ABSTRACT

In order to avoid fiber accumulations in the housing, the cover and the cover support surface form a small gap which extends outwardly at an angle of less than 45° relative to the rotational axis of the opening roll. In this way, the centrifugal force component on the fibers acting in the direction of the gap becomes so small that the fibers are not forced into the gap and can thus be swept along the housing surfaces and out of the transfer duct to the rotor.

10 Claims, 8 Drawing Figures
HOUSING FOR AN OPENING ROLL OF AN OPEN END SPINNING DEVICE

This invention relates to open end spinning devices and particularly to a housing for an opening roll of an open end spring device.

Open end spinning devices for processing staple fibers into a twisted yarn have been known to employ opening rolls in order to detach fibers from a supplied fiber sliver and to transfer the detached fibers into a rotor via a suitable transfer duct. As is known, the fibers have been deposited on a fiber collecting surface in the rotor and have been taken off as a twisted yarn.

In many instances, it has been found that fiber accumulations have occurred in the housing containing the opening rolls to such an extent as to impair the operation of the spinning device, and most importantly, the quality of the produced yarn.

In order to overcome these problems, various means have been tried or proposed to ensure against fiber accumulations in the relatively small spaces between the rims of the opening rolls and the housing walls and between the face sides of the opening rolls and the opposed housing walls. As is known, an accumulation of fibers from the airstream passing through these spaces can not only impair the life span of the opening roll, as the clogging which would eventually occur can block and mechanically damage the opening rolls, but also detrimentally influence the quality of the yarn produced, as the accumulations can eventually reach the fiber carrying airstream again and be spun into the yarn to result in creased ends and thick places.

In one instance, the laterally protruding face side rims of an opening roll have been provided with protrusions such as teeth, grooves or similar shapes. However, this has not achieved any noticeable success as the fibers, after arriving at the face side of the opening roll, have found the way back into the needle zone of the roll practically blocked by the angular path determined by the rim of the opening roll. Thus, the fibers have merely accumulated about these protrusions.

In another known instance, the housing walls facing the opening face sides have been provided with inlet openings for the outside air. In this way a radial airstream is created which is directed towards the protruding rims of the opening rolls in order to prevent transfer of the fibers from the needle zone into the clearance between the opening roll face side and the housing. In order to increase the radial air movement, the rims of the opening roll have been provided with radial grooves which act as a fan. This arrangement, however, shows the disadvantage that the action of the radial airstream extends only over a portion of the circumference in close vicinity of the inlet openings. An additional disadvantage is that fly waste (dust and short fibers) present in the vicinity of the inlet openings is sucked in and, thus, also transferred into the space at the face side of the opening roll to cause the above unacceptable symptoms.

A further known means of avoiding clogging and the disturbances in operation caused by clogging and of improving the yarn quality has provided an opening roll rim with a large central opening to connect the roll on one side with the surrounding air. A number of penetrating holes have also been provided in the roll towards the cover side so that the air is carried on more effectively on both sides of the roll and so that the pressure at the opening roll periphery is increased. The disadvantage of this arrangement, aside from the disadvantage due to the rims, is that between the opening roll face side and the openings in the housing on one side, and between the holes in the roll and the face side of the housing on the other hand, fly waste carried from the outside air, as well as originating from the inside, accumulates and causes clogging at the covered opening roll face side. The same can occur at the large central opening on the opposite side, as fly waste is also sucked in from the surrounding room by the airstream between the opening roll and the peripheral cover, which fly waste accumulates opposite the rim of the opening roll and causes clogging. Also, the penetrating holes tend to accumulate dirt, fiber preparation and fiber debris. These accumulations can reach such proportions that even detrimental unbalances can occur.

Accordingly, it is an object of the invention to avoid accumulations of fibers within the housing for an opening roll of an open and spinning device.

It is another object of the invention to improve the quality of yarn processed in open end spinning devices.

It is another object of the invention to substantially reduce the number of ends down and of thick places in yarn processed by open end spinning devices.

It is another object of the invention to reduce the susceptibility of opening roll arrangement to disturbances.

It is another object of the invention to provide a simple housing for an opening roll of an open end spinning device which can be produced and which can avoid fiber accumulations therein.

It is another object of the invention to facilitate the unavoidable flow of fibers along the opening roll face side and re-entry into the stream of fibers or into the clothing respectively while avoiding, under any circumstances, the danger of fiber accumulations at the periphery of the inside room of the housing where these fibers necessarily arrive upon leaving their path along the opening roll face side.

It is another object of the invention to avoid fiber jamming at the places where the cover and the housing sleeve meet to form a separating or limiting surface. B briefly, the invention provides a housing for an opening roll of an opening and spinning device in which the roll can be rotatably mounted about a rotational axis. The housing has an inside surface for receiving the roll, a support surface adjacent this inside surface and a removably mounted cover. The cover is spaced from the support surface to define a small gap therewith which extends outwardly at an angle of less than 45° relative to the rotational axis of the opening roll. This gap is positioned so that the component of centrifugal force acting on any one fiber in the direction of the gap is less than the force required to cause penetration of the fiber into the gap.

In addition, the opening roll is provided with a clothing within the inside surface of the housing and is rimless at the side of the clothing. The clothing is disposed in facing relation to the gap between the cover and the inside surface of the housing and is disposed in closely spaced relation to the gap.

In one embodiment, the gap can be disposed on an angle of zero degrees relative to the rotational axis of
the roll, i.e. the gap can be annular and disposed coaxially of the rotational axis. In another embodiment, instead of extending away from the rotational axis of the opening roll, the gap can extend toward the rotational axis.

In still another embodiment, a braking clearance is provided adjacent the inner end of the gap between the cover and the inside surface to reduce the speed of the fibers penetrating into the clearance.

In another embodiment, the axial distance between a portion of the cover closest to the clothing and an outermost circle of clothing points is smaller than the axial distance between a face side of the opening roll opposed to the cover and the outermost circle of clothing points.

In another embodiment, the clothing of the opening roll is provided with an outermost circle of points directed towards the cover portion closest to the clothing with the points extending over the lateral limitation of the opening roll.

These and other objects and advantages of the invention will become more apparent from the following detailed description and appended claims taken in conjunction with the accompanying drawings in which:

FIG. 1 illustrates a cross-sectional view of an open end spinning device, having an housing according to the invention;

FIG. 2 illustrates a cross-sectional view of the opening roll along line II-II of FIG. 1;

FIG. 3 illustrates a detail of the housing according to the invention;

FIGS. 4 and 5 each illustrate a detail of a modified housing according to the invention;

FIGS. 6 and 7 each illustrates a detail of a modified housing utilizing a braking clearance according to the invention; and

FIG. 8 illustrates a detail of a modified housing utilizing the features of FIGS. 4 and 7.

Referring to FIG. 1, the open end spinning device includes a spinning rotor 1 having a fiber collecting surface 2, as is known, to which individual fibers 4 are fed via a transfer duct 3 to be twisted into a yarn 5 which is thereafter taken off. The fibers are detached from a supplied fiber sliver 8 by an opening roll 7 equipped with a clothing 6 (needles or clothing wire provided with points) and are thrown into the duct 3 in which an airstream flows under the influence of a vacuum prevailing in the chamber 9 about the rotor 1 from a waste separator opening 10 and from an opening 11 at the supply point of the sliver 8. The opening roll 7 rotates in a housing 12 which forms a cylindrical inside surface, the diameter of which only slightly exceeds the outside 8c diameter of the clothing 6, i.e. which leaves a small radial clearance.

Referring to FIG. 2, the housing 12 has a removable cover 14 which is fixed in place in any suitable manner. The inside cover surface 15 is separated from the face side 16 of the opening roll 7 by a small clearance 17 only. The cover 14 in a mounted state contacts a cover support surface 18 of the housing 12 and laterally limits the inside room of the housing along the contact line B. In order to avoid excessive precision requirements for manufacturing the parts forming the support surface 18, a small gap 19 caused by imprecisions of manufacturing operations is tolerated. The width of this gap 19 is of the order of a few one-hundredth parts of a millimeter (the gap being shown in exaggerated width in FIG. 3).

Referring to FIG. 3, in order to ensure that none of the fibers F, the diameter of which is relatively small, and which tend to move radially toward the outside from the clothing 6 of the opening roll 7 which rotates, e.g. at 5,000 to 8,000 r.p.m., i.e. the fibers which are thrown from the opening roll 7 into the region of the gap 19, can be caught there, as such would inevitably result in the fiber accumulations, the gap 19 or the support surface 18, respectively are arranged on the angle less than 45° with respect to the rotational axis 20 of the opening roll 7. If this angle is smaller than 45°, the centrifugal force Z, separated into a force component K, in the direction of the gap 19 acting upon the fiber, becomes so small (K = Z sin α) as to be unable to produce the force required to cause penetration of the fiber into the gap. The fiber thus is carried on along the circumference of the surface 13 until finally reaching the fiber transfer duct 3.

The described action of the support surface 18 being disposed on an angle less than 45° is particularly effective if used in cooperation with a rimless opening roll 7 the type of which roll is known as such. In this case, the fibers can be thrown from the clothing 6 without obstacles against the gap 19. The use of such rimless opening rolls is also desirable in order that a fiber, carried on in the airstream within the clearance 17 in the direction towards the duct 3, is transferred without obstacles back into the space between the clothing 6 and the inside surface 13 to join the other fibers. In this manner no cause for fiber accumulations remains, which could result in thick places in the yarn or ends down or in mechanical damage to the device.

Referring to FIG. 4, the housing can also be constructed so that not only is the angle 0 zero degrees and thus K, zero, but also the cover 14 is provided with a thickened portion 21 which extends towards the inside at the edge of the cover surface 15. A small axial distance a thus remains between the plane G imagined in the cycle of the outermost points of the clothing 6 and the contact line B of the cover 14 and the inside surface 13, which distance a is substantially smaller than the distance a' between the face side surface 16 of the opening roll 7 and the plane G. If a fiber is thrown from the clearance 17 radially towards the outside, it is very unlikely that the path of movement of the fiber is deflected by more than 90° so that the fiber could penetrate into the gap 19. This construction proves advantageous due to the small axial distance a from the clothing 6, as the fibers are caught by the clothing 6 and thus the entrance end of the gap 19 is continuously cleared of fibers arriving there. An angle greater than zero degrees, e.g. in the range of about 45° and 20°, however, shows the further advantage that the support surface can also act as a centering device for the cover 14 (FIGS. 2 and 3). This is also the case in a construction such as shown in FIG. 5, where a negative angle α is chosen.

Thorough investigation of the influence of the position of the gap on the frequency of fiber accumulation using a construction according to FIG. 3, in which the gap extended radially (α = 90 degrees), or axially (α = zero degrees), confirmed the effectiveness of the invention. The following results were found:
The investigations have shown clearly, that fibers are caught very frequently in a radially arranged gap, the width of the gap being larger than the fiber diameter however carefully the parts are manufactured. Also, due to imprecisions, the width of the gap varies along the circumference, and furthermore, depends on the materials used, on the manufacturing conditions, and on the pressure forces caused depending on the type of fixation of the cover on the housing. It can be clearly observed how the fibers rotating at high speed are pressed into a radial gap ($\alpha = 90^\circ$) by the centrifugal force. Once a fiber has been caught, the end still protruding from the gap serves to catch further fibers until the accumulation is large enough to be carried on again by the clothing from whence the accumulation is transferred into the fiber transfer duct and into the rotor. Exact investigations clearly confirmed that fiber jamming in the gap always causes the dreaded fiber accumulations, the more the fibers, due to their speed, show a force component corresponding to the direction of the gap. The investigations with a gap differing from the radial arrangement by more than $45^\circ$ ($\alpha = 0^\circ$) prove that practically no fiber accumulations occur. The force component directed in the direction of the gap is reduced to such an extent that the natural fiber crimp is sufficient of itself to prevent penetration of the fiber into the gap.

Referring to FIG. 6, in order to further improve the construction of create housing, the support surface 22 which is used as a centering surface is set back somewhat, in order to create an annular braking clearance 25 between the cover 23 and the inside surface 24 adjacent the inner end of the gap 26. The width of the braking clearance 25 is one to several tenths of a millimeter (e.g. from 0.1 to 0.3 mm) and the depth is a few millimeters (e.g. 2 mm). The function of this braking clearance 25 is to reduce the speed of the fibers which penetrate into the clearance 25 to such an extent, that the fibers 27 which extend from the bottom of the braking clearance 25 along the supporting surface 22 in like manner as the gap 19 above is no longer subject to fiber pressure. The dimensions of the clearance 25 are chosen such that the ratio of the width to the depth of the clearance is large enough so that fibers can neither jam nor accumulate therein, but are carried on in the direction of the circumference over a short distance and leave the clearance 25. The braking clearance 25 also allows the manufacturing tolerances for the surfaces of the parts forming the gap to be chosen somewhat less stringently so that manufacturing cost can be reduced.

Referring to FIG. 7, instead of using an axial clearance of uniform width, a clearance 27 can be used which converges in the direction of the gap 26. To this end, the entry zone 28 of the clearance 27 is of conical shape, which, if needed, can be kept free of fibers by means of an inclined row of needles 29 of the clothing. This arrangement has the advantage that up to the middle of the clearance 27, an increased airstream is induced transmitting some additional force to the fibers in the direction of the circumference. As a result, the fibers rotate at slower speed and eventually emerge from the clearance 27 or are caught by the needles 29. Alternatively, the braking clearance can converge in steps which extend slightly towards the outside instead of cylindrically.

Referring to FIG. 8, wherein like reference characters indicate like parts and dimensions as above, the features of the constructions of FIGS. 4 and 6 are combined to provide a braking clearance 30 and to have the cover 31 extend into close vicinity of the clothing 32, so that again $\alpha < \alpha'$.

All of the constructions described show the eminent advantage that detrimental fiber accumulations are avoided by simplifying the construction of the opening roll substantially, i.e. by constructing the opening roll without lateral rims in the region of the clothing. Furthermore, as there is no need to have penetrating openings in the roll or in the lateral housing walls opposite the opening roll face sides, no fiber deposits can accumulate or can be drawn into the hollow room of the opening roll housing from the outside.

A considerable advantage in manufacturing a mass-produced item such as the one described is seen in that by merely altering the construction of the components already used slightly, the advantageous effect can be achieved. Further, as the constructions of the cover and roll are simple, each can be made economically. It is a particularly welcome fact, that the immediate and disturbance-free re-entry of the fibers leaving the clothing is facilitated.

A surprising result of the described measure was a drastic reduction in the number of thick places in the produced yarns such that the yarn quality was improved decisively.

What is claimed is:

1. A housing of an open end spinning device having an inside surface for receiving a rotatably mounted opening roll therein about a rotational axis, a support surface adjacent said inside surface, and a removably mounted cover spaced from said support surface to define a small gap therewith extending outwardly at an angle of less than $45^\circ$ relative to said rotational axis.

2. A housing as set forth in claim 1 wherein said angle is zero degrees whereby said gap being annular and disposed coaxially of said rotational axis.

3. A housing as set forth in claim 1 wherein said gap includes an annular braking clearance adjacent said inner end and between said cover and said inside surface to reduce the speed of fibers penetrating into said clearance.

4. A housing as set forth in claim 3 wherein said clearance is of a width of from one to several tenths of a millimeter and of a depth of a few millimeters.

5. A housing as set forth in claim 1 wherein said gap is annular.

6. In combination a housing of an open end spinning device having an inside surface and a support surface adjacent said inside surface; a cover removably mounted on said housing laterally of said roll, said cover being spaced from said support surface to define a small gap therewith extending at an angle of less than $45^\circ$ relative to said rotational axis from an inner end towards the outside; and an opening roll rotatably supported in said housing about a rotational axis and having a clothing
thereon within said inside surface, said roll being rimless at the side of said clothing and said clothing facing said gap in closely spaced relation.

7. The combination as set forth in claim 6 wherein the axial distance (a) between a portion of said cover closest to said clothing and an outermost circle of points of said clothing is smaller than the axial distance (a') between a face side of said roll opposed to said cover and said outermost circle of points of said clothing.

8. The combination as set forth in claim 6 wherein said clothing has an outermost circle of points directed angularly towards said cover to extend over the lateral limitation of said opening roll.

9. The combination as set forth in claim 6 wherein said angle is zero degrees with said gap being annular and disposed coaxially of said rotational axis.

10. The combination as set forth in claim 6 wherein said gap includes an annular braking clearance adjacent said inner end and between said cover and said inside surface to reduce the speed of fibers penetrating into said clearance.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,839,855 Dated October 8, 1974

Inventor(s) Herbert Stalder

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In the title page insert the priority particulars to read as follows:

--Switzerland 8416/72 June 7, 1972--.

Column 2, line 33, before "produced" insert --mass--.
Column 3, line 54, delete "8C" after --outside--.
Column 3, line 55, delete "14" after --clearance--.
Column 5, line 5, delete "2" (second occurrence) and insert --1--.
Column 5, line 35, "create" should be --the--.
Column 5, line 37, "creat" should be --create--.

Signed and sealed this 11th day of March 1975.

(SEAL)
Attest: C. MARSHALL DANN
RUTH C. MASON Commissioner of Patents
Attesting Officer and Trademarks