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METHOD AND DEVICE FOR SPINDLELESS SPINNING

Filed Feb. 18, 1970

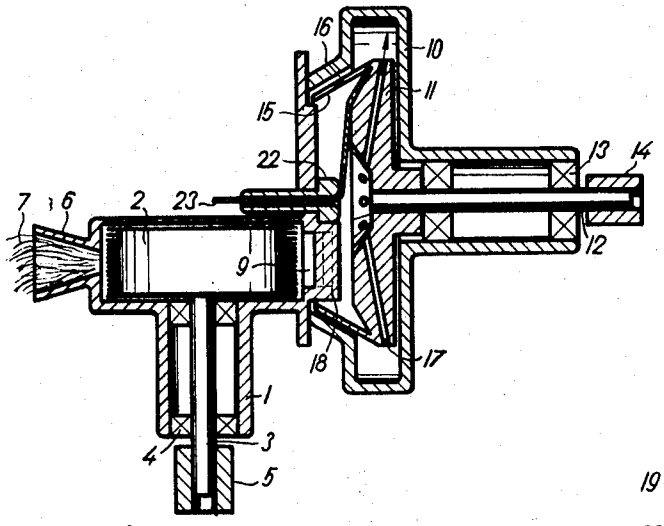


Fig. 1.

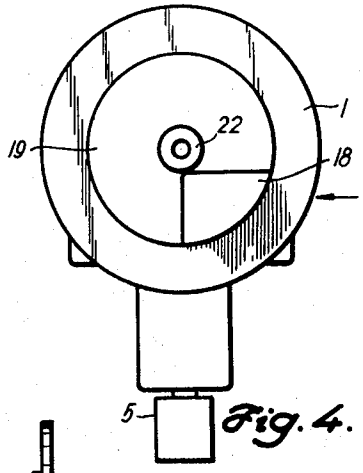


Fig. 4.

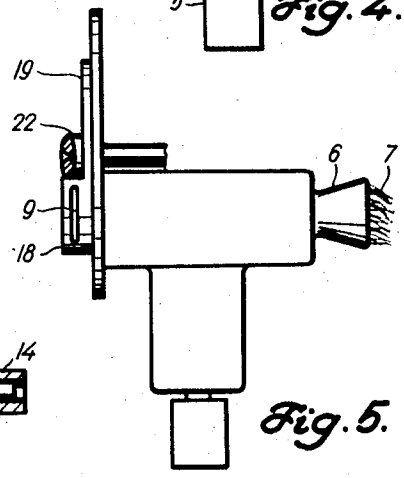


Fig. 5.

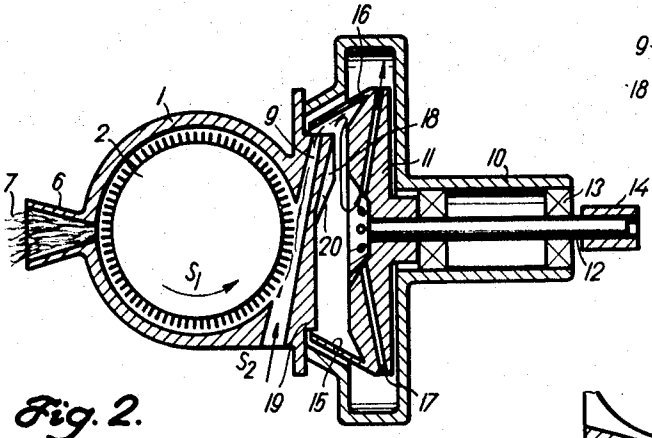


Fig. 2.

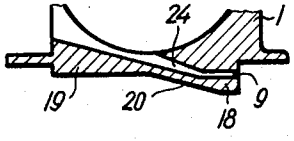


Fig. 6.

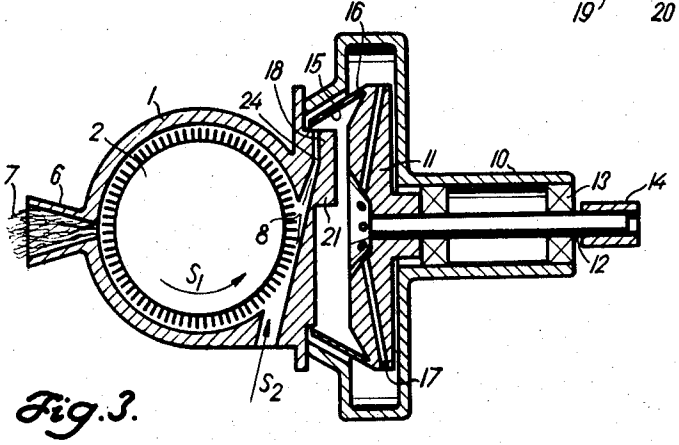


Fig. 3.

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METHOD AND DEVICE FOR SPINDLELESS SPINNING

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U.S. Cl. 57—58.91 10 Claims

ABSTRACT OF THE DISCLOSURE

A method and a device for spindleless spinning. A hollow spinning chamber is rotated about an axis which intersects an open side of the spinning chamber normal to the general plane of the open side. Such rotation causes escape of air under the influence of centrifugal forces from the interior of the spinning chamber through apertures provided for this purpose in the wall thereof. As a result of the escape, a continuous flow of air is aspirated through the open side. A stream of fibers is fed into the open side and is centrifugally deposited on the inner circumferential surface of the chamber and converted into a yarn. A pulsing motion is superimposed upon the flow of air before the latter can escape through the apertures to thereby dislodge and eject with the flow of air such particulate contaminants as tend to accumulate in the chamber and in the aperutres.

BACKGROUND OF THE INVENTION

The present invention relates generally to spindleless spinning machines, and more particularly to spinning machines employing rotary spinning chambers.

Still more specifically the invention relates to a method of cleaning rotary spinning chambers of spindleless spinning machines, and to an apparatus for carrying out the method.

Spinning machines employing rotary spinning chambers for continuous spindleless spinning of fibers are already well known. They operate on the principle that a hollow spinning chamber is rotated at high speed and fibers are introduced into its interior. The spinning chamber is provided in its circumferential wall with apertures through which air is ejected under the influence of centrifugal force from the interior of the spinning chamber. Fibers are fed through an open side of the spinning chamber and become deposited on an inner circumferential wall of the spinning chamber under the influence of centrifugal force. They slide on this wall, which advantageously tapers in axial direciton of the spinning chamber, that is in direction of the axis of rotation, and become collected on a collecting surface where they become converted into a yarn in known manner. Such an apparatus is for instance disclosed in U.S. Pat. No. 3,370,413 (Rajnoha et al.). Reference may be had for specific details concerning the construction and operation of machines of the type in question, to that patent.

Generally speaking, these known prior-art devices comprise two main constituent components, namely the actual spinning apparatus—that is the rotary spinning chamber—and the fiber separating device which includes a carding roller. Usually, a straight channel connects the carding roller of the fiber separating device with the interior of the rotary spinning chamber. Generally speaking, a cylindrical portion of the fiber separator housing extends into the open side of the spinning chamber and has a circumferential outer surface facing the inner circumferential surface of the spinning chamber. The outlet of the channel through which the fibers are supplied is provided in this circumferential surface of the cylindrical portion.

The flow of air aspirated into the open side of the spinning chamber and subsequently again ejected under the influence of centrifugal force through the air escape apertures of the spinning chamber, carries along the fibers dust and other impurities supplied from the carding roller, it being understood that the carding roller separates the fibrous sliver into its constituent fibers, and that the sliver contains in addition to the fibers also dust and certain impurities. The fibers, the dust and the other impurities are accumulated on the inner circumferential wall of the chamber by centrifugal force, and the fibers slide on the inner tapered wall to the fiber selecting surface where they become converted into a yarn. The accumulation of dust and impurities, however, is clearly undesirable for several reasons. This includes the fact that they tend to unbalance the spinning chamber which rotates at high speed so that even a minor imbalance will tend to disadvantageously affect the proper operation of the chamber. Clearly, this reduces the lifetime of the spinning chamber and adversely affects the productivity of the apparatus and the quality of the resulting product. Therefore, the operator is required to frequently stop the machine and to remove the accumulated impurities, thus necessitating not only the constant or near-constant presence of an operator but also necessitating shut-down of the machine while the cleaning operation is carried out. This is uneconomical. In addition, impurities which accumulate in the region of the air escape openings tend to decrease the cross-sectional area of these openings and thus disadvantageously influence the underpressure existing in the chamber, and increasing the number of yarn breakages and the quality—particularly the smoothness—of the produced yarn.

SUMMARY OF THE INVENTION

It is, accordingly, an object of the present invention to overcome the aforementioned disadvantages.

More particularly it is an object of the present invention to provide a method whereby apparatus of the type under discussion is in effect self-cleaning, so that dust and other impurities need no longer be removed by an attendant.

A further object of the invention is to provide an apparatus for carrying out the method.

In pursuance of the above objects, and others which will become apparent hereafter, one feature of the invention resides in a method of spindleless spinning which comprises, briefly stated, the steps of rotating a hollow spinning chamber about an axis which intersects an open side of the spinning chamber normal to the general plane of the open side whereby, as a result of centrifugal ejection of air through apertures in the wall of the spinning chamber, a flow of air is continuously aspirated into the chamber through the open side thereof. A stream of fibers is fed into the open side for centrifugal deposition on an inner circumferential surface on the chamber and is there converted into a yarn. Upon the flow of air there is superimposed, in accordance with the present invention, a pulsing motion before the air is ejected through the apertures, for thereby dislodging and ejecting with the flow of air particulate contaminants which tend to accumulate in the chamber and in the apertures.

According to the invention the airflow in the chamber is dissipated and guided by feeding the incoming fibers in such a manner that they are directed onto the fiber collecting surface of the spinning chamber in direction normal to the surface and from a minimum distance therefrom. The yarn itself is formed at a point which is as remote

as possible from the location where the fibers are deposited on the surface, the purpose being to permit the dust and other impurities to be sucked off by the airstream moving through the chamber, whereas the fibers which adhere to the wall of the spinning chamber slide along the same to the location where they become converted into a yarn, in straightened and oriented condition. This prevents the deposition and accumulation of dust and impurities, and the inclusion of dust and impurities in the yarn which is being formed. This, in conjunction with the occurrence the orientation of the fibers during sliding movement thereof along the inner circumferential wall of the spinning chamber from the location where they impinge upon the wall to the location where they become formed into a yarn, increases the smoothness, evenness and strength of the yarn which is being formed.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a somewhat diagrammatic side-elevational section illustrating an apparatus according to the present invention;

FIG. 2 is a section taken on a line normal to the plane of FIG. 1;

FIG. 3 is a view similar to FIG. 2 but illustrating a different embodiment of the invention;

FIG. 4 is a bottom plane detail view of the apparatus according to the invention;

FIG. 5 is a side-elevational view of FIG. 4 as seen in the direction of the arrow associated with the latter figure; and

FIG. 6 is a fragmentary sectioned detail view illustrating a portion of the embodiment of FIG. 3.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Discussing firstly the embodiment of FIGS. 1 and 2 it will be seen that reference numeral **1** generally identifies a housing of a fiber separating device in which there is mounted a carding or separating roller **2** on a shaft **3** for rotation about the axis of the shaft. The shaft in turn is mounted in bearings **4** of suitable construction and provided at its free end with a pulley **5** so that the shaft and thereby the roller **2** may be driven by a non-illustrated motive source. Also mounted in the housing **1** is a condenser **6** into which a sliver **7** of fibrous material is fed, to be condensed in known manner and to pass to the carding roller **2** which separates the sliver into its constitutent fibers. A continuous connecting channel **9** is provided and is inclined in the direction of rotation of the roller **2**, communicating with the cavity in which the roller **2** rotates. Thus, fibers separated by the roller **2** enter into and advance along the channel **9**. The inlet of the channel **9** is connected with the ambient atmosphere so that air can enter into it as suggested by the arrow S_2 (see FIG. 2).

There is further provided a rotary spinning chamber **11** which is surrounded by a housing **10** and mounted on a shaft **12** which is in turn journaled in bearings **13** and provided at its free end with a pulley **14** so that rotation may be transmitted by a non-illustrated motive source to the shaft and thereby to the rotary spinning chamber **11**. The latter is provided with a plurality of air escape or ventilation openings **17** communicating with the interior.

Into the open side of the spinning chamber, which open side extends normal to the axis of rotation defined by the shaft **12**, there extends a portion **19** of the housing **1**, and the channel **9** has its outlet opening in this portion

19, juxtaposed quite closely with the inner circumferential surface **15** of the spinning chamber **11**. Thus, fibers ejected from the channel **9** are ejected at least substantially normal with reference to the surface **15** and will then slide—because the surface **15** diverges conically in direction away from the open side and the spinning chamber—to the groove **16** which is annular and surrounds the axis of rotation of the spinning chamber **11**. The fibers adhere under the influence of the centrifugal force to the surface **15** and, when they enter the groove **16**, will accumulate therein into the form of a yarn which can then be withdrawn in known manner. Because the groove **16** is quite far removed from the point where the fibers first contact the surface **15**, the fibers have the opportunity during movement from this point to the groove **16**, to become straightened and oriented in their direction of movement. This improves the quality of the yarn which is obtained.

In accordance with the present invention the housing portion **19** is provided with one or more projections **18** having in the embodiment of FIGS. 1 and 2 an inclination **20** of substantially wing-shaped configuration. The projections **18** are provided in proximity of the outlet of the channel **9**. A hollow pin **22** passes through the axis of the spinning chamber **11** in the portion **19** for the purpose of withdrawn yarn **23** which is formed in the groove **16**.

According to the embodiment illustrated in FIGS. 3 and 6 the portion **19** may be provided with one or more projections **21** of rib-shaped configuration, and the channel **9** may be provided upstream proximal to the outlet thereof with a bend **24**.

The end and side elevation of the fiber separating section of the device is evident in FIGS. 4 and 5, and the configuration of the portion **19** of the housing **1** is evident in detail in FIG. 6. It should be noted in FIG. 6 the channel **9** is provided with the bend **24** as shown in FIG. 3, instead of being straight as in FIGS. 1 and 2.

In operation, sliver **7** is fed into the condenser **6** where it undergoes condensing and passes into the cavity housing the separating or carding roller **2**. The carding roller rotates in the direction of the arrow S_1 and, by contact with its outer circumferential surface which is provided with (non-illustrated) pins, needles or the like, the sliver **7** is separated into individual component fibers. Such carding rollers are well known and require no detailed discussion.

The separated fibers **8** are conveyed into the channel **9** by the rotational movement of the carding roller **2**, and are carried along through the channel **9** by the fact that centrifugal ejection of air from the rotary spinning chamber **11** through the air outlet or escape openings thereof causes the aspiration of a continuous flow of air through the open side of the spinning chamber and through the channel **9** from the ambient atmoshpere, as indicated by the arrow S_2. This flow of air causes the fibers **8** to advance along the channel **9** and to be ejected from the outlet of the channel **9** in a direction substantially perpendicular to the inner circumferential wall surface **15** of the spinning chamber **11**. Now these fibers slide along this wall surface **15** to the grooves **16** where they become twisted together and form the yarn **23** which is continuously withdrawn through the hollow pin **22** from the spinning chamber.

Along with the fibers **8**, dust and other contaminants enter the interior of the spinning chamber. According to the invention the air flow which conveys the separated fibers **8** through the channel **9** into the spinning chamber **11**, is reflected off the wall surface **15** and contacts, before it can exit through the air escape openings **17**, the projection or projections **18** or **21**, respectively, which are provided on the portion **19** of the housing **1**. This breaks up or dissipates the air stream, superimposing upon it a pulsating motion which blows or whirls the dust and contaminants off whatever surface portions they have settled

in the interior of the spinning chamber **11**, so that they can be entrained by the air which passes through the apertures **17** and be carried out to the ambient atmosphere. This results in a self-cleaning action of the spinning chamber **11**, avoiding the disadvantages outlined above with respect to the prior art.

The present invention thus provides for a continuous cleaning of the interior of the spinning chamber of dust and other contaminants at all times at which the spinning chamber is in rotation, avoiding the necessity for frequent stoppages and manual cleaning by an attendant, avoiding the necessity to have an attendant present for this purpose, and reducing the number of yarn breakages while increasing the quality of the yarn produced.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of constructions differing from the types described above.

While the invention has been illustrated and described as embodied in a device for spindleless spinning, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be protected by Letters Patent is set forth in the appended claims.

We claim:

1. In a method of spindleless spinning, the steps of rotating a hollow spinning chamber about an axis which intersects an open side of said spinning chamber normal to the general plane of such open side whereby, as a result of centrifugal ejection of air through apertures in the wall of said spinning chamber, a flow of air is continuously aspirated through said open side into and sweeps in laminar flow through said chamber; feeding a stream of fibers into said open side for centrifugal deposition on an inner circumferential surface of said chamber, and conversion into a yarn; and effecting deterioration of said laminar flow by superimposing upon it a pulsing motion prior to ejection through said apertures, for dislodging and ejecting with said air particulate contaminants tending to accumulate in said chamber and in said apertures.

2. In a method as defined in claim **1**; and further comprising reflecting said flow of air off said inner circumferential surface prior to superimposing of said pulsing motion.

3. In a method as defined in claim **1**; and further comprising withdrawing said yarn continuously from said spinning chamber.

4. In a device for spindleless spinning, in combination, a hollow spinning chamber having a peripheral wall, air escape apertures in said wall, an interior circumferential surface, and an open side; mounting means mounting said spinning chamber for rotation about an axis normal to the general plane of said open side; fiber supply means adjacent said open side and comprising a carding roller, and a fiber supply channel inclined in the direction of rotation of said carding roller and having an inlet communicating with the latter for receiving carded fibers and an outlet adjacent said interior circumferential surface and oriented for discharging fibers thereonto in direction substantially normal to said surface; and means for superimposing upon a continuous stream of air which is aspirated into and sweeps in laminar flow through said chamber in response to centrifugal expulsion of air through said escape apertures, a pulsing motion so as to effect dislodging and entrainment by said air of particulate contaminants in said chamber.

5. In a device as defined in claim **4**, wherein said channel comprises a bend in the region upstream of and proximal to said outlet.

6. In a device as defined in claim **4**, wherein said outlet is directly adjacent said surface.

7. In a device as defined in claim **4**, said means comprising at least one projection extending into said spinning chamber from said open side thereof.

8. In a device as defined in claim **7**, wherein said projection is wing-shaped.

9. In a device as defined in claim **7**, wherein said projection is rib-shaped.

10. In a device as defined in claim **7**, said fiber supply means comprising a casing having wall means proximal to said open side and provided with said fiber supply channel; and wherein said at least one projection is provided on said wall means and extends from the same into said spinning chamber.

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JOHN PETRAKES, Primary Examiner

U.S. Cl. X.R.

57—58.95, 156