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PATENT SPECIFICATION

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(54) APPARATUS FOR FEEDING FIBRES TO THE INNER WALL OF A SPINNING ROTOR OF AN OPEN-END SPINNING APPARATUS

(71) We, SCHUBERT & SALZER MASCHINENFABRIK AKTIENGESELLSCHAFT, a of 8070 Ingolstadt, Friedrich-Ebertstr., 84, Germany, a German Company, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to apparatus for feeding fibres to the inner wall of a spinning rotor of an open-end spinning apparatus, the fibres — which have been formed by opening out a sliver — being conveyed by means of an air current.

With a view to stretching the fibres and maintaining them in parallel condition during their conveyance from the apparatus, in which the slivers are opened out to the form of fibres, to the spinning rotor, the air current has, in the past, been accelerated by conical or tapering feed ducts so that in this way a force is exerted on the fibres (British Patent 1,033,074). This accelerated air current results in an inner friction of the flowing air. In this way a thrusting stress is created between the flowing layers or zones, and results in turbulence. Also, the composite movement is so reduced in areas lying in the immediate vicinity of stationary walls that the flow is always laminar in these zones. The air flow will therefore be turbulent, at some distance from these walls, in consequence of the above described inner friction of the wall. As the fibres assume the speed of the air through the flowing medium that is to say in consequence of friction between air and the fibres, the turbulence will be transmitted to the fibres.

The invention has the general object of providing a fibre feed apparatus, which eliminates these drawbacks and also the turbulence in the flow of fibres prior to the latter being deposited on the inner wall of the spinning rotor.

According to the invention therefore there is provided a fibre feed apparatus in an open-end spinning apparatus which functions subject to a reduced pressure, with a spinning rotor and with a feed duct which is directed tangentially of the inner wall of the spinning rotor, the feed duct having a first conical part and a second cylindrical part which lies immediately contiguously of the first, conical part, characterised in that the cross-sectional area of the inlet or mouth of the conical part should be from 4 to 20 times that of the cylindrical part, whose diameter amounts to 1/10 to 1/25 of the total length of the feed duct, the length of the cylindrical part being 0.5 to 3 times that of the conical part. By thus proportioning the feed duct, the speed of the air is controlled so that the air initially rapidly accelerates the fibres. However, owing to their weight, the fibres have a certain inertia, so that they cannot be accelerated as soon as the air. The fibres therefore need a certain time or distance before they have assumed the speed of the air in the cylindrical part of the feed duct. As, owing to the reduced inner friction, the air flow in the cylindrical part of the feed duct is less turbulent, the positioning of the fibres is at the same time improved and stabilised. In order to prevent turbulence at the outlet of the feed duct, the distance of the centre of the outlet or mouth of the feed duct from the inner wall of the spinning rotor preferably amounts to 1/2.5 to 1/10 of the diameter of the rotor. Also, for improving the guidance of the fibres, the outlet or mouth of the feed duct may have a recess which extends in the circumferential direction of the spinning rotor. British Patents 1,289,601 and 1,264,882 disclose a feed duct having a first, conical part and a second, cylindrical part. In the case of the first of these specifications we are in practice concerned with a conical feed duct which is constituted as a condenser, the cylindrical part of this duct being, owing to

its shortness, practically without effect on the fibres, this feed duct merely serving to fix the duct to the cover. In the case of the second above-mentioned specification the apex angle of the conical part of the feed duct is so small that sufficient acceleration cannot be imparted to the fibres. Instead of this, the fibres are accelerated by an additional air current, produced by suction, which current acts on the fibres between the conical and the cylindrical part. Appreciable turbulence is produced by the abrupt effect of this air current, as a result of which the positioning of the fibres is adversely affected.

The invention is further described below with reference to the drawings, in which:—

Figure 1 illustrates, in cross-section, an open-end spinning apparatus, with the fibre feed apparatus according to the invention;

Figure 2 is a cross-sectional view of a feed duct according to the invention;

Figure 3 illustrates part of a modified feed duct, in cross-section; and

Figure 4 shows, in cross-section, a spinning rotor and a feed duct which opens into the latter.

The open-end spinning apparatus illustrated in Figure 1 includes, in a known manner, a device 1, which may be of any desired construction and which serves for opening-out the sliver into fibres which are fed, by means of a feed duct 2, to a spinning rotor 3. The spinning rotor 3 is mounted in a housing 30, which is closed by a cover 31. The cover 31 receives, in a known manner, a thread draw-off duct (not shown), through which the spun thread is drawn off by a conventional thread draw-off device. The reduced pressure, necessary for the spinning operation is either produced by the spinning rotor 3 itself (in consequence of its rotation), or by an outside source of underpressure, which is intended for use for a number of spinning rotors. In the embodiment illustrated, the apparatus 1, serving to open out the sliver, comprises a high-speed clothed roller 11, which is mounted in a housing 10. The recess 12 in the housing, which surrounds the clothed roller 11, merges into the feed duct 2, which has a first conical part 20 and a second, cylindrical part 21, which directly adjoins the said first part 20. According to the invention, the air is to be accelerated, in the first conical part 20, until the desired final speed is reached; this entails a very great acceleration of the air. For this purpose the inlet or mouth 22 of the conical part 20 has a cross-section which is from 4 to 20 times that of the cylindrical part 21. In a known manner, the cross-sectional area of the cylindrical part 21 of the feed duct 2 is predetermined. The air assumes a constant speed in the cylindrical part 21.

The fibres, which are accelerated through frictional contact with the air, are accelerated to a lesser extent that the current of air, owing to the inertia of the fibres. Therefore, the speed of the fibres is less than that of the air in the region 23 of the transition from the conical part 20 to the cylindrical part 21. The parallelism of the fibres is destroyed through the inner friction of the accelerated air current and through the turbulence created thereby. According to the invention, and with a view to subsequently accelerating the fibres — and also to stabilising and improving the relative positioning of the fibres — a cylindrical part 21 is arranged directly contiguously of the conical part 20, the current of air being in a less turbulent condition in this cylindrical part 21 owing to the reduced inner friction. According to the invention, the length a of the cylindrical part 21 amounts to 1/2 to 3 times the length b of the conical part 20. Tests have shown that the fibres cannot be subsequently accelerated to the speed of the air if the cylindrical part 21 is shorter than as has been indicated above. If this part 21 is, on the other hand, longer than indicated above, the frictional resistance which the wall presents to the air will preponderate in the cylindrical part 21, and the flowing medium will, together with the fibres, continue to flow in a turbulent manner.

According to the invention the total length l of the feed duct 2 will be 10 to 25 times the diameter d of the cylindrical part 21. In this way it is ensured that the fibres will be accelerated to the desired final speed, although the fibres will be maintained in a good condition of parallelism in the cylindrical part 21 of the feed duct 2, and the position of these fibres will be stabilised.

Accordingly, the fibres are initially subject, after they have been formed through opening out the sliver, to the effect of the air current, which is rapidly accelerated in the conical part 20 of the feed duct 2, and then to the effect of the air current which flows at an approximately constant speed. The fibres then leave the feed duct 2 and are subjected to the effect of the rotating inner wall 32 of the spinning rotor 3 and of the rotating air interface, the speed of the air interface corresponding, in the immediate vicinity of, or very close to, the inner wall 32 of the spinning rotor 3, to the circumferential speed of this inner wall 32. The speed of the air layer, which rotates with the said air interface, decreases radially towards the centre; this is because, firstly, the radius becomes smaller in this direction and, secondly, the effect of frictional contact with the air interface decreases. If the feed duct 2 opens out into

a zone in which, in consequence of the air interface (which rotates together with the air layer), the speed of the air is greater than the speed at which the air leaves the feed duct 2, then a so-called air break-away edge will be formed at the end of the feed duct 2, this air breakaway edge resulting in the formation of air eddies. The effect of these air eddies may be felt as far as the inside of the feed duct 2, so as to impart a turbulence to the fibres issuing from the outlet or mouth 24 of the feed duct 2. Therefore, the radial distance *c* of the centre of the outlet or mouth 24 of the feed duct 2 from the inner wall 32 of the spinning rotor 3 is to amount to about 1/2.5 to 1/10 the diameter D of the rotor. At this distance the rotating air layer will not tend to eddy into the feed duct 2. It may also be be ensured, in this way, that the air ring will not be disturbed in the course of its rotation. it will also be possible to arrange the upper or lower (in relation to the axis of the spinning rotor) edge of the outlet or mouth 24 to lie closer to the inner wall 32 of the spinning rotor 3, so as to give the fibres a longer path of guidance in the axial direction, that is to say in the direction of the axis of the rotor. Under these circumstances, and according to the invention, the outlet or mouth 24 of the feed duct 2 will be formed with a recess 25 which extends in the circumferential direction of the spinning rotor 3, while the feed duct 2 has two tongues 26 and 27, located at the upper and lower (with respect to the axis of the rotor) edge respectively.

The recess 25 of this kind is of fundamental importance, and is not necessarily provided in conjunction with a feed duct 6 having the shape described above.

By means of the method and apparatus proposed according to the invention the fibres are so affected in their path of conveyance from the sliver opening apparatus 1, by the controlled air flow that these fibres are deposited in stretched and parallelised condition on the inner wall 32 of the spinning rotor 3. The apparatus is simple in construction. The particular shape given to the cover 31 is without importance for the present invention. Thus, it is not a matter of vital importance whether (and, if so, to what extent) the cover 31 extends into the inside of the spinning rotor 3, and whether the feed duct 2 opens out at the circumferential surface of this kind of extension (appendage) of the cover, or whether it terminates in the free space below the cover 31.

WHAT WE CLAIM IS:—

1. Fibre feed apparatus in an open-end spinning apparatus which functions subject to a reduced pressure, with a spinning rotor and with a feed duct which is directed tangentially of the inner wall of the spinning rotor, the feed duct having a first conical part and a second, cylindrical part which lies immediately contiguously of the first, conical part, characterised in that the cross-sectional area of the inlet or mouth of the conical part amounts to 4 to 20 times the cross-sectional area of the cylindrical part, the diameter of the cylindrical part amounts to 1/10 to 1/25 the total length of the feed duct, and the length of the cylindrical part being 0.5 to 3 times the length of the conical part.

2. Fibre feed apparatus according to Claim 1, characterised in that the distance of the centre of the outlet or mouth of the feed duct from the inner wall of the spinning rotor amounts to 1/2.5 to 1/10 of the diameter of the rotor.

3. Fibre feed apparatus as set forth in Claim 1 or Claim 2, characterised in that the outlet or mouth of the feed duct has a recess which extends in the circumferential direction of the spinning rotor.

4. Fibre feed apparatus in an open-end spinning apparatus substantially as hereinbefore described with reference to, and as shown in, the accompanying drawings.

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a zone in which, in consequence of the air interface (which rotates together with the air layer), the speed of the air is greater than the speed at which the air leaves the feed duct 2, then a so-called air break-away edge will be formed at the end of the feed duct 2, this air breakaway edge resulting in the formation of air eddies. The effect of these air eddies may be felt as far as the inside of the feed duct 2, so as to impart a turbulence to the fibres issuing from the outlet or mouth 24 of the feed duct 2. Therefore, the radial distance *c* of the centre of the outlet or mouth 24 of the feed duct 2 from the inner wall 32 of the spinning rotor 3 is to amount to about 1/2.5 to 1/10 the diameter D of the rotor. At this distance the rotating air layer will not tend to eddy into the feed duct 2. It may also be be ensured, in this way, that the air ring will not be disturbed in the course of its rotation. it will also be possible to arrange the upper or lower (in relation to the axis of the spinning rotor) edge of the outlet or mouth 24 to lie closer to the inner wall 32 of the spinning rotor 3, so as to give the fibres a longer path of guidance in the axial direction, that is to say in the direction of the axis of the rotor. Under these circumstances, and according to the invention, the outlet or mouth 24 of the feed duct 2 will be formed with a recess 25 which extends in the circumferential direction of the spinning rotor 3, while the feed duct 2 has two tongues 26 and 27, located at the upper and lower (with respect to the axis of the rotor) edge respectively.

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