(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 227 220**
A2

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **86307522.2**

(51) Int. Cl.⁴: **D01H 7/885**

(22) Date of filing: **01.10.86**

A request for correction of Fig. 2 and page 5 has been filed pursuant to Rule 88 EPC. A decision on the request will be taken during the proceedings before the Examining Division (Guidelines for Examination in the EPO, A-V, 2.2).

(30) Priority: **22.11.85 GB 8528844**
22.11.85 GB 8528845

(43) Date of publication of application:
01.07.87 Bulletin 87/27

(84) Designated Contracting States:
AT CH DE ES FR IT LI

(71) Applicant: **HOLLINGSWORTH (U.K.) LIMITED**
Scaitcliffe Street P.O. Box 55
Accrington Lancashire BB5 0RN(GB)

(72) Inventor: **Clough, Douglas Owen**
26, Parkwood Drive Rawtenstall
Rossendale Lancashire, BB4 6RP(GB)

(74) Representative: **Barlow, Roy James et al**
J.A.KEMP & CO. 14, South Square Gray's Inn
London WC1R 5EU(GB)

(54) Friction spinning apparatus.

(57) A friction spinning unit includes a pair of cylindrical friction spinning rollers of which one (1) has an air nozzle 8 mounted adjacent to its periphery and able to discharge a current of air along the surface of that roller (1) so as to move any unwanted fibres which may be on the surface of said roller (1). The air jet from the nozzle (8) may provide a pneumatic barrier to hold fibres away from an annular passage between a surrounding shroud (7) and the outer foraminous sleeve (3) of the foraminous roller (1), and/or the air jet may be used to clear a fibrous slub from the spinning nip in the event of such a slub forming after a yarn break.

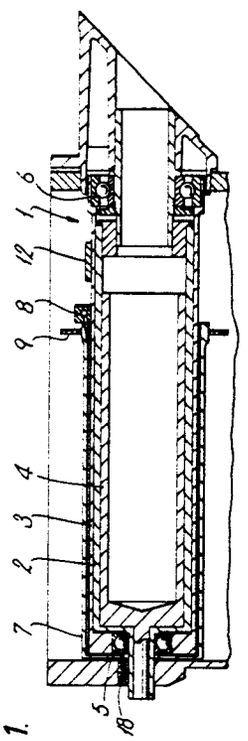

Fig.1.

EP 0 227 220 A2

"FRICTION SPINNING APPARATUS"

The present invention relates to a friction spinning apparatus comprising two parallel, closely arranged cylindrical rollers defining a spinning nip into which fibres are introduced to be rolled up to form a yarn.

The conventional friction spinning apparatus of such a type has a suction slot within one or both of the spinning rollers, providing localised suction so as to concentrate the fibres at the nip. However, some fibres may escape this suction effect and, because of the localisation of the suction, may then be able to lodge in other parts of the friction spinning unit. For example, one time when fibres may well cause difficulties in the friction spinning unit is after a yarn break when the slub resulting from a short over feed of fibres following the breaking of the yarn results in the fact that these fibres are unable to be removed from the spinning nip and become rolled up to form a slub which needs to be removed before the yarn can be re-pieced.

Accordingly one aspect of the present invention provides a friction spinning apparatus including a pair of parallel adjacently arranged rollers drivable in the same sense and defining a spinning nip, means for feeding fibers to said spinning nip, characterized by an airflow-confining shroud closely surrounding a part of the cylindrical surface of one of said rollers, and by an air discharge nozzle for discharging air at the periphery at said one of said friction spinning rollers for urging unwanted fibres along the nip towards one end thereof.

In order that the present invention may more readily be understood the following description is given, merely by way of example, with reference to the accompanying drawing in which:-

FIGURE 1 is a longitudinal sectional view of one of the two friction spinning rollers of a single friction spinning unit in accordance with the present invention; and

FIGURE 2 is a partly sectioned end view showing the friction spinning unit of Figure 1.

In this particular friction spinning unit, which may be one of several such units in a multi-position friction spinning machine, one (1) of the rollers is foraminous and the other is imperforate. However, the principles of the invention could if desired be applied to a friction spinning unit having both of the rollers foraminous.

The foraminous roller 1 comprises an inner sleeve 2 defining a suction slot within a foraminous outer sleeve 3, so that the slot in the inner sleeve 2 localises the suction to the nip.

A further sleeve 4 includes a parallelogram-shaped slot which is used during piecing, as disclosed in our EP-A-0 052 412.

In normal use of the friction spinning unit, the foraminous outer sleeve 3 rotates at high speed by virtue of the end bearings 5 and 6 and by virtue of the tangential belt drive 12 riding on the periphery of the sleeve 3, while the slotted inner sleeves 2 and 4 are stationary.

The position of the slot in the sleeve 2 can if desired be adjusted, for example for the purposes of tuning the friction spinning unit for a particular staple fibre material being spun; the inner-most sleeve 4 is rotated only during the shut-down and piecing operations.

Around the foraminous outer sleeve 3 is, in this case, a further sleeve 7 serving as a shroud of the perforated roller and spaced from the sleeve 3 to define therewith a narrow passage extending circumferentially around the foraminous roller assembly 1.

At one end of the annular passage defined between the shroud 7, and the foraminous outer sleeve 3 of that perforated roller 1, is an air jet nozzle 8 positioned alongside the holding plate 9 for the shroud 7. At its end the shroud 7 is held by a grub screw 18. The nozzle 8 projects air into the annular passage between the shroud 7 and the foraminous outer sleeve 3, with a component of movement along the foraminous roller assembly 1.

In this particular case the movement of the air from the nozzle 8 is helically around the axis of the foraminous roller assembly 1, but in such a way that the airflow is directed in a clockwise sense around the foraminous roller assembly 1 as viewed in Figure 2 and hence the effect of the air jet is to blow the fibrous slub, which may remain in the friction spinning unit upon shut-down, in a direction axially along the spinning nip. Thus, upon shut-down, the air jet can be activated to clear the chamber, and the strength of the air jet released from nozzle 8 can be sufficient to expel the slub along the nip even while suction to the interior of the slotted sleeves 2 and 4 is applied. However, it is alternatively possible for the suction to be switched off during pneumatic cleaning by the nozzle 8.

At one end of the two friction spinning rollers 1 and 10, i.e. the left hand end as viewed in Figure 1, there may be a receptacle (not shown) to receive the fibrous slub released by the jet issuing from the nozzle 8 during the cleaning operation. Alternatively, in the case of a manually cleaned spinning unit, the slub may be allowed to be discharged forwardly of the apparatus when the unit is opened. The friction spinning unit illustrated in Figures 1 and 2 will be as disclosed in our EP-A-0 052 412 in that the imperforate roller 10 is lifted clear of the

fibre feed duct 11 and the foraminous roller assembly 1 when the spinning unit is opened for cleaning and re-piecing. Hence the operation of the air jet at the time will be capable of expelling the fibrous slub clear of the friction spinning rollers if no separate slub receptacle is required.

Any such slub receptacle may of course be subject to vacuum as disclosed in out EP-A-0179644.

Figure 2 also shows the imperforate friction spinning roller 10 and the fibre feed duct 11 which feeds staple fibres to the nip for spinning purposes.

In addition to ejecting any slubs from the spinning unit upon cleaning the operation of the air jet 8 also serves to provide a pneumatic barrier preventing stray fibres from entering the space between the shroud 7 and the foraminous outer sleeve 3 during cleaning. Hence the likelihood of individual fibres being carried into and trapped within the annular passage between the shroud and the outer foraminous sleeve still rotating during the cleaning operation after a yarn break is considerably reduced and in this way the likelihood that, during prolonged use of the spinning unit, fibre will build-up on a nucleus provided by such a trapped fibre eventually causing jamming of the annular passage between the shroud and the foraminous outer sleeve is removed.

In order to provide this "pneumatic barrier" function, the nozzle 8 is switched to discharge an air jet during the cleaning operation of the friction spinning unit, for example as the spinning unit is opened in the case of a manually cleaned unit.

Preferably the shroud is within 0.02" (0.51 mm) from the roller 1. This embodiment of spinning unit is one in which the two friction spinning rollers are open to atmosphere.

Figure 2 shows that the shroud 7 extends around the major part of the foraminous roller assembly but is open at the front (underside) and the rear (top side) of the nip between the rollers 1 and 10.

Reference to Figure 2 will show that the cylindrical part of the shroud 7 extends over in excess of 180° of the circumference of the perforated roller 1, and in this case extends over substantially 250° of the circumference of that roller.

As shown in the end view of Figure 2, the fibre feed duct 14 butts up against an axially extending external face of the shroud 7 which is smoothly radiused at 17 and hence serves as a continuation of the shroud up to the spinning nip between the solid roller 10 and the perforated roller 1. Similarly, there is a "nose" member 15 above the two rollers 1 and 10, which lifts away when the spinning unit is opened for cleaning purposes, as disclosed in our EP-A-0 052 412, and this again serves as a continuation of the shroud 7, but with a working clearance to allow the "nose" 15 to move into and out of position as the spinning unit cover 16 is opened and closed. Thus, while the shroud 10 extends around substantially 250° of the circumference of the perforated roller 1, the concave arcuate extension formed by the smoothly radiused part 17 of the fibre feed duct 14 and a tangential extension formed by the "nose" 15 provide for well in excess of 300° of arc of the periphery of the perforated roller to be shrouded. Furthermore, it should be noted that the "nose" 15 crosses the common tangent plane C-C bisecting the spinning nip, so that the nose 15 deflects fly and short fibres towards the first or perforated roller 1 if they are able to pass through the nip. The thus deflected fly and short fibre is then confined to pass around the first roller back to the front or underside of the spinning nip by the presence of the shroud 10 and in this travel the fly and short fibre will only encounter components which (see the fibre feed duct 14) present a smoothly radiused edge to the fibre and fly to avoid fibre stagnation.

In order further to enhance the guiding action of the "nose" 15, it extends back in towards the nip over a considerable proportion of the spacing between the plane A-A containing the axes of rotation of the first and second rollers 1 and 2 and the parallel common tangential plane of those two rollers making the path of the belt 12. In practice the nose 15 extends through substantially half of that spacing, and is thereby able to be contacted by any stray fly and short fibre very soon after is has passed through the nip.

It is of course important to keep the concave surfaces of the fibre feed duct close to the two rollers, so as to confine the friction spinning nip as much as possible and to economise on the use of technological air, and it is this very step of keeping the cheeks of the fibre feed duct close to the rollers which can give rise to fibre build-up. By extending the shroud 7 round substantially into contact with the radiused edge 17 of the fibre feed duct 14, and by providing that edge itself of smoothly radiused, and preferably highly polished, quality, the circulation of any fly and short fibres back to the spinning nip is enhanced to the maximum extent and a high proportion of the nevertheless minimal quantity of fly and short fibre which penetrates the nip will move back into the front of the nip. This increases the efficiiency of conversion of the incoming fibre material to spun yarn.

If desired, the left hand end of the perforated roller assembly 1 shown in Figure 1 may be provided with some type of self-pumping formation in order to generate an airflow away from the bearing 4.

If desired, the hollow cylindrical body 2 may be provided with apertures at each end near the bearings 4 and 17, for a purpose explained in our British Patent Application No.8523761.

The shroud 7 may, for example, be formed of aluminium with a highly polished radially inner surface. It may also be desirable to treat the radially inner surface in some other way to enhance its abrasion resistance. For example the inner surface may be anodized.

Although, in the above description, it is only the perforated roller 1 which has a shroud, it is of course possible for the other roller 10 (which may be either perforated or imperforate) also to be shrouded.

Although, in the above description, we refer to manual cleaning of the friction spinning unit, it is equally possible to incorporate the air jet in a multiposition friction spinning apparatus where the units are each cleaned by a servicing robot travelling along the machine. The air nozzle may in that case be carried by the robot itself, if desired, and there will be no need for the roller 10 to be moved away for cleaning.

Claims

1. Friction spinning apparatus including a pair of parallel adjacently arranged rollers (1, 10) drivable in the same sense and defining a spinning nip, means (14) for feeding fibres to said spinning nip, characterized by an airflow-confining shroud (7) closely surrounding a part of the cylindrical surface of one (1) of said rollers, and by a air discharge nozzle (8) for discharging air at the periphery of said one (1) of said friction spinning rollers for urging unwanted fibres along the nip towards one end thereof.

2. Friction spinning apparatus according to claim 1, wherein the air-discharging nozzle is directed to discharge air with a first component of movement along, and close to, the surface of said one roller (1), and a second component of movement circumferentially around the said one roller.

3. Friction spinning apparatus according to claim 2, characterized in that said shroud is a stationary cylindrical shroud (7) closely surrounding said one friction spinning roller (1), and in that the air-discharging nozzle (8) discharges a jet of air into an annular clearance defined between said shroud and said one roller, with said second component of movement opposed to the direction of movement of said one roller (1) in use of the spinning apparatus.

4. Friction spinning apparatus according to claim 3, characterized in that said shroud (7) surrounds said one roller (1) over at least 180° of arc thereof and along a major part of the length thereof.

5. Friction spinning apparatus according to claim 3, characterized in that said shroud (7) surrounds substantially 250° of arc of said roller (1) along a major part of the length thereof.

6. Friction spinning apparatus according to any one of the preceding claims, characterized in that said airdischarging means (8) is operated only during piecing.

7. Friction spinning apparatus according to claim 6, when appendant to claim 3 or 4, characterized in that said air-discharging means (8) provides a pneumatic barrier preventing stray fibres from entering the annular space between said cylindrical shroud (7) and the said one roller (1) which it surrounds.

8. Friction spinning apparatus according to claim 7, characterized in that said air-discharging means (8) is effective to provide a pneumatic barrier to prevent fibres from leaving the back of the friction spinning nip after they have been introduced to the front of the nip by said fibre feed means (14).

9. A method of operating friction spinning apparatus comprising two closely spaced cylindrical friction spinning rollers (1, 10) defining a nip to which separated fibres are fed to be rolled up into a yarn, characterized in that during cleaning after a yarn break an air jet is discharged along the surface of one said roller (1) to provide a pneumatic barrier to prevent loosened fibres from being carried on the surface of the said one roller in a direction away from the nip.

10. A method according to claim 9, characterized in that said air jet is discharged between the surface of said roller and a cylindrical stationary shroud (7) closely surrounding a part of said one roller (1).

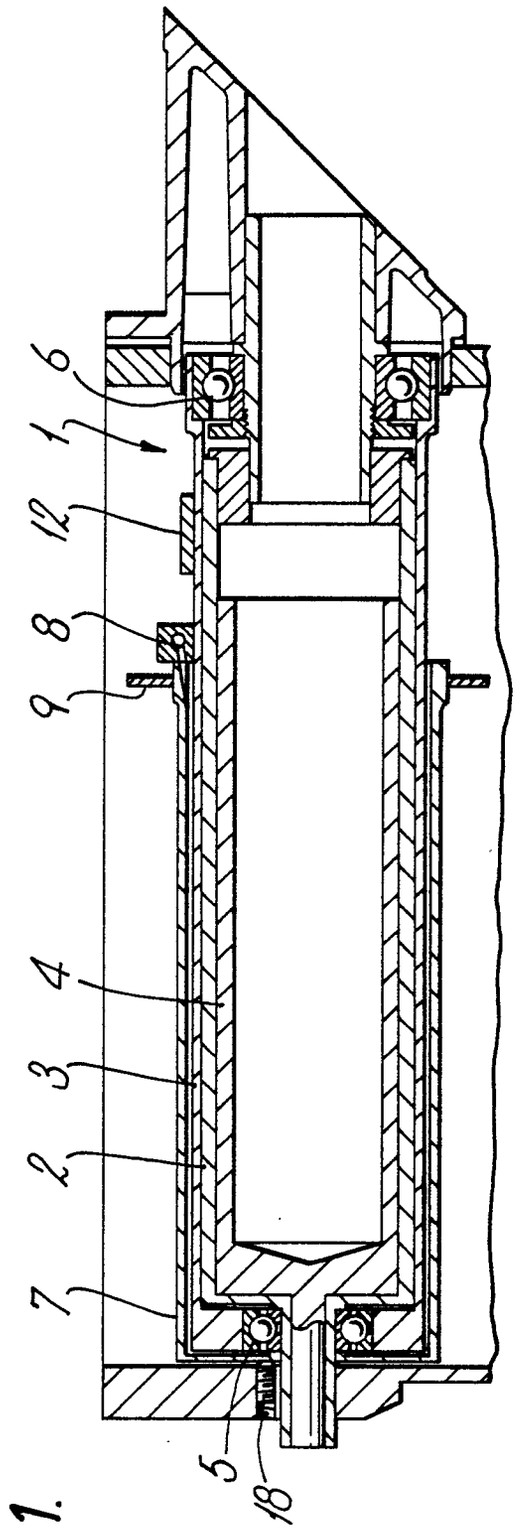

Fig.1.

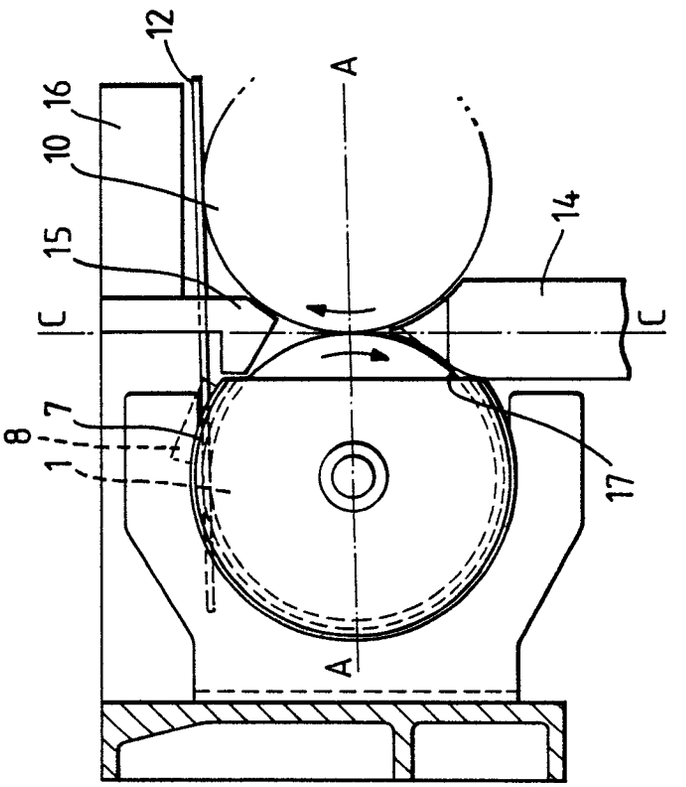

Fig.2.