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Grau

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[54] **OPEN-END SPINNING APPARATUS**

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[51] **Int. Cl.** **D01h 1/12**

[58] **Field of Search** 57/58.89–58.95, 56

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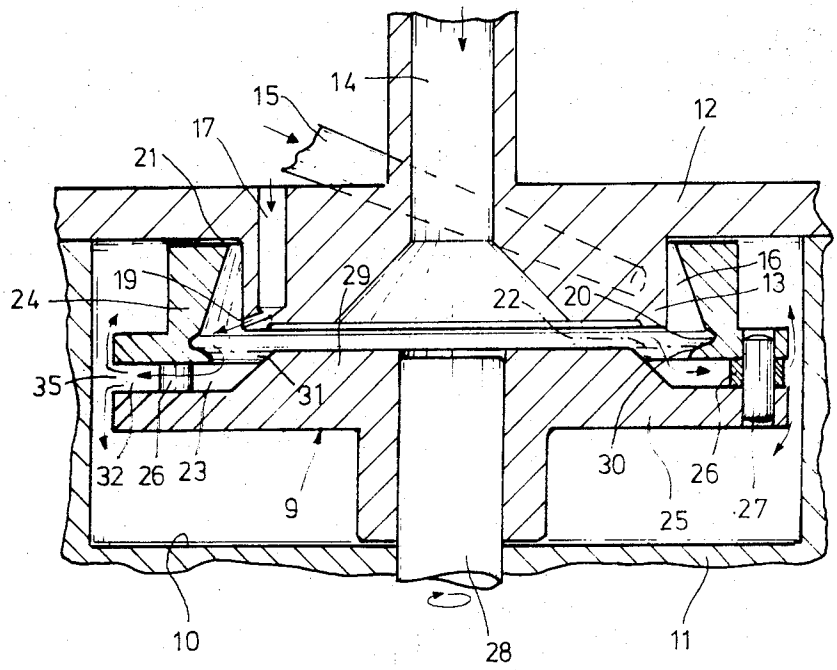
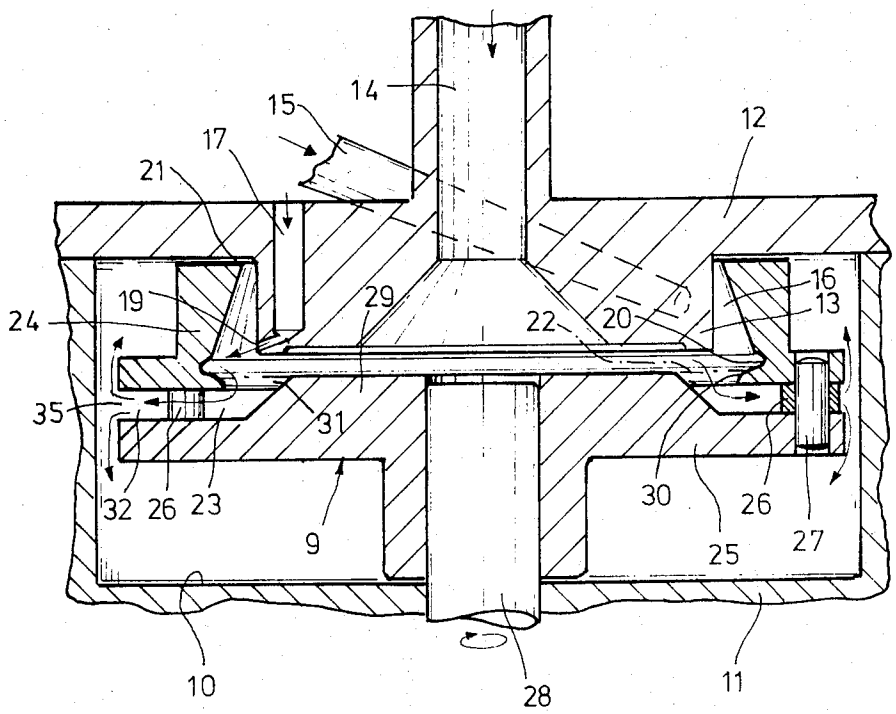
[57] **ABSTRACT**

Into the rotary spinning chamber of an openend spinning apparatus there is, for cleaning purposes, periodically introduced a jet of pressurized air directed to the circumferential fiber collecting groove provided in the wall of the spinning chamber. The pressurized air, together with the impurities dislodged thereby, is withdrawn from the spinning chamber through an air outlet means having an annular inlet opening which is situated adjacent the fiber groove and which surrounds the rotary axis thereof.

10 Claims, 1 Drawing Figure

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OPEN-END SPINNING APPARATUS

BACKGROUND OF THE INVENTION

This invention relates to an open-end spinning apparatus having a spinning rotor which is provided at its internal wall with a fiber collecting groove (hereinafter referred to as fiber groove). The spinning rotor is disposed in a housing chamber and has an open radial face into which there extends a stationary yarn guiding body containing a yarn outlet channel. The apparatus is further of the type that is provided with a blow nozzle which is connected to a pneumatic source and which serves for blowing pressurized air in the direction of the fiber groove for the purpose of cleaning the same.

In open-end spinning apparatus, for the purpose of spinning the fibers into the open-ended yarn, it is necessary to cause an air stream to travel in the yarn outlet channel in a direction opposed to the normal advancing direction of the yarn. This air stream then flows into the inner chamber (spinning chamber) of the spinning rotor. The penumatic transportation of the opened individual fibers into the spinning chamber also causes a continuous inflow of the air thereinto.

In a known open-end spinning apparatus of the aforenoted type, such as disclosed in Swiss Pat. No. 466,768, in which the fiber groove is cleaned periodically by pressurized air, the withdrawal of air flowing into the rotor chamber and the withdrawal of pressurized air blown into the fiber groove during the cleaning operation are effected through the hollow rotor shaft, that is, through a central air outlet channel in the rotor. The inlet opening of this central air channel which is relatively small and which is of circular configuration, is disposed exactly opposite the yarn outlet channel, that is, in exact alignment therewith. This arrangement has, among others, the disadvantage that the impurities dislodged from the fiber groove by means of the pressurized air have to be conveyed towards the central inlet opening of the air outlet channel against the centrifugal force generated by the rotation of the spinning rotor. Consequently, in case of relatively high rotor rpm's, the removal of the impurities from the spinning chamber is not reliably ensured. Further, the long flow paths of the pressurized air from the fiber groove to the central air outlet channel is in principle disadvantageous regarding the removal of the dislodged impurities from the inner chamber of the rotor, since the flow speed of the pressurized air drops substantially along its path to the air outlet channel and generates in the spinning chamber uncontrollable eddy currents which tend to substantially hinder the removal of the dislodged impurities. Further, to guide the air in the manner taught by the prior art is also disadvantageous regarding the spinning of the yarn, since for this purpose the yarn has to be carried in the spinning chamber from the yarn outlet channel to the fiber groove. Thus, there prevails the danger that this yarn does not reach the fiber groove, but is sucked out through the aforedescribed central air outlet channel.

OBJECT, SUMMARY AND ADVANTAGES OF THE INVENTION

It is an object of the invention to provide an improved open-end spinning apparatus in which the aforediscussed disadvantages are no longer present.

Briefly stated, according to the invention, the spinning rotor in the zone of its inner wall which adjoins that side of the fiber groove that is remote from the open end of the spinning rotor, has an annular inlet opening which forms part of an air outlet means and which surrounds the geometrical rotary axis of the fiber groove. Through this annular inlet opening air — including the pressurized air blown into the rotor chamber for cleaning — may flow out of the spinning chamber.

By means of the aforeoutlined measure the pressurized air blown into the spinning chamber during the cleaning of the fiber groove is admitted rapidly and securely into the air outlet. In this manner the impurities dislodged by the pressurized air remain in the pressurized air stream and arrive securely and completely to the air outlet means through which they are removed from the spinning chamber. Due to the short-length flow path of the pressurized air in the inner chamber of the rotor, fewer uncontrollable turbulent streams are generated therein. Consequently, higher speeds of the pressurized air stream may be used and accordingly, more thorough and more rapid cleaning of the fiber groove may be effected.

The invention will be better understood as well as further objects and advantages become more apparent from the ensuing detailed specification of a preferred, although exemplary embodiment of the invention taken in conjunction with the sole figure illustrating the preferred embodiment in longitudinal axial section.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In the FIGURE there is illustrated a housing **11** which defines a chamber **10** forming part of an open-end spinning apparatus, details of which that are not pertinent to the invention are not illustrated for the sake of clarity. The chamber **10** accommodates a spinning rotor **9.**

It is noted that an open-end spinning machine contains a great plurality of spinning apparatuses such as illustrated in the FIGURE and now to be described.

The chamber **10** is closed by means of a cover **12** which may be opened, for example, by tilting it about hinges, not shown. At its side oriented towards the chamber **10,** the lid **12** has a rotationally symmetrical projection which constitutes a yarn guiding body **13** extending into the inner chamber (spinning chamber) **16** of the spinning rotor **9** through the open radial face thereof. The yarn guiding body **13** contains a throughgoing central yarn outlet channel **14** through which the spun yarn is continuously taken out and thus removed from the housing **11.** The cover **12** and the yarn guiding body **13** contain, in a conventional manner, a fiber supply channel **15** through which the individual fibers are introduced into the spinning chamber **16** by virtue of an air stream.

The annular clearance between the inner face of the cover **12** and the annular radial edge face bounding the open side of the spinning rotor **9** is so small that practically no air may flow therethrough.

The cover **12** further has a bore **17** which passes through the yarn guiding body **13** spaced from the yarn outlet channel **14** and which terminates in a blow nozzle **19** opening into the spinning chamber **16.** The bore **17** is, in a manner not shown, connected by means of a pressure conduit to a pressurized air source (also not

shown). In the pressurized conduit there is provided a conventional shut-off valve (also not shown), for example, a magnetic valve for permitting or preventing the flow of pressurized air into the spinning chamber **16.** This valve may be actuated manually or automatically when a cleaning of the fiber groove **20** by means of the pressurized air is desired. The fiber groove **20** is provided circumferentially in an internal wall of the spinning rotor **9** and is situated in the spinning chamber **16.**

In general, it is sufficient to apply the pressurized air jet only after relatively long intervals (for example, every 2–3 days). Or, it is also expedient to effect this air blast while the spinning rotor **9** is slowing down from its operational speed to standstill. For this purpose there may be provided means which turn on the air jet for a predetermined period automatically when driving of the spinning rotor **9** is interrupted. Or, the cleaning of the fiber groove **20** may be automatically effected when yarn breakage occurs. This is a logical time to clean, since often the yarn breakage is caused by an excessive soiling of the fiber groove. Open-end spinning apparatuses are often provided with means which, upon the occurrence of yarn breakage, automatically carry the yarn backwards from the yarn outlet channel to the fiber groove for restarting the spinning. These means include a sensor which is responsive to the slackening of the yarn tension and which emits a signal for restarting the spinning. This signal may then be additionally used to initiate a short-period flow of pressurized air through the blow nozzle **19** onto the fiber groove **20.** If the cleaning is effected upon yarn breakage, it is expedient to automatically brake the rotor, so that the cleaning operation is effected at lower than normal rotor rpm's.

The geometrical longitudinal axis of the blow nozzle **19** is inclined to the geometrical axis of the rotor **9** and is oriented towards the fiber groove **20.** The outlet opening of the blow nozzle **19** is at a distance from the radial plane defined by the base of the fiber groove **20** and is disposed at that side of the aforenoted plane which is oriented towards the open end **21** of the spinning rotor **9.** At the other side of the aforedescribed radial plane there is disposed, at a small distance therefrom (preferably 1 – 3 mm), the inlet opening **22** of an air outlet means **23** of the rotor **9.** The plane of the annular inlet opening **22** is indicated with a dash-dot line. The inlet opening **22** may be rotationally symmetrical, but it is also feasible to provide a rotationally non-symmetrical configuration therefor. Thus, the inner bounding edge of the air inlet opening **22** may have a wave-shaped course. The air flowing into the spinning chamber **16** may be withdrawn therefrom through the air outlet means **23** and introduced into the housing chamber **10.** From the latter, the air may be taken out through one or more air outlet channels connected in a known manner to one or more vacuum sources. Or, the air may be drawn from the chamber **10** by an air drain generated by the rotation of the rotor **9,** provided that this suction effect is sufficient to generate the required flow rate. The air that is admitted to the spinning chamber **16** through the fiber supply channel **15** and the yarn outlet channel **14** and the pressurized air admitted to the spinning chamber **16** for the cleaning of the fiber groove **20** are both withdrawn through the air outlet means **23.**

In the preferred embodiment the air outlet means **23** is constituted by a clearance between two spaced components **24** and **25** forming the spinning rotor **9.** The rotationally symmetrical, generally ring-shaped component **24** forms a circumferential wall which contains the fiber groove **20.** The rotationally symmetrical, generally disc-shaped component **25** of the rotor **9** forms a radial wall portion which is held at a distance from the component by spacers **26** which are traversed by bolts **27** securing the components **24** and **25** firmly to one another. In a central bore of the rotor component **25** there is inserted a solid rotor shaft **28** which is supported in the housing **11** in a manner not shown and is driven externally of the housing **11** by means (also not shown) such as a tangential drive belt assembly.

The inlet opening **22** of the outlet means **23** begins very close to the fiber groove **20** (for example, at a distance of approximately **2** mm) and has the configuration of an annulus, the plane of which is normal to the rotary axis of the rotor **9.** The arrangement of the inlet opening **22** in the immediate vicinity of the fiber groove **20** is particularly advantageous in case of yarn breakage, since the aforediscussed backward transportation of the yarn from the yarn outlet channel to the fiber groove **20** is not hindered by the pressurized air jet. This is so because the pressurized air leaves the spinning chamber **16** immediately from the fiber groove **20** and is thus not admitted to the vicinity of the yarn outlet channel **14.**

The rotor component **25** has a frustoconical elevation **29** which is rotationally symmetrical with respect to the rotary axis of the rotor **9** and the radial face of which is disposed at a small distance (for example, 4 – 5 mm) from the yarn guiding body **13.** This clearance provides for the yarn which is formed during the spinning, a passage from the fiber groove **20** to the yarn outlet channel **14.**

The fiber groove **20** is joined in the direction of the air outlet means **23** by a convex, rotationally symmetrical wall portion **30** of the rotor component **24.** The wall portion **30** is shaped in such a manner that the inner diameter of the rotor component **24** continuously decreases from the base of fiber groove **20** until a location which is situated 1 – 2 mm within the air outlet **23** across the inlet opening **22.** Thus, the wall face **30** has an approximately funnel-shaped, rotationally symmetrical configuration. This design of the zone **30** is particularly advantageous to obtain an effective, rapid air flow that leaves the remainder of the spinning chamber **16** unaffected. By virtue of the frustoconical projection **29** which is disposed radially inwardly spaced from the zone **30,** there is obtained at a short partial zone **31** of the air outlet means **23** a funnel-like cross section that adjoins the inlet opening **22.** This short zone **31** of the air outlet **23** extends practically parallel to the geometrical rotary axis of the rotor **9.** The zone **31** continues in a zone **32** of the outlet channel **23.** The zone **32** extends radially outwardly to the outer circumference of the spinning rotor **9** and is divided into several outlet portions by the spacers **26** in the zone thereof. For example, five spacers **26** may be provided which reduce the total cross section of the air outlet **23** only in an insubstantial manner in their zone.

By virtue of the abovedescribed design of the air outlet means **23,** the outlet opening **35** of the air outlet means **23** is at a greater radial distance from the rotor axis than the outer edge of the inlet opening **22,** so that

the impurities which are blown into the air outlet means **23** during the cleaning of the fiber groove **20** are rapidly and securely transported into the chamber **10** surrounding the rotor **9** with the aid of centrifugal forces imparted thereon.

To enhance the withdrawal of air from the spinning chamber **16**, the air outlet means **23** may be provided with impeller vanes (not shown). Or, in the rotor wall bores (also not shown) may be provided which are inclined to the rotor axis and which form channels for the air outlet means **23**.

The impurities are removed from the chamber **10** — where they can no longer have an adverse effect on the spinning operation — through outlets (not shown) extending from the chamber **10**. The outlet opening **35** has the surface of a relatively large-diameter, relatively small-height circular cylinder.

As it may be observed in the drawing, the pressurized air is guided by means of the design of the inlet opening **22** and the zone **30** in such a manner that immediately downstream of the fiber groove **20** it enters the air outlet **23** and the dislodged impurities are blown directly into the air outlet **23**.

The design of the rotor **9** according to the invention substantially enhances the cleaning of the fiber groove, the removal of the dislodged impurities and the withdrawal of pressurized air. Also, during the normal spinning operation and for the initial spinning of fibers into the yarn it provides particularly advantageous air flow conditions in the spinning chamber **16**.

What is claimed is:

1. In an open-end spinning apparatus of the known type that has (a) a housing chamber, (b) a spinning rotor disposed in said housing chamber and having internal wall means and an open radial face, (c) a spinning chamber defined by said internal wall means of said spinning rotor, (d) a fiber groove provided in said internal wall means and having a base, said fiber groove dividing said wall means into a first wall portion extending between said fiber groove and said open radial face and a second wall portion separated from said open radial face by said fiber groove, (e) a stationary yarn guiding body projecting through said open radial face of said spinning rotor, (f) a yarn outlet channel provided in said stationary yarn guiding body, said yarn outlet channel communicating with said spinning chamber, (g) a blow nozzle having an opening in said spinning chamber, said blow nozzle being oriented toward said fiber groove for periodically emitting a pressurized air jet theretoward for cleaning the same, the improvement comprising air outlet means for guiding air out of said spinning chamber, said air outlet means including an inlet opening provided in said second wall portion of said internal wall means, said inlet opening having an annular configuration and spacedly surrounding the geometrical rotary axis of said spinning rotor.

2. An improvement as defined in claim **1**, wherein said inlet opening begins immediately adjacent said fiber groove.

3. An improvement as defined in claim **1**, including a rotationally symmetrical surface forming part of said second wall portion, said rotationally symmetrical surface extending from the base of said fiber groove into said air outlet means, said rotationally symmetrical surface having a funnel-shaped configuration between said base and at least said inlet opening, said rotationally symmetrical surface having its greatest diameter at said base.

4. An improvement as defined in claim **1**, said air outlet means including a rotationally symmetrical zone extending from said inlet opening approximately parallel to said geometrical rotary axis of said spinning rotor.

5. An improvement as defined in claim **1**, said inlet opening having an outer bounding edge, said air outlet means having an outlet opening, the distance of said outlet opening from said geometrical rotary axis of said spinning rotor being greater than the distance of said outer bounding edge from said geometrical rotary axis of said spinning rotor.

6. An improvement as defined in claim **5**, wherein said outlet opening is provided on the outer circumference of said spinning rotor.

7. An improvement as defined in claim **1**, said inlet opening having a rotationally symmetrical configuration.

8. An improvement as defined in claim **1**, wherein the width of said air outlet means continuously decreases along a predetermined length from said inlet opening.

9. An improvement as defined in claim **8**, including a frusto-conical wall portion bounding air outlet means along said predetermined length.

10. An improvement as defined in claim **1**, said spinning rotor comprising

A. a first component containing said fiber groove,

B. a second component having a radial face constituting a radial base wall of said spinning chamber,

C. means securing said first and second components to one another to form a rigid unit, and

D. spacer means disposed between said first and second components to maintain a clearance therebetween, said clearance constituting said air outlet means.

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