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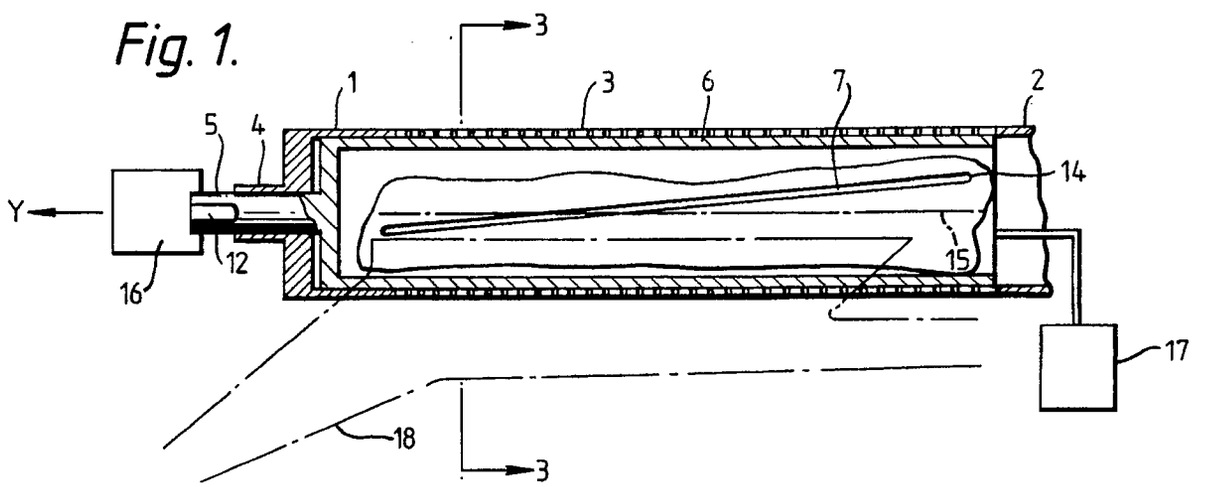
(54) Friction spinning apparatus.

(57) A friction spinning unit includes at least one perforated friction spinning roller (1) comprising a single suction insert operative to transform the friction spinning roller between a normal spinning configuration and a piecing configuration, wherein said single insert comprises a rotatable hollow member (6) having a slot (7) which moves during rotation of the hollow member from its normal spinning position to its piecing position. Preferably the suction applied through said slot is blanked off by bringing the slot into register with a wall (20) of a fibre feed duct (18) of the friction spinning unit.

Fig. 1.



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FRICTION SPINNING APPARATUS

The present invention relates to a friction spinning apparatus, and in particular to a perforated roller for use in a friction spinning apparatus, for example of the type disclosed in US Patent 4315398 (Parker et al).

In US Patent 4315398, there is disclosed a pair of side-by-side rollers which are close enough to define a spinning gap and fibres are held in the spinning gap by suction applied to the interior of one of the two rollers, having a perforated outer surface, while the other roller has an imperforate surface.

Other similar forms of friction spinning apparatus use two separate perforated rollers, each having internal suction to hold the fibres in the spinning gap.

In US Patent 4367623 (Parker et al) there is disclosure of the use of two separate internal sleeves forming part of the suction insert applying localised suction to the perforated outer sleeve of the perforated roller. The inner of these two sleeves has a right angled triangular slot in it whereas the intermediate sleeve (the outer of the two sleeves forming the suction insert) has a rectilinear slot extending substantially parallel to the generatrix of that sleeve and to the longer of the two perpendicular sides of the triangle of the slot in the inner sleeve. The purpose of the outer sleeve is to define the slot at which the suction is to be applied to the spinning gap, whereas the purpose of the inner of the two sleeves is to provide for variation of the axial positioning along the suction slot of the intermediate sleeve during piecing, to vary between a distribution in which there is no suction applied along that sleeve, progressively increasing the length of sleeve slot affected until the whole of the length of the slot is subject to suction.

US Patent 4380892 (Parker et al) discloses the use of a parallelogram-shaped slot (instead of the right-angled triangular slot) in the inner sleeve to allow the suction distribution to be varied in a different way on shut-down, in order to clear and fibre built up from the yarn formation line by ejecting the resulting slub clear of the perforated roller.

US Patent 4502272 (Fuchs) discloses a friction spinning machine in which there are two perforated drums each of which has a single suction insert which can be adjusted in position to suit the type and count of material being spun. However, there is no facility for varying the suction pattern on piecing.

US Patent 4819421 (Stalder et al) discloses a friction spinning unit which has a suction slot capable of being adjusted in position to vary the diameter of the spun yarn in that the depth to which the spun yarn is driven into the nip changes. However, there is no suggestion of varying the suction conditions on piecing.

US Patent 4586325 (Wassenhoven) similarly shows variation in the position of the suction insert in accordance with the properties of the yarn being spun, but no adjustment for piecing.

It is an object of the present invention to improve on the friction spinning roller disclosed in US Patents 4367623 and 4380892 by simplifying the construction.

In accordance with a first aspect of the present invention there is provided a friction spinning roller comprising:- a rotatable perforated sleeve within said perforated sleeve a cylindrical hollow member directly contiguous the interior wall of the sleeve and having a slot which is inclined relative to a generatrix of said hollow member; means for applying suction to the interior of said hollow member; and means for rotating said hollow member between a normal operating position and a piecing position in which piecing position the suction applied to the interior of the hollow member is ineffective at the yarn formation line along at least part of its length and becomes progressively effective as the hollow member is rotated towards said normal operating position; characterised in that said hollow member is the only suction-directing member within the perforated sleeve.

The invention also provides a friction spinning unit including first and second friction spinning rollers and a fibre feed duct arranged to extend into the nip between said first and second friction spinning rollers to feed fibres directly to said nip, said fibre feed duct having at least one wall shaped to conform to the cylindrical exterior of at least one of said friction spinning rollers, wherein said first friction spinning roller is a roller according to the first aspect of the invention, and wherein said means for rotating said hollow member is effective to rotate the hollow member to a position in which said slot is facing said at least one wall of the fibre feed duct whereby the position of the fibre feed duct blanks off at least the majority of the suction slot to reduce the suction, said position in which at least the majority of the suction effect is blanked off being the said piecing position of the hollow member.

The present invention also provides a method of piecing a friction spinning unit which comprises a friction roller containing within a rotatable perforated sleeve; a rotatable suction insert in the form of a cylindrical hollow member which has means defining a slot inclined to a generatrix of the hollow

member; said method comprising the steps of:-

(a) rotating said hollow member to a first position in which suction communicated through the slot is ineffective along at least a part of said yarn formation region;

(b) activating said suction applying means to apply suction to the interior of said hollow member; and

(c) rotating said hollow member progressively through a second position in which the suction begins to become effective at one end of the yarn formation region to attract fibres fed thereto, and towards a third position in which the suction becomes sufficiently extensive along the yarn formation region to permit and maintain spinning, normal spinning being carried out in said third position of the hollow member; characterised by the fact that there is no other suction-confining member within said perforated sleeve and the single suction slot of the single hollow member is used to cut off and to restore suction along the yarn formation region.

Preferably, said friction spinning unit includes a fibre feed duct having a wall bounding a fibre discharge mouth of the duct, and said first position to which the said hollow member is rotated is one in which the suction communicated through said slot of the hollow member is blanked off by said wall of the fibre feed duct, whereby as the hollow member is progressively rotated through said second position the slot moves clear of its position of being blanked by the said wall of the fibre feed duct and the suction effect is restored.

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 section view of a perforated friction spinning roller in accordance with the present invention;

Figure 2 is an end view of the suction insert of Figure 1, when viewed from the left; and

Figure 3 is an end view showing the relative positioning of the two friction spinning rollers and the fibre feed duct.

The friction spinning roller of Figure 1 includes a rotatable outer perforated sleeve having imperforate end regions 1 and 2 to either end of a central perforated region 3. The imperforate end region 1 includes a tubular portion 4 which fits smoothly around a shaft 5 of an inner hollow member 6 of generally imperforate form but having defined therein a slot 7 in this case of coarse pitch helical form. The illustration in Figure 1 is somewhat schematic and the actual pitch of the helix and the helical nature of the slot 7 are not necessarily identical to those shown. It may be desirable for some shape other than purely helical form to be used.

The suction insert defined by the inner hollow member 6 is equivalent to the intermediate and inner sleeves of US Patents 4367623 and 4380892 so that the suction insert has been simplified by the provision of a single inner hollow member 6 having a single slot 7 rather having than the two cooperating sleeves, each with peculiar slots, proposed in US Patents 4367623 and 4380892.

In normal use of the apparatus, the inner hollow member 6 is held stationary and its shaft portion 5 is held to prevent the hollow member 6 from rotating.

A bearing, for example a ball bearing, has its inner race fitted snugly on the exterior of the tubular portion 4 at the left-hand end of the sleeve 1, 2, 3 and has its outer race supported in the machine frame for mounting the perforated outer sleeve rotatably relative to the frame.

Figure 3 shows the arrangement of the fibre feed duct 18 in conjunction with the perforated roller 1 and a cooperating adjacent imperforate roller 19. The two rollers 1 and 19 are shown, in this case, as rotating in the anticlockwise direction so that the perforated roller 1 moves into the nip and the imperforate roller 19 moves out of the nip, and the fibre feed duct 18 is positioned beneath the nip so as to project the fibres upwardly (with a component of rightward movement as viewed in Figure 1 where the same fibre feed duct is shown in chain dotted outline but with the appropriate slanting with respect to the yarn formation line).

Effectively, Figure 3 is a transverse section taken on the line 3-3 of Figure 1.

Figure 3 also shows the alternative positions of the appropriate part of the suction slit 7 in that the solid line illustration 7 in Figure 3 shows the configuration which the slit has when in the Figure 1 position, and the chain dotted line position 7a in Figure 3 shows the position when the hollow member 6 has been rotated into a position where the suction slit becomes at least partly blanked by the appropriate wall 20 of the fibre feed duct adjacent the perforated roller 1, blanking off the suction which is then no longer felt at the nip. This action is useful at various stages in the piecing cycle.

As shown in Figure 1, in the normal spinning position the slot 7 will be arranged such that at the yarn formation end 14 of the slot (the end near the tip of the forming yarn) which will be at the right hand end in Figure 1, the slot 7 will be above the yarn formation line 15 (given that the fibre feed duct of the fibre feed means will project the fibres in a generally upwardly and horizontally inclined direction towards the friction spinning gap) whereas in the downstream yarn consolidation zone of the spinning gap at the left in Figure 1, the slot 7 will be on or even slightly below the yarn formation line

15 so as to apply maximum suction attracting the fibres on to the roller 1 at the spinning gap by means of a suction device 17. In this way the fibres at the delicate tip of the yarn will be subjected to a less fierce suction than those further downstream along the forming yarn where the stronger suction is necessary to hold the yarn firmly against the surface of the rotating perforated roller in order to subject the yarn to higher friction, and hence impart higher twist to it in the yarn consolidation zone.

In the steady state, the apparatus can satisfactorily produce yarn in this manner.

Using the hollow member 6 shown in Figure 1, blanking off the suction can be effected by rotating the hollow member by means of a motor 16 or the like in a direction which lowers the slot 7 in the direction of the chain-dotted position 7a in Figure 3 (i.e. to such an extent that the suction applied through the slot is virtually ineffective at the yarn formation gap as it becomes cut off by the blanking effect of the fibre feed duct). It will, however, be appreciated that where the fibres are being introduced in a generally upward direction onto the yarn formation gap, the right-hand end of the slot 7, as viewed in Figure 1, will be the one nearest the yarn formation line. Hence raising the slot progressively will first of all restore suction to the right-hand of the yarn formation line ready for activation of the fibre feed, and without imposing high friction on the seed yarn in the downstream (left hand) region of the nip, and then gradually (when fibres are being fed) that suction field will spread leftwardly until substantially the whole of the yarn formation line between the opposite ends of the slot 7 will be subjected to fibre-attracting suction giving the conditions necessary for normal spinning.

Figure 2 shows a laboratory style indicator on the hollow member 6, in order to indicate to the operator of a laboratory rig the position of the slot 7 relative to the yarn formation line (ie. to the friction spinning gap adjacent the line of closest approach between the perforated roller shown in Figure 1 and the adjacent non-illustrated imperforate roller).

The hollow member 6 can be adjusted by manipulating the dogs 8 using a suitable adjusting tool, and the indicating arm 9 will then move up and down the scale 10, in the corresponding direction, by virtue of the existence of the grub screw 11 engaging the flat 12 on the shaft-like extension 5 of the hollow member 6. Alternatively, the indicating arm 9 may itself serve as a lever to rotate the hollow member 6.

Once the required degree of angular movement of the hollow member 6 between the normal spinning position and the "start of piecing" position has been determined using the scale 10 and the indicating arm 9, in the laboratory, the production apparatus can be equipped with suitable control means to carry out the appropriate movement.

Claims

1. A friction spinning roller (1) comprising:- a rotatable perforated sleeve (2); within said perforated sleeve a cylindrical hollow member (6) directly contiguous the interior wall of the sleeve and having a slot (7) which is inclined relative to a generatrix of said hollow member; means (5, 17) (8) for applying suction to the interior of said hollow member; and means (16) for rotating said hollow member between a normal operating position and a piecing position in which piecing position the suction applied to the interior of the hollow member is ineffective at the yarn formation line along at least part of its length and becomes progressively effective as the hollow member is rotated towards said normal operating position; characterised in that said hollow member is the only suction-directing member within the perforated sleeve (2).

2. A friction spinning roller according to claim 1, wherein said slot is a single helical slot based on a coarse pitch helix.

3. A friction spinning roller according to claim 1 or 2, wherein the means for rotating said hollow member between its normal operating position and its piecing position includes a projection (5)(8) on an end of the hollow member.

4. A friction spinning roller according to claim 3, wherein the said projection comprises a diametrically extending dog (8) on one end of the hollow member.

5. A friction spinning roller according to claim 3, wherein said projection comprises a shaft (5) integrally formed with an end of the hollow member and having a flat (12) on it, and an actuating/indicating member (9) engaged with said flat.

6. A friction spinning unit including first and second friction spinning rollers (1, 19) and a fibre feed duct (18) arranged to extend into the nip between said first and second friction spinning rollers to feed fibres directly to said nip, said fibre feed duct having at least one wall (20) shaped to conform to the cylindrical exterior of at least one of said friction spinning rollers, wherein said first friction spinning roller is a roller according to claim 1, and wherein said means for rotating said hollow member is ef-

fective to rotate the hollow member (6) to a position in which said slot is facing said at least one wall (20) of the fibre feed duct whereby the position of the fibre feed duct blanks off at least the majority of the suction slot (7) to reduce the suction, said position in which at least the majority of the suction effect is blanked off being the said piecing position of the hollow member.

7. A friction spinning unit according to claim 5, wherein said suction slot (7) includes a portion which is parallel to a generatrix of said hollow member and said fibre feed duct includes a mouth having a boundary parallel to a generatrix of said hollow member, whereby all of said portion of the slot becomes blanked off simultaneously, said portion being at the end of said slot which is nearer that end of said friction spinning unit towards which the yarn (Y) is withdrawn during normal spinning operation of the friction spinning unit.

8. A method of piecing a friction spinning unit which comprises a friction roller containing within a rotatable perforated sleeve; a rotatable suction insert in the form of a cylindrical hollow member which has means defining a slot (7) inclined to a generatrix of the hollow member (6); said method comprising the steps of:-

(a) rotating said hollow member to a first position in which suction communicated through the slot is ineffective along at least a part of said yarn formation region;

(b) activating said suction applying means to apply suction to the interior of said hollow member; and

(c) rotating said hollow member progressively through a second position in which the suction begins to become effective at one end of the yarn formation region to attract fibres fed thereto, and towards a third position in which the suction becomes sufficiently extensive along the yarn formation region to permit and maintain spinning, normal spinning being carried out in said third position of the hollow member; characterised by the fact that there is no other suction-confining member within said perforated sleeve (2) and the single suction slot (7) of the single hollow member (6) is used to cut off and to restore suction along the yarn formation region.

9. A method according to claim 8, wherein said friction spinning unit includes a fibre feed duct (18) having a wall (20) bounding a fibre discharge mouth of the duct, and wherein said first position to which the said hollow member (6) is rotated is one in which the suction communicated through said slot (7) of the hollow member is blanked off by said wall (20) of the fibre feed duct, whereby as the hollow member is progressively rotated through said second position the slot moves clear of its position of being blanked by the said wall of the fibre feed duct and the suction effect is restored.

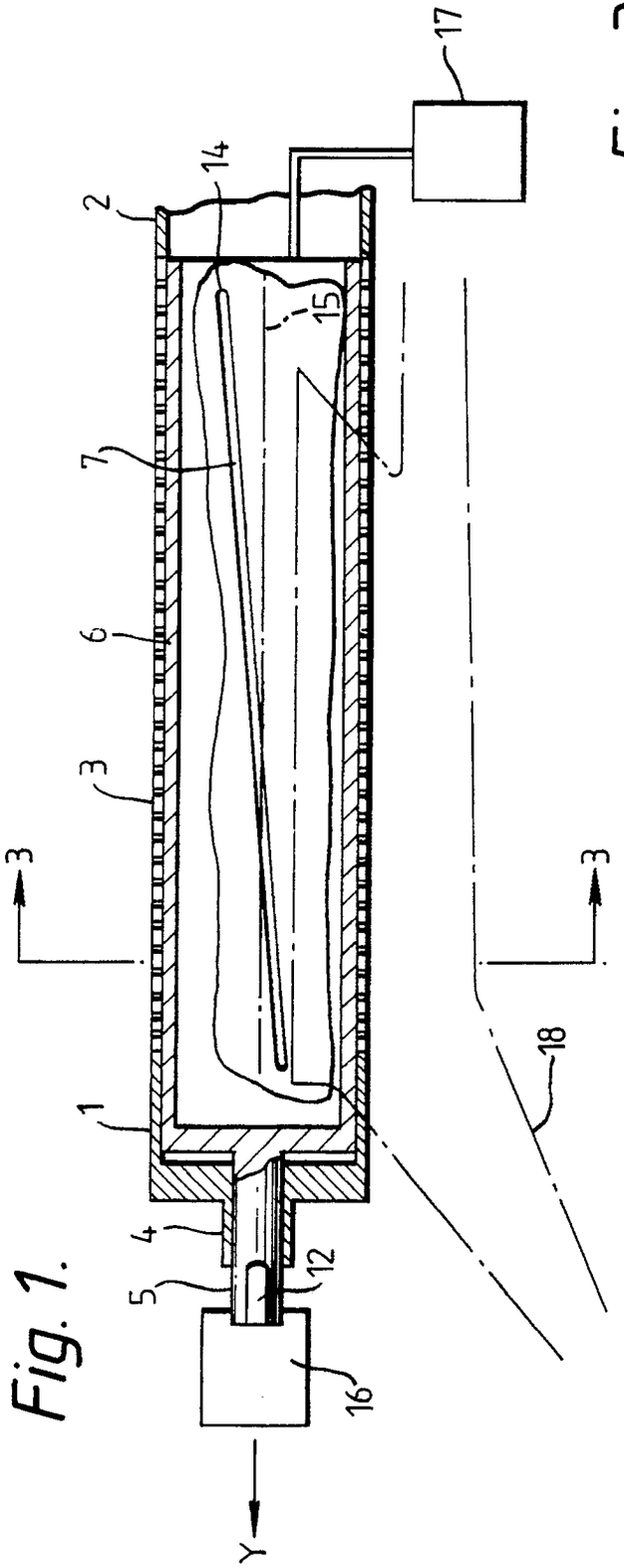

Fig. 1.

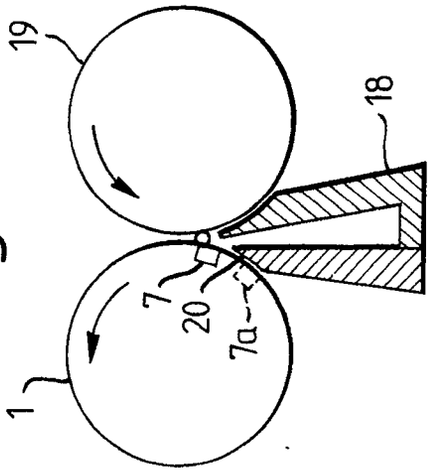

Fig. 3.

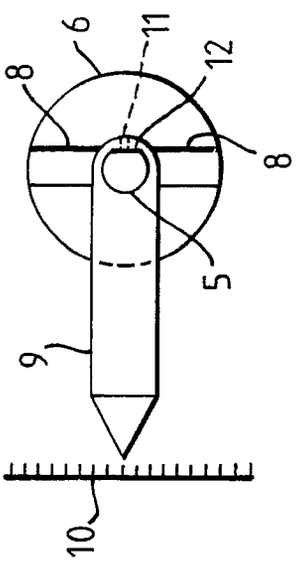

Fig. 2.

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 90 30 0805

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
	NO RELEVANT DOCUMENTS HABE BEEN DISCLOSED -----		D01H4/52
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			D01H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	29 AUGUST 1990	HOEFER W. D.

CATEGORY OF CITED DOCUMENTS

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