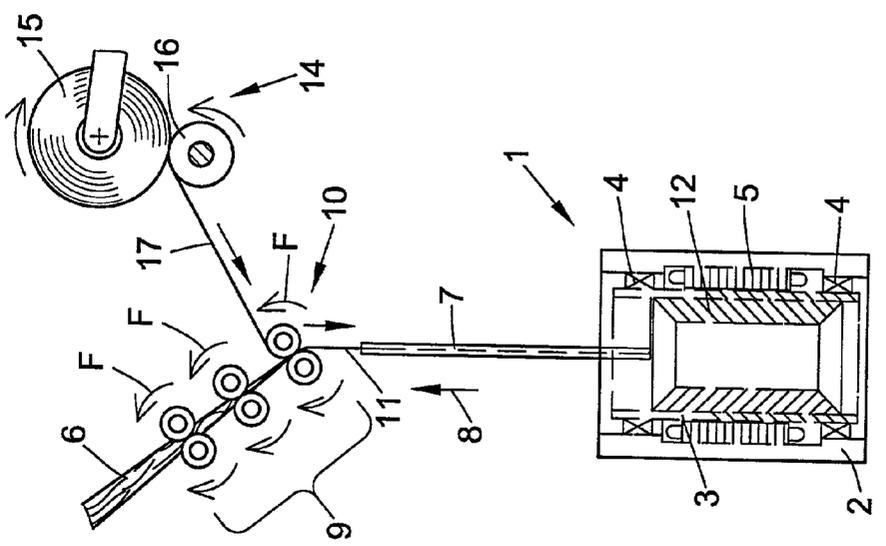


FIG. 3c

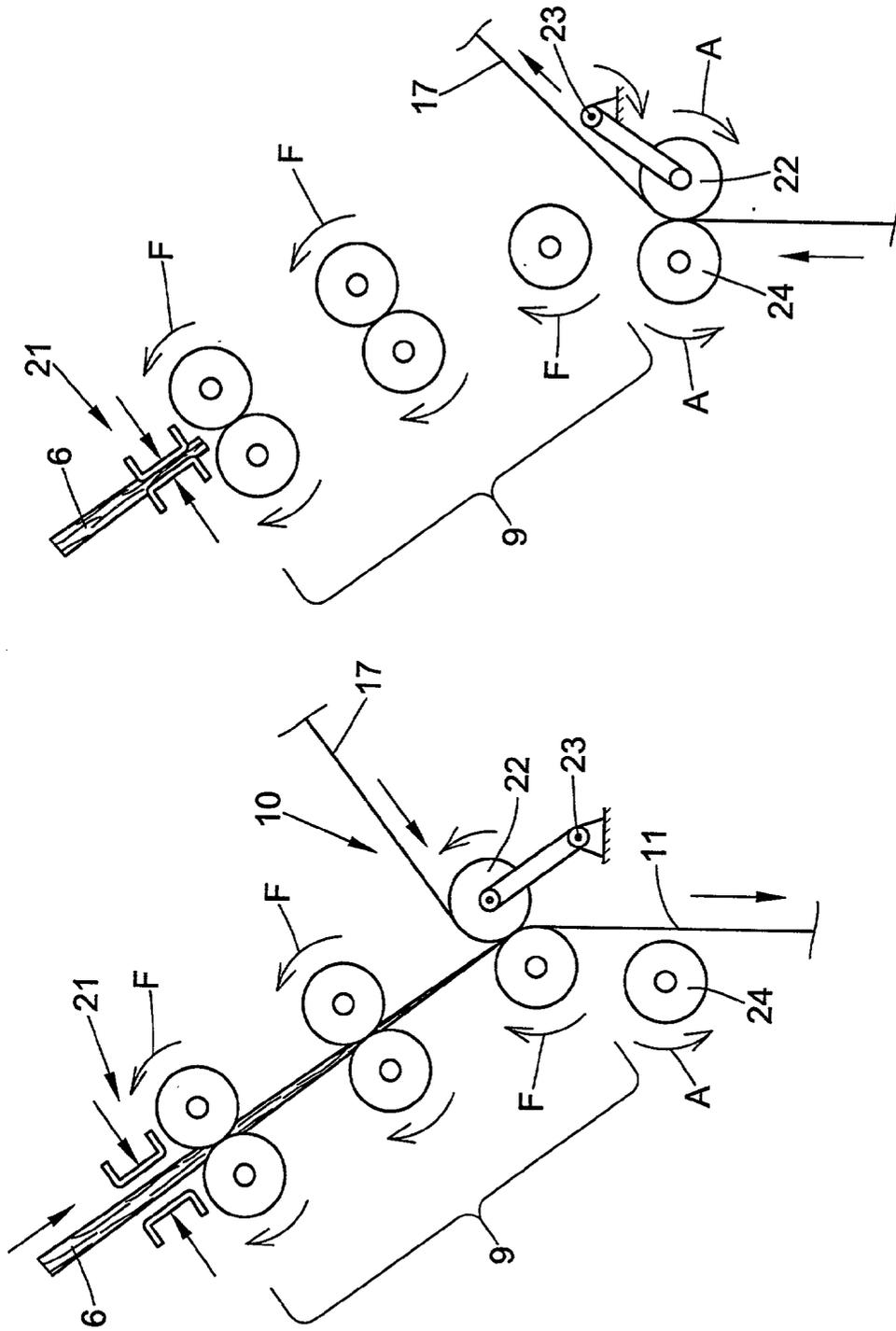


FIG. 4a

FIG. 4b

METHOD OF PRODUCING A STAPLE FIBER YARN

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of German patent application 10102907.1 filed Jan. 23, 2001, herein incorporated by reference.

BACKGROUND OF THE INVENTION

[0002] Various spinning processes are known in conjunction with the production of staple fiber yarns.

[0003] In addition to ring spinning and rotor spinning, centrifugal spinning, also sometimes known as pot spinning or can spinning, is a spinning process that has long been known.

[0004] A distinction is made in centrifugal spinning between two different types of spinning, one-stage spinning and so-called two-stage spinning.

[0005] In both types of centrifugal spinning, a feed material, either a sliver stored in a spinning can or a fiber slubbing supplied from a roving bobbin, is first drawn in a drafting device in accordance with the desired yarn fineness (i.e., yarn count) and transported via a yarn guidance tube supported in an axially shiftable manner into a spinning centrifuge rotating at a high speed. The drawn yarn material exiting from the mouth of the yarn guidance tube is placed, under formation of a yarn shank, on the inner centrifuge wall and entrained thereby. In this manner, the yarn material receives a twist from the rotation of the centrifuge.

[0006] The yarn thusly produced by this twisting effect is deposited by the axially shiftable yarn guidance tube on the inner centrifuge wall, where the yarn is progressively formed into a so-called yarn cake.

[0007] In the one-stage spinning process, the centrifuge speed and delivery rate of the drawn yarn material are coordinated with one another such that the yarn deposited as a yarn cake has already received its full twist and can be wound in a subsequent process step onto a rewinding tube introduced into the centrifuge. The spinning cop produced during this rewinding process is later rewound on a bobbin winding machine at a downstream stage of the yarn production process onto a large-volume cheese.

[0008] In the two-stage spinning operation, the centrifuge speed and the delivery rate of the feed material are selected such that the yarn deposited in the first spinning stage on the inner centrifuge wall initially receives only a part of its final twist. The partially twisted yarn deposited as a yarn cake receives an additional twisting when it is withdrawn out of the spinning centrifuge in a second spinning stage and is wound directly onto a cheese in a bobbin winding device.

[0009] Since the amount of continuous length yarn that can be produced without a splicing or other connection is limited by the volume of the yarn cake in both the one-stage and the two-stage centrifugal spinning processes, it obligatorily follows that numerous yarn ends must be joined to each other in the production of a cheese.

[0010] German Patent Publication DE 40 00 059 A1 teaches a centrifugal spinning/winding device whose work

stations comprise, among other things, a spinning centrifuge and an associated winding device. This known apparatus operates according to the previously described two-stage spinning process. That is, the yarn is first partially twisted in a first spinning stage. At the end of the first spinning stage, the partially twisted yarn material is separated in the area of the drafting device. The thusly produced yarn end of the partially twisted yarn extending from the yarn cake is drawn by suction via an injector into an intermediate storage location. The yarn end stored in the intermediate storage location is subsequently joined in a splicing device to a completely twisted yarn end retrieved from the cheese being wound at the associated winding device.

[0011] The second spinning stage is then initiated by an appropriate driving of the cheese. In this second stage, the partially drawn yarn deposited in the spinning centrifuge as a yarn cake is withdrawn from of the centrifuge, provided with its final twist and wound onto the cheese.

[0012] However, these known methods have the disadvantage that the yarn connection made in the splicing device always distinctly differs structurally from the remaining length of the spun yarn. A production of uniform yarn connections is not possible with the known device.

SUMMARY OF THE INVENTION

[0013] In view of the above described state of the art, the present invention seeks to develop a method, especially for spinning centrifuges operating in two stages, that improves the yarn quality, especially in the area of splicing locations.

[0014] More specifically, the present invention provides a method which has the particular advantage that an almost uniform yarn structure at the locations at which two yarn ends joined. Thus, the main length of the yarn as well as the areas of yarn joiner have similar properties as regards yarn orientation, yarn drawing and yarn twist over the yarn cross section.

[0015] In view of the quality achieved by these essentially uniform yarn joiner locations, the invention also makes it possible to significantly reduce the centrifuge sizes and the amount of yarn wound therein between each yarn withdrawal and joiner operation, therewith achieving a distinct savings of drive energy. That is, the method of the invention results, in addition to an increase of the quality of the yarn produced, in an improvement of the economy of the centrifuge spinning machines concerned.

[0016] In an advantageous embodiment, the end of the yarn unwound from the cheese for splicing with the yarn cake from the centrifuge is processed in a known preparation device before being placed with the yarn material from the centrifuge. Thus, the yarn end of the already fully twisted yarn from the cheese is pneumatically loaded, e.g., in a small preparation tube.

[0017] A preferred embodiment provides that this yarn end is untwisted at least partially over a certain yarn length, e.g., by appropriately blowing on it.

[0018] A further possibility for preparing the yarn end from the cheese is to thin out the yarn end. The thinning out of the yarn end can also take place in a special, small preparation tube provided, for example, with comb-like

elements against which the yarn end is beaten or along and on which the yarn end is drawn.

[0019] An alternative possibility of assuring that the yarn end of the yarn unwound from the cheese has less twist than the regular yarn before being spun into the feed material is to draw off the yarn at the end of the second spinning stage at an elevated rate. As a result of the elevated yarn draw-off speed, the yarn receives a correspondingly lesser twist, especially at the yarn end, which has a positive effect on the yarn splice or joiner formed subsequently in the yarn joining step in the spinning process.

[0020] It is also contemplated that the yarn end can already be prepared for the later yarn joining process in accordance with the invention in that during the joining phase at the beginning of the first spinning stage and also at the end of the first spinning stage, the draft of the drafting device is briefly increased. To this end, the withdrawal roller pair of the drafting device can be operated for a brief time at an increased supply speed. Even these measures have the result that the yarn end is prepared in such a manner that it is assured that the locations of yarn joiner exhibit an almost uniform yarn structure.

[0021] Moreover, an advantageous embodiment provides that in order to draw off the partially spun yarn deposited in the rotating spinning centrifuge as a yarn cake either the direction of transport of the withdrawal roller pair of the drafting device is changed or a draw-off roller rotating in the direction of yarn withdrawal as well as a pivotably supported pressure roller are used. Both embodiments assure a reliable drawing off of the partially twisted yarn from the yarn cake in the second spinning stage, which yarn receives the still lacking twist during the withdrawal. The yarn is wound at the same time, as already indicated previously, in a winding device onto a cheese.

[0022] Further details, features and advantages of the present invention will be understood from the following description of an exemplary embodiment with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0023] FIG. 1 shows a centrifugal spinning device operating in two stages during the first spinning stage.

[0024] FIG. 2 shows the centrifugal spinning device according to FIG. 1 during the second spinning stage.

[0025] FIGS. 3a-3c show the centrifugal spinning device of FIGS. 1 and 2 during the transition from the first to the second spinning stage.

[0026] FIG. 4a shows an alternative embodiment of a drafting device for a two stage centrifugal spinning device during the first spinning stage.

[0027] FIG. 4b shows the drafting device according to FIG. 4a during the second spinning stage.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0028] FIG. 1 schematically shows a work station of a centrifugal spinning/winding machine. Such work stations also comprise a winding device 14 in addition to a centrifugal spinning device 1.

[0029] Such known centrifugal spinning devices 1 generally comprise a spinning centrifuge 3 supported over bearing supports 4 in a centrifuge housing 2 and driven via an electromotor 5. Supports 4 can be designed as magnetic supports and, in that case, support the spinning centrifuge 3 without physical contact. Yarn guidance tube 7 can be lowered into the spinning centrifuge 3. This tube is operated by a schematically indicated drive 8 to execute oscillating movements and can be raised or lowered at the same time thereby in the axial direction. Feed material 6, such as a sliver or roving, previously drawn to a desired yarn fineness in drafting device 9 is delivered via the yarn guidance tube 7 into the spinning centrifuge 3, where it is twisted and deposited as a yarn cake 12 on the inner wall 13 of the spinning centrifuge 3.

[0030] Spinning device 14 comprises, as is customary, a creel 25 for rotatably holding a cheese 15 as well as a yarn guide drum 16 for frictionally driving the cheese 15. Yarn guide drum 16 also provides the traversing of yarn 17, that has received its final spinning, during its winding onto cheese 15.

[0031] As is further indicated in FIG. 1, a yarn preparation device 18 can also be installed, e.g., in the area of the winding device 14. The end of yarn 17, that has already been completely twisted, is processed in the yarn preparation device 18 before it is placed on the feed material 6, e.g., by a pneumatically loadable small preparation tube 19. Yarn preparation device 18 is connected in such an instance, e.g., via a pneumatic line 20, to an excess pressure source (not shown).

[0032] As has already been indicated above, FIG. 1 shows a situation in which centrifugal spinning device 1, that operates in two stages, is operating in the first spinning stage. That is, the drafted feed material 6 supplied via the drafting device 9 is transported via the yarn guidance tube 7 into the spinning centrifuge 3, partially twisted and then deposited as the yarn cake 12 on the inner wall 13 of the spinning centrifuge 3. The delivery speed of the feed material 6 and the speed of rotation of the spinning centrifuge 3 are selected so that the yarn 11 deposited as the yarn cake 12 receives only a part of its final twist.

[0033] FIG. 2 shows a situation in which centrifugal spinning device 1 is operating in the second spinning stage. That is, the partially twisted yarn 11 deposited as the yarn cake 12 in the spinning centrifuge 3 is drawn via a pair of withdrawal rollers 10 of the drafting device 9 out of the spinning centrifuge 3 and thereby receives its final twist. The withdrawn finished yarn 17 is immediately wound on the winding device 14 onto the large-volume cheese 15.

[0034] The operation of the spinning device 1 in accordance with the method of the present invention is explained with reference to FIGS. 3a to 3c and FIGS. 4a and 4b.

[0035] When the yarn cake 12 has attained a predetermined size in the spinning centrifuge 3, as is indicated in FIG. 3a, the end of the yarn 17 connected to the cheese 15 is spun into the feed material 6 in front of the withdrawal roller pair 10. Thus, the end of the yarn 17, which end was previously processed in yarn preparation device 18, e.g., by being combed out or untwisted, is transported in the direction of the spinning centrifuge 3 by the withdrawal roller pair 10 of the drafting device 9, which rollers are running in the direction of transport F, and the yarn end is spun thereby into feed material 6.

[0036] At the same time, the further delivery of the feed material 6 is stopped, as indicated in FIG. 3b. For example, the roller pairs 9', 9" of the drafting device 9 are stopped, which results in a separation of the feed material 6.

[0037] The withdrawal roller pair 10 is subsequently switched over to draw-off direction A, as indicated in FIG. 3c, and the partially spun yarn 11 is drawn out of the spinning centrifuge 3 as a result. During this withdrawal, the yarn 11 receives its final twist and is wound as the yarn 17 onto the cheese 15.

[0038] Instead of switching the direction of transport of the withdrawal roller pair 10, a modified embodiment of a withdrawal roller pair can also be used. This alternative embodiment shown in FIGS. 4a and 4b functions as follows.

[0039] After the joining of the processed end of the yarn 17 from the cheese 15 to the feed material 6, a so-called slubbing stop device 21 is initiated that prevents the further supply of the feed material 6. At the same time, an idler pressure roller 22 is pivoted about its pivot axis 23 in such a manner that it comes to rest on the withdrawal roller 24 rotating in the withdrawal direction. The withdrawal roller 24 rotating in withdrawal direction A assures in conjunction with contacting of the pressure roller 22 that the yarn 11 deposited as the yarn cake 12 is drawn out of the spinning centrifuge 3 and completely twisted thereby. The finished yarn 17 is also wound onto a cheese 15 in the winding device 14 in the case of this device.

[0040] It will therefore be readily understood by those persons skilled in the art that the present invention is susceptible of broad utility and application. Many embodiments and adaptations of the present invention other than those herein described, as well as many variations, modifications and equivalent arrangements, will be apparent from or reasonably suggested by the present invention and the foregoing description thereof, without departing from the substance or scope of the present invention. Accordingly, while the present invention has been described herein in detail in relation to its preferred embodiment, it is to be understood that this disclosure is only illustrative and exemplary of the present invention and is made merely for purposes of providing a full and enabling disclosure of the invention. The foregoing disclosure is not intended or to be construed to limit the present invention or otherwise to exclude any such other embodiments, adaptations, variations, modifications and equivalent arrangements, the present invention being limited only by the claims appended hereto and the equivalents thereof.

What is claimed is:

1. A two stage method of centrifugally spinning a staple fiber yarn comprising the steps of:

in a first spinning stage:

drawing a feed material by a drafting device; and

depositing the drafted feed material onto an interior surface of a spinning centrifuge via a yarn guidance

tube axially shiftable therein while twisting the drafted feed material between the drafting device and the interior surface of the spinning centrifuge into a partially twisted yarn; and

in a second spinning stage:

withdrawing the partially twisted yarn from the spinning centrifuge while further twisting of the partially twisted yarn into a fully twisted yarn and winding the fully twisted yarn onto a cheese by a winding device;

wherein shortly prior to completion of the first spinning stage:

placing a prepared end of a previously finished yarn unwound from the cheese onto the feed material at the drafting device;

joining the prepared end of the finished yarn to the partially twisted yarn of the first spinning stage;

separating the feed material at the joiner between the prepared end of the finished yarn and the partially twisted yarn;

then changing the direction of travel of the partially twisted yarn; and

then initiating the second spinning stage by withdrawing the partially twisted yarn from the spinning centrifuge.

2. The method according to claim 1, characterized in that the end of the yarn unwound from the cheese is processed in a preparation device before being joined to the partially twisted yarn.

3. The method according to claim 2, characterized in that the end of the yarn unwound from the cheese is at least partially untwisted in the preparation device.

4. The method according to claim 2, characterized in that the end of the yarn unwound from the cheese is thinned in the preparation device.

5. The method according to claim 1, characterized in that the end of the yarn unwound from the cheese is unwound at the end of the second spinning stage at an elevated speed and receives a lesser twist.

6. The method according to claim 1, characterized in that the drawing of the drafting device is briefly elevated during the joining step in the first spinning stage.

7. The method according to claim 1, characterized in that the drawing of the drafting device is briefly elevated at the end of the first spinning stage.

8. The method according to claim 1, characterized in that the direction of transport of the drafting device is reversed to withdraw the partially twisted yarn from the spinning centrifuge.

9. The method according to claim 1, characterized in that a pressure roller of the drafting device is pivoted onto a draw-off roller of the drafting device rotating in the direction of withdrawal to withdraw the partially twisted yarn from the spinning centrifuge.

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