METHOD OF AND APPARATUS FOR SEPARATING IMPURITIES FROM FIBERS DURING CLEANING OF THE FIBERS

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ABSTRACT

Method of and apparatus for separating impurities from fibers during their cleaning between the zone of combing-out and the zone of duffing during separating which precedes the spinning of the fibers by the open-end method. A cleaning slot guides an air stream onto the combing-out roller of the cleaning mechanism, said air stream driving the impurities into a collecting area, while preventing the separated fibers from flying away. The apparatus shown comprises a separating device of a ringless spinning unit, with a cleaning slot between the combing-out zone and the duffing zone. The body of the separating device comprises a cleaning chamber with a cleaning hole forming a cleaning slot into which the tips of the combing-out roller project, there being a separating channel at the one side of the cleaning hole oriented with respect to said cleaning hole, the other side bearing a reflecting wall and an adjacent exhaust hole.

13 Claims, 10 Drawing Figures
METHOD OF AND APPARATUS FOR SEPARATING IMPURITIES FROM FIBERS DURING CLEANING OF THE FIBERS

This application is related to the following applications assigned to the same assignee:

a. METHOD OF AND APPARATUS FOR REMOVING IMPURITIES RELEASED FROM STAPLE FIBERS—Ser. No. 236,758 filed Mar. 21, 1972
b. RINGLESS SPINNING MACHINE—Ser. No. 236,581 filed Mar. 21, 1972

The present invention relates to a method of and an apparatus for separating impurities from fibers during their cleaning between the zone of combing-out and the zone of doffing during a separating operation that precedes spinning the fibers by the open-end method. The apparatus for performing the method comprises a separating device of a ringless spinning unit with a cleaning slot between the fiber combing zone and the fiber doffing zone.

Fibrous material spun on ringless spinning machines contains impurities, such as crushed husks, leaves, stems, seeds, dust, buds, short fibers, agglomerated and caked fibers, and chemical contaminations. Such ingredients are most undesirable for the product leaving the spinning machine — the yarn. Moreover, they gradually fill in the working zone of the spinning machine, impair the stability of the spinning regime, and thus also impair the quality of the spun yarn. In different known devices designed as a part of the separating apparatus preceding the spinning chamber these impurities are partially removed from the separated fibers prepared for ringless spinning.

Basically, these devices operate upon the principle of a slot arranged in the separating apparatus either between the zone of combing out the sliver and the zone of doffing the fibers, or following the fiber doffing zone. In these cleaning slots some of the impurities are removed; the effectiveness of these slots is determined among other factors, by the length of their circumference which, however, can not be increased arbitrarily because of the danger of fibers flying away.

Except for the said cleaning slot, the majority of known separating devices are not equipped with any special channel for the intake of technological air via the separating device to the spinning chamber; in consequence of this, the pneumatic conditions within the cleaning slot tend to be rather very confused, so that the operation of the cleaning equipment impairs the spinning process.

In our companion application (a) above the cleaning slot on slots is/are arranged in close vicinity of the combing-out zone. Consequently the impurities are released from the fiber sooner than the individual fibers, the individual fibers being pulled out of the fringe wherein they are held by fibrous friction throughout their entire movement through the cleaning zone, whereas the impurities are released almost immediately due to their smaller dimensions.

Accordingly, the said impurities are separated in this cleaning slot, the effectiveness of this solution also being conditioned by the length of the cleaning slot. Thanks to a suitable chosen length and position of the cleaning slot with respect to the combing-out zone, the impurities are released at the beginning of this slot, so that neither the shape of its opposite limiting edge nor the angle included by this edge and the fiberizing roller, have any direct effect upon this process. This solution allows a high proportion of impurities to be removed, yet, unfortunately, some usable fibers are removed as well, as also appears to be the case with a number of other cleaning devices.

It is an aim of the present invention also to hold the loosened fibers by the fiberizing roller. The impurities, however, are not prevented from flying off.

In the method according to the present invention an air stream is directed to the combing-out roller through the cleaning slot, allowing the removed impurities to leave, while preventing the separated fibers from flying away.

In the illustrated embodiment of the apparatus for performing the method according to the present invention a chamber with a cleaning hole is provided in the body of the separating apparatus, forming a cleaning slot into which the tips of the combing-out roller project while at the one side of the cleaning hole there is formed a separating channel oriented with respect to said cleaning hole, the other side being a reflecting wall with the adjacent exhaust hole.

Simplicity of production and easy maintenance are offered by an embodiment of the apparatus wherein the cleaning chamber is demountably accommodated in a recess of the body of the separating device.

A further feature of the invention is that in that one wall of the separating channel is formed by a part of the wall of the recess in the body of the separating device, and the opposite wall is formed by the directing wall formed by bending the cut-through part of the cleaning chamber. The edge of the reflecting wall turned to the combing-out roller may have the form of a cutting edge.

Advantageous embodiments have a rounded-off edge of the reflecting wall turned to the combing-out roller; alternatively, the edge of the reflecting wall turned to the combing-out roller is partially formed by a sloping wall including a predetermined angle with the adjacent part of the combing-out roller, while said sloping wall passes over, at the one hand, to the reflecting wall, and at the other hand to the arcuate wall.

From the viewpoint of achieving favorable pneumatic conditions, a preferred embodiment of the apparatus has a hole arranged in the cleaning chamber coaxially with the exhaust hole; where the wall of the cleaning chamber is deflected the said hole extends into the zone of action of the exhaust hole.

Good service life is obtained if the edge of the reflecting wall adjacent to the combing-out roller is made of anti-abrasive material, e.g., fused corundum, etc.

The foregoing and other features of the method and apparatus according to the invention will be more fully explained in the following detailed description read with the accompanying drawings, in which:

FIG. 1 is a view in section of the separating device including the spinning chamber;
FIG. 2 is a fragmentary sectional view of the cleaning chamber;
FIG. 3 is a view in section of the cleaning chamber, the section being taken along the line 3—3 in FIG. 2;
FIG. 4 is a view similar to FIG. 3 of another embodiment of the lateral wall of the cleaning chamber;
FIG. 5 is a view similar to FIG. 2 showing another embodiment of the cleaning chamber;
FIGS. 6—9, incl. show four different profiles, respectively, of the starting walls; and
FIG. 10 is a view in perspective of the cleaning chamber. Turning now to FIG. 1, in body 1 of the separating device a combing-out roller 11 is accommodated in an appropriate recess with an adjacent feeding roller 12 for feeding the sliver 2 of staple fibers to the needle covered working surface of the combing-out roller 11. The sliver 2 enters the separating device through a condensing funnel 13 and is resiliently pressed against the feeding roller 12 by a pressure shoe 14. The combing and the feeding rollers 11, 12 are driven by known and, consequently, not illustrated means.

The combing-out roller 11 projects into the outlet channel 15 the inlet of which opens into the freely surrounding atmosphere and the outlet of which is arranged in the lateral cylindrical wall of a projection 16 extending into the known spinning chamber 3 for spinning by the open-end method.

The body 1 of the separating device comprises the cleaning chamber 4 with a cleaning hole 40 connecting the area of the cleaning chamber 4 with the area accommodating the combing-out roller 11 in such a way that the tips 111 of said combing-out roller partially project into the space of the cleaning chamber 4 through the cleaning hole 40 (FIG. 2). The cleaning hole 40 represents, basically, the cleaning slot for the passage of impurities, as will be described in more detail hereinafter.

At the side (bottom, FIG. 2) of the cleaning hole 40 which the tips 111 enter during the rotation of the combing-out roller 11 in a counter-clockwise direction in the example of the embodiment, there is provided a separating channel 41 oriented toward the cleaning hole 40, a preferred embodiment of said channel 41 having one side formed as a part of the wall 10 of the recess in body 1, said recess accommodating the cleaning chamber 4. The other side — the one opposite the separating channel 41, is formed by the directing wall 42 formed by bending the cut-through part of the cleaning chamber 4 upwardly. The separating channel 41 is connected with the surrounding atmosphere.

At the other (upper, FIG. 2) side of the cleaning hole 40 where the tips 111 leave the cleaning hole 40, the cleaning chamber 4 is limited by the reflecting wall 43 linked with the sucking part 44, part 44 being connected to a source of vacuum (not shown). The wall 45 opposite the reflecting wall 43 can advantageously be provided with an opening 451 communicating with the atmosphere, as shown. As shown in FIG. 3, one side of 47 of the cleaning chamber 4 is open; the other side is closed by the wall 46 which is preferably inclined downwardly away from the cleaning hole 40 toward the zone of influence of the sucking hole 44.

Further advantages are attained when the cleaning chamber 4 is made readily removable from the recess in the body 1 in which it is mounted.

The end of the reflecting wall 43 confronting the combing-out roller 11 is formed as an edge 431 (FIGS. 2, 5, and 6). Also a rounded-off termination 432 (FIG. 7) is possible, or such termination which is partially formed with a sloping wall 433 (FIG. 8) including a predetermined angle with the adjacent part of the combing-out roller 11, while the sloping wall 433 passes over, at the one hand, to the reflecting wall 43 with the radius R and, at the other hand, to the arcuated wall 434 (FIG. 9). The said termination of the reflecting wall 43 is preferably made of abrasion resistant material, such as fused corundum, etc.

In the embodiment of FIG. 4 there is inserted a bent orifice plate 48 in the part corresponding to open side 47 in FIG. 3, whereby partially to close such opening.

In the embodiment according to FIG. 5 the cleaning chamber 4 has a shape substantially circular in section; naturally, a good deal of different variants of this cleaning chamber are possible.

The above-described apparatus operates as follows.

The sliver 2 of staple fibers is fed by the feeding roller 12 to the rotating combing-out roller 11. The combing tips 111 of roller 11 comb the individual fibers 21 from the sliver 2 within the combing-out zone and separate them. The fibers 21 are delivered by combined pneumatic and mechanical effect into the doffing zone C (FIG. 1) where they are taken into the outlet channel 15, through which they leave the separating device and enter the rotating spinning chamber 3 wherein they are transformed to yarn in a known way by the open-end method.

The impurities 22, such as crushed husks, leaves, stems, seeds, dust, buds, short fibers, agglomerated or caked fibers, chemical contaminations etc., contained in the fed sliver 2, have surfaces which are small with respect to their mass. A certain kinetic energy has been imparted to such impurities by the combing-out roller 11, and so they are shot through the cleaning hole 40 into the cleaning chamber 4, in spite of an air stream being directed to the combing-out roller 11 through the separating channel 41 in the zone of the cleaning hole 40. This stream of air permits the said impurities to pass, yet prevents the fibers 21 that are being combed out from flying into the cleaning chamber, having even the opposite effect of holding the fibers 21 against the surface of the combing-out roller 11. The air stream passing through the separating channel 41 is induced by vacuum existing in the area between the combing-out roller 11 and the body 1 of the separating device. This stream, consequently, separates the fibers 21 from impurities 22 in the cleaning hole 40.

The majority of the impurities 22 strike against the reflecting wall 43 in the cleaning chamber 4, and thus are brought under the effect of the vacuum inlet opening 451 connected with the surrounding atmosphere. The required orientation of the impurities towards the sucking hole 44 is further supported by air streaming through the open part 47 (FIG. 3) of the cleaning chamber 4 and also by the inclined wall 46 opposite the open part 47. The bent orifice plate 48 employed in the embodiment of FIG. 4 advantageously aids this action. Although the invention is illustrated and described with reference to a plurality of preferred embodiments thereof, it is to be expressly understood that it is in no way limited to the disclosure of such a plurality of preferred embodiments, but is capable of numerous modifications within the scope of the appended claims.

What is claimed is:

1. In a method of treatment of fibers wherein impurities are separated from the fibers between a zone of combing-out the fibers by a combing-out roller and a zone of doffing of the cleaned fibers preceding a zone of spinning of the fibers by the open-end method, the improvement which comprises guiding an air stream from the atmosphere onto the combing-out roller by a cleaning slot, driving the impurities by said air stream into a collecting area and removing them therefrom,
preventing the separated fibers from flying away into the collecting area, and introducing the separated fibers into the spinning zone.

2. In fiber treating apparatus having a fiber combing-out roller, an impurity-separating zone following said combing-out roller, a zone of doffing following the impurity separating zone, and means for spinning the cleaned fibers by the open-end method, the improvement which comprises a separating device having a body with a cleaning slot between the combing-out zone and the doffing zone, the separating device having a body with a cleaning chamber with a cleaning hole forming a cleaning slot into which the tips of the combing-out roller project at the one side of the cleaning hole, there being a separating channel connected to the cleaning hole at the other side of the cleaning hole, and there being a reflecting wall, the reflecting wall having an exhaust port therein.

3. Apparatus according to claim 2, wherein the cleaning chamber is readily removably mounted in a recess in the body of the separating device.

4. Apparatus according to claim 1, wherein one wall of the separating channel is formed by a part of the wall of the recess in the body of the separating device, and the opposite wall is formed by the directing wall, the directing wall being in the form of a bent flap having its free edge confronting and spaced from the combing-out roller.

5. Apparatus according to claim 2, wherein the edge of the reflecting wall which confronts the combing-out roller has the form of a cutting edge.

6. Apparatus according to claim 2, wherein the edge of the reflecting wall confronting the combing-out roller is rounded off.

7. Apparatus according to claim 2, wherein the edge of the reflecting wall confronting the combing-out roller is partially formed by a sloping wall disposed at a predetermined angle with the adjacent part of the combing-out roller, said sloping wall merging with an arcuate wall spaced from the combing-out roller.

8. Apparatus according to claim 2, wherein a hole is disposed in the cleaning chamber coaxially with the exhaust hole port.

9. Apparatus according to claim 2, wherein the end of the flap adjacent its free edge is bent toward the exhaust port.

10. Apparatus according to claim 5, wherein the edge of the reflecting wall adjacent to the combing-out roller is made of anti-abrasive material.

11. Apparatus according to claim 2, wherein the cleaning chamber has a substantially circular shape in a section perpendicular to the cleaning slot.

12. Apparatus according to claim 2, wherein the cleaning slot is parallel to the axis of rotation of the combing-out roller.

13. Apparatus according to claim 2, wherein the cleaning slot is inclined with respect to the axis of rotation of the combing-out roller.

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