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(54) Drawing device for spinning machine

(57) An drawing device for a spinning station (1) comprises a pair of feeding rollers (2,3), a pair of apron-holding rollers (10,11) downstream from the pair of feeding rollers (2,3), a pair of aprons (8,9) wound around said apron-holding rollers (10,11), return curve and guide devices (14,18,31,15), which condition the paths of the aprons (8,9) to create a stretch of contact (17), along which said aprons (8,9) are fixed to each other, creating a guide for a sliver (5). A pair of drawing rollers (21,22) is set downstream from the stretch of contact (17) of the pair of aprons (8,9). A pre-drawing area is created between a tightening slot (4) of the pair of feeding rollers (2,3) and an entrance tightening slot (7) of said aprons (8,9) between said apron-holding rollers (10,11). A main drawing area is created between the pair of apron-holding rollers (10,11) and the pair of drawing rollers (21,22), in which the angle (α) that is defined between a plane or straight joining line between the axes of rotation (26,28) of the pair of apron-holding rollers (10,11) and a plane or straight joining line between the axes of rotation (27,29) of the pair of drawing rollers (21,22) is greater than 10°.

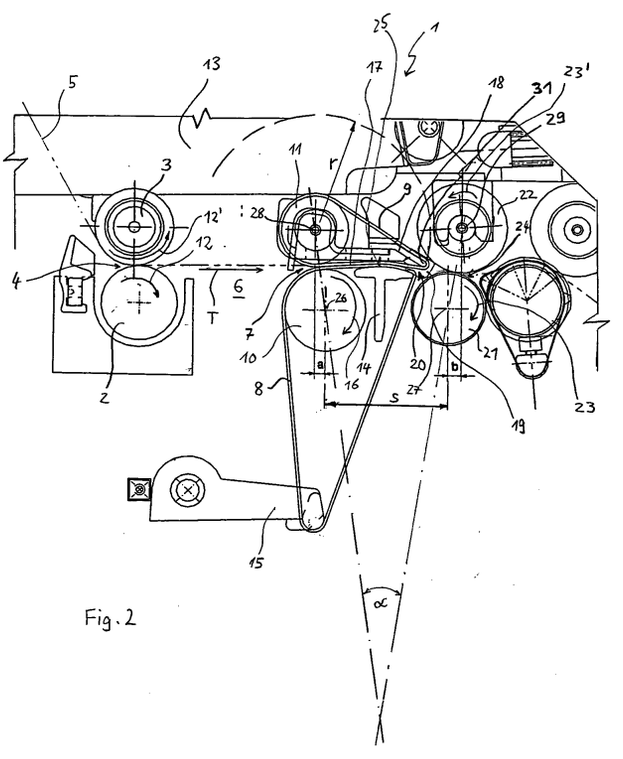

Fig. 2

EP 1 602 755 A1

Description

[0001] The present invention refers to a double apron drawing device for a spinning machine, in particular for a ring or jet spinning machine.

[0002] Ring spinning machines are usually made up of a variety of spinning stations aligned along its fronts. Each spinning machine front is made up of hundreds of these stations. In these spinning machines, the rough sliver usually comes from a package hanging above the spinning station and is brought to a pair of feeding rollers and passed through a defined pre-drawing area between the pair of feeding rollers and the tightening slot of a pair of two aprons that are supported by two apron-holding rollers. The rough sliver is refined and lengthened in this pre-drawing area thanks to the circumferential speed difference between the pair of feeding rollers and the pair of aprons.

[0003] The two aprons are fixed to each other along one of their predetermined stretches of contact and provide guiding and transporting devices along this stretch for the pre-drawn sliver set between them.

[0004] A lower apron of the pair of aprons follows an approximately triangular path that is determined by a lower apron-holding roller, a guide part so-called a small bridge, which supports the lower apron along a part of the stretch of contact with the upper apron and a belt tightening lever to guarantee a set tension of the lower apron.

[0005] An upper apron of the pair of aprons follows an approximately triangular path that is determined by an upper apron-holding roller and a so-called return cage, which creates an acute angle of the upper apron in an exit area of the sliver from the two aprons. This return cage rests on the small bridge near the exit area by means of one of its spacer parts.

[0006] The stretch of contact between the two aprons is thus defined between the entrance tightening slot of the pair of belt-holding rollers and the tightening slot or the exit area between the small cage and the small bridge.

[0007] A main drawing area is defined between the aforesaid entrance tightening slot of the pair of aprons and a tightening slot of a pair of drawing rollers placed downstream in the direction of movement of the sliver, where the sliver is further refined and lengthened thanks to the circumferential speed difference between the pair of drawing rollers and the pair of aprons.

[0008] The drawn sliver is fed from the pair of drawing rollers to a condensation device or directly to a torsion group, for example one that is ring type, of the spinning machine.

[0009] The degree of uniformity and compactness of the sliver during and after drawing not only determines the quality of the final yarn, but also the resistance of the sliver during the same drawing phase and during the subsequent phases of condensation, twisting and winding of the yarn and consequently the speed and efficiency with which these processing phases can be carried out.

[0010] To obtain uniform drawing and reduce the risk of the sliver separating or tearing as a result of drawing that is too restricted, it is advisable to increase the distance between the tightening slot of the pair of apron-holding rollers and the tightening slot of the pair of drawing rollers. At the same time, it is also advisable to reduce the distance between the exit area of the pair of aprons and the tightening slot of the pair of drawing rollers to reduce the so-called free stretch where the fibres pass basically without control.

[0011] On the other hand, the so-called gauge, which is the distance between the axis of rotation of the lower apron-holding roller and the axis of rotation of the lower exit roller must be chosen depending on the average length and type of the single fibres composing the sliver.

[0012] If this gauge increases too greatly in relation to the average length of the single fibres, an uninterrupted sequence of fibres that are at least partially overlapping is no longer guaranteed between the pair of apron-holding rollers and the pair of drawing rollers.

[0013] Moreover, by increasing the distance between the exit area of the pair of aprons and the pair of drawing rollers, the space also increases, where the sliver is free, in other words without support transversal to the direction of movement, and consequently subject to phenomena of cross fraying and section irregularity.

[0014] The aim of the present invention is therefore to make a drawing device available for spinning machines, with characteristics that can conciliate the aforesaid contrasting requirements and resolve the problems stated referring to the prior art.

[0015] This and other aims are achieved by means of a drawing device for spinning machines according to claim 1.

[0016] For a better understanding of the invention and to appreciate its advantages, a form of embodiment will be described below by way of example, which is not limiting, with reference to the accompanying drawings, wherein:

[0017] figure 1 is a side view of a part of a spinning station, containing a drawing device according to the invention;

[0018] figure 2 is a side view of the drawing device according to the invention.

[0019] With reference to the drawings, a spinning station 1 of a spinning machine comprises a pair of feeding rollers 2, 3, which define a tightening slot 4, into which a rough sliver is fed 5 (line dot dash).

[0020] In keeping with a form of embodiment, a lower feeding roller 2 of the pair of feeding rollers 2, 3, similar to other lower rollers that will be described later on is made up of a segment that is preferably grooved of a longitudinal rotating bar, in common with the adjacent spinning stations, which can be operated by means of rotation in a controlled manner according to the arrow 12.

[0021] The upper counter feeding roller 3 is advantageously supported in idle mode by a lever or support beam 13, by means of which the upper feeding roller 3 can be pressed against the lower feeding roller 2 so that this drags it making it rotate according to the arrow 12'.

[0022] When the rough sliver 5 comes out of the tightening slot 4 of the pair of feeding rollers 2,3, it passes through a pre-drawing area 6 defined between the pair of feeding rollers 2, 3 and an entrance tightening slot 7 of a pair of aprons 8, 9.

[0023] Preferably, a lower apron 8 of the pair of aprons 8, 9 is wound around a lower apron-holding roller 10, a guide part 14 and a belt tightening lever 15, which determine its approximately triangular path.

[0024] Advantageously, the lower belt-holding roller 10 comprises a knurled segment of a longitudinal bar, preferably in common with the adjacent spinning stations, which can be operated by means of rotation in a controlled manner according to the arrow 16 and adapted to dragging the lower apron 8 along its path.

[0025] The guide part or small bridge 14 is set so that it supports the lower apron 8 along at least one part of a stretch of contact 17 with the upper apron 9, whilst the belt tightening lever 15 is supported, preferably elastically, to guarantee a set tension of the lower apron 8.

[0026] The upper apron 9 is preferably idle and supported so it can be moved by dragging by the lower apron 8.

[0027] In keeping with a form of embodiment, the upper apron 9 is wound around an upper apron-holding roller 11 and a return cage 18, which determine its approximately triangular path. The upper apron-holding roller 11 is supported in idle mode by the support lever 13 that allows it to be pressed against the lower apron-holding roller 10 so that the lower apron-holding roller 10 can move the pair of aprons 8, 9 by dragging with the upper apron-holding roller 11.

[0028] The small return cage 18 is preferably formed and arranged to create an acute angle return curve of the upper apron 9 near an exit area of the sliver from the stretch of contact 17 of the two aprons 8, 9. The small return cage 18 also comprises a spacer part 19 by means of which it rests on the small bridge 14 to guarantee a determined distance between the small return cage 18 and the small bridge 14, which defines the exact position of an exit tightening slot 20 of the pair of aprons 8, 9. The conformation of this spacer part preferably varies depending on the fibres to be processed in the spinning station.

[0029] The stretch of contact 17 of the two aprons 8, 9 is therefore defined between the entrance slots 7 (which coincides with the tightening slot of the pair of belt-holding rollers 10, 11) and the exit slot 20 that is defined between the small return cage 18 and the guide part (small bridge) 14.

[0030] The pair of feeding rollers 2, 3, particularly the lower feeding roller 2, can be operated with a different circumferential speed, in particular that is less than the circumferential speed by which the pair of aprons 8,9 can be operated by the lower apron-holding roller 10. The difference in the circumferential speeds of the aforesaid lower rollers results into a difference in the transporting speed of the sliver 5 in the pre-drawing area 6, which results in refinement and lengthening of the length and conformation of the rough sliver.

[0031] The thus pre-drawn sliver enters the entrance slot 7 of the pair of aprons 8, 9 and is carried between them along their stretch of contact 17 to the exit slot 20 of the pair of aprons 8, 9.

[0032] When the sliver comes out of the exit slot 20 of the pair of aprons 8,9, it passes through a final drawing area that is defined between said exit slot 20 and a tightening slot 24 of a pair of drawing rollers 21, 22 downstream from the exit slot 20.

[0033] The pair of drawing rollers 21, 22 can be operated with a greater circumferential speed than that of the aprons 8, 9 to give the sliver one last iron.

[0034] In keeping with a form of embodiment, a lower roller 21 of the drawing rollers is made up of a grooved segment of a longitudinal bar, preferably in common with the adjacent spinning stations, which can be operated by means of rotation in a controlled manner according to the arrow 23 and which is adapted to dragging an upper drawing roller 22 resting on it to make it rotate.

[0035] Advantageously, the upper drawing counter roller 22 is supported in idle mode by the lever or support beam 13 by means of which said upper drawing roller 22 can be pressed against the lower drawing roller 21 so that this drags it to make it rotate according to the arrow 23'.

[0036] The difference in circumferential speed between the pair of drawing rollers 21, 22 and the pair of aprons 8, 9 results into a difference in the transport speed of the sliver in the main drawing area, which results in refinement and lengthening of the length of the pre-drawn sliver.

[0037] The drawn sliver coming out of the pair of drawing rollers 21, 22 is then fed to a condensation device or directly to a torsion group, which are known and therefore not described in detail.

[0038] Advantageously, the small guide bridge or part 14 presents a guide surface 25 for the lower apron 8 that has a basically convex shape without any cavities so that the part of the stretch of contact 17 of the belts 8, 9, which is sustained by the guide part 14, presents a curvature of constant sign and is in constant contact with said guide surface 25.

[0039] Even more advantageously, the so-called gauge s, which is the distance s in the transport direction of the sliver between the axis of rotation 26 of the lower apron-holding roller 10 and the axis of rotation 27 of the lower drawing roller 21 is less than the distance in the transport direction of the sliver between the axis of rotation 28 of the upper apron-holding roller 11 and the axis of rotation 29 of the upper drawing roller 22.

[0040] Preferably, the axis of rotation 28 of the upper

apron-holding roller 11 is upstream from the axis of rotation 26 of the lower apron-holding roller 10 (along the transport direction T of the sliver 5) and distanced from this in the transport direction T by a variable between 3,0 millimetres and 6,0 millimetres, preferably by a variable between 4,0 millimetres and 4.5 millimetres and, again more preferably, the axis of rotation 29 of the upper drawing roller 22 is downstream from the axis of rotation 28 of the lower drawing roller 21 and distanced from this in the transport direction T of the sliver by b variable between 3,0 millimetres and 6,0 millimetres, preferably by b variable between 4,0 millimetres and 4,5 millimetres.

[0041] In keeping with a particularly advantageous form of embodiment, the angle α that is defined between a plane or straight joining line between the axes of rotation 26, 28 of the pair of apron-holding rollers 10, 11 and a plane or straight joining line between the axes of rotation 27, 29 of the pair of drawing rollers 21, 22 is between 10° and 25° inclusive, preferably between 15° and 20°, even more preferably about 17°.

[0042] Thanks to the aforesaid layout of the pairs of apron-holding rollers and drawing rollers, the drawing space of the sliver can increase on a par with the gauge. However, the sliver is further guided by the return curve effect around the circumferential surfaces of the lower rollers concerned.

[0043] According to a further development of the invention, the small return cage 18 presents an extension in the transport direction T of the sliver, which is such that one return curve extremity 31 of the return cage 18 is set in the converging throat between the two drawing rollers 21, 22.

[0044] Preferably, for a gauge s of about 45 millimetres, the distance r of the return curve extremity 31 from the axis of rotation 28 of the upper apron-holding roller 11 (the so-called range r of the small cage 18) is between 38 millimetres and 45 millimetres inclusive, preferably between 40 millimetres and 43 millimetres, even more preferably about 42,5 millimetres. In this form of embodiment, the aforesaid shift a between the axes of rotation 26, 28 of the pair of apron-holding rollers 10, 11 is advantageously between 3,5 millimetres and 6,5 millimetres inclusive and the shift b between the axes of rotation 27, 29 of the pair of drawing rollers 21, 22 is advantageously between 4 millimetres and 5 millimetres inclusive. This configuration is particularly suitable for drawing a sliver of combed cotton fibres.

[0045] Within the sphere of the present invention, it has been found that a particularly uniform yarn can be obtained when the radius/gauge r/s ratio is greater than 0,8. Advantageously, this r/s ratio is included in the interval between 0,8 and 1,05, preferably between 0,9 and 1,0 and according to the preferred embodiment, about 0,94. This, combined with an α angle between the above stated orientations of the pairs of apron-holding and drawing rollers from about 17° to about 20,5° enables the drawing of the sliver to be distributed over an increased space, at the same time providing sufficient devices for guiding and transversally containing the sliver to avoid swelling and fraying.

[0046] The drawing device according to the invention enables a yarn to be obtained that is more uniformly drawn, less hairy and more resistant than the one obtained with the devices of the prior art.

[0047] Moreover, the risk of the sliver tearing due to local overloading of the sliver is reduced thanks to the increased effective space, where the sliver is drawn.

[0048] The offset layout of the rollers of the pairs of apron-holding and drawing rollers along the transport direction T of the sliver provides additional return curve surfaces (made from the circumferential surfaces of the relative lower rollers), which transport the sliver in a guided and sustained manner to further reduce the risk of accidental separation and swelling or fraying.

[0049] Consequently, the drawing device allows an even greater increase in speed and spinning efficiency by resolving the problems related to the resistance of the sliver during processing.

Claims

1. Drawing device with a double apron for a spinning station (1), comprising:

   - a pair of feeding rollers (2, 3);
   - a pair of apron-holding rollers (10, 11) downstream from the pair of feeding rollers (2, 3);
   - a pair of aprons (8, 9) wound around said apron-holding rollers (10, 11);
   - guide and return curve devices (14, 18, 31, 15), which condition the paths of the aprons (8, 9) to create a stretch of contact (17), to which said aprons (8, 9) are fixed, forming a guide for a sliver (5);
   - a pair of drawing rollers (21, 22) downstream from the stretch of contact (17) of the pair of aprons (8, 9),

   wherein a pre-drawing area is formed between a tightening slot (4) of the pair of feeding rollers (2, 3) and an entrance tightening slot (7) of the aprons (8,9) between said apron-holding (10, 11) rollers,
   wherein a principal drawing area is created between the pair of apron-holding rollers (10, 11) and the pair of drawing rollers (21, 22),
   wherein the angle (α) defined between a plane or straight joining line between the axes of rotation (26, 28) of the pair of apron-holding rollers (10, 11) and a plane or straight joining line between the axes of rotation (27, 29) of the pair of drawing rollers (21, 22) is greater than 10°.

2. Drawing device according to claim 1, wherein said angle (α) is between 10° and 25° inclusive.

3. Drawing device according to claim 1, wherein said angle (α) is about 17°.

4. Drawing device according to any one of the previous claims, wherein the distance (s) in the transport direction of the sliver (5) between the axis of rotation (26) of a lower apron-holding roller (10) and the axis of rotation (27) of a lower drawing roller (21) is less than the distance in the transport direction of the sliver (5) between the axis of rotation (28) of an upper apron-holding roller (11) and the axis of rotation (29) of an upper drawing roller (22).

5. Drawing device according to claim 4, wherein the axis of rotation (28) of the upper apron-holding roller (11) is upstream from the axis of rotation (26) of the lower apron-holding roller (10) in the transport direction of the sliver (5) and the distance (a) between the two axes of rotation (26, 28) in the transport direction of the sliver (5) is between 3,0mm and 6,0mm inclusive.

6. Drawing device according to claim 5, wherein said distance (a) is between 4,0mm and 4.5mm inclusive.

7. Drawing device according to any one of the claims from 4 to 6, wherein the axis of rotation (29) of the upper drawing roller (22) is downstream from the axis of rotation (27) of the lower drawing roller (21) in the transport direction of the sliver (5) and the distance (b) between the two axes of rotation (29, 27) is between 3,0 millimetres and 6,0 millimetres inclusive.

8. Drawing device according to claim 7, wherein said distance (b) is between 4,0 millimetres and 4,5 millimetres inclusive.

9. Drawing device according to any one of the previous claims, wherein said return curve and guide devices (14, 18, 31, 15) comprise a small bridge (14) with a guide surface (25) adapted to sustaining and guiding a lower apron (8) of said belts (8, 9), said guide surface (25) being of an essentially convex shape so that a part of the stretch of contact (17) of the belts (8, 9), which is sustained by the guide part (14), presents a curvature of constant sign and is in constant contact with said guide surface (25).

10. Drawing device according to any one of the previous claims, wherein said return curve and guide devices (14, 18, 31, 15) comprise a small return cage (18) that is adapted to sustaining and guiding an upper apron (9) of said belts (8, 9), said small return cage (18) having an extension in the transport direction of the sliver (5), which is such that a return curve extremity (31) of the small cage (18) is set in the converging throat between the two drawing rollers (21, 22).

11. Drawing device according to claim 10, wherein the ratio of the distance (r) of the return curve extremity (31) from the axis of rotation (28) of the upper apron-holding roller (11) over the distance (s) in the transport direction of the sliver (5) between the axis of rotation (26) of the lower apron-holding roller (10) and the axis of rotation (27) of the lower drawing roller (21) (range r/gauge s) is greater than 0,8.

12. Drawing device according to claim 11, wherein said ratio (r/s) is included in the interval between 0,8 and 1,05.

13. Drawing device according to claim 11, wherein said ratio (r/s) is included in the interval between 0,9 and 1,0.

14. Drawing device according to claim 11, wherein said ratio (r/s) is about 0,94.

15. Drawing device according to any one of the previous claims, wherein the distance (s) in the transport direction of the sliver (5) between the axis of rotation (26) of the lower apron-holding roller (10) and the axis of rotation (27) of the lower drawing roller (21) is about 45 millimetres and the distance (r) of the return curve extremity (31) from the axis of rotation (28) of the upper apron-holding roller (11) is included in the interval between 38 millimetres and 45 millimetres.

16. Drawing device according to claim 15, wherein said distance (r) is included in the interval between 40 millimetres and 43 millimetres.

17. Drawing device according to claim 15, wherein said distance (r) is about 42,5 millimetres.

18. Spinning station (1) of a spinning machine comprising an drawing device according to any one of the previous claims.

19. Spinning machine comprising one or more spinning stations according to claim 18.

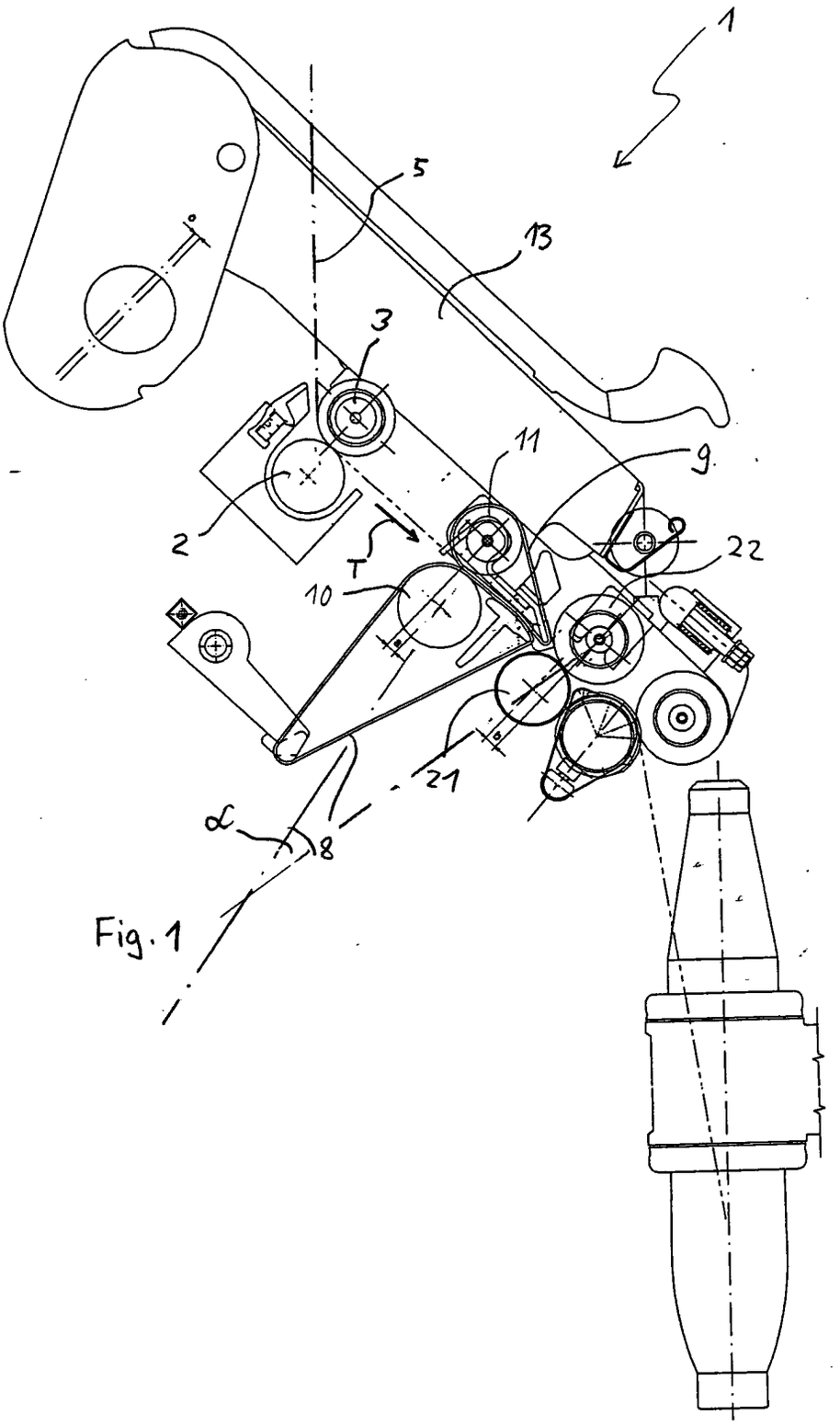

Fig. 1

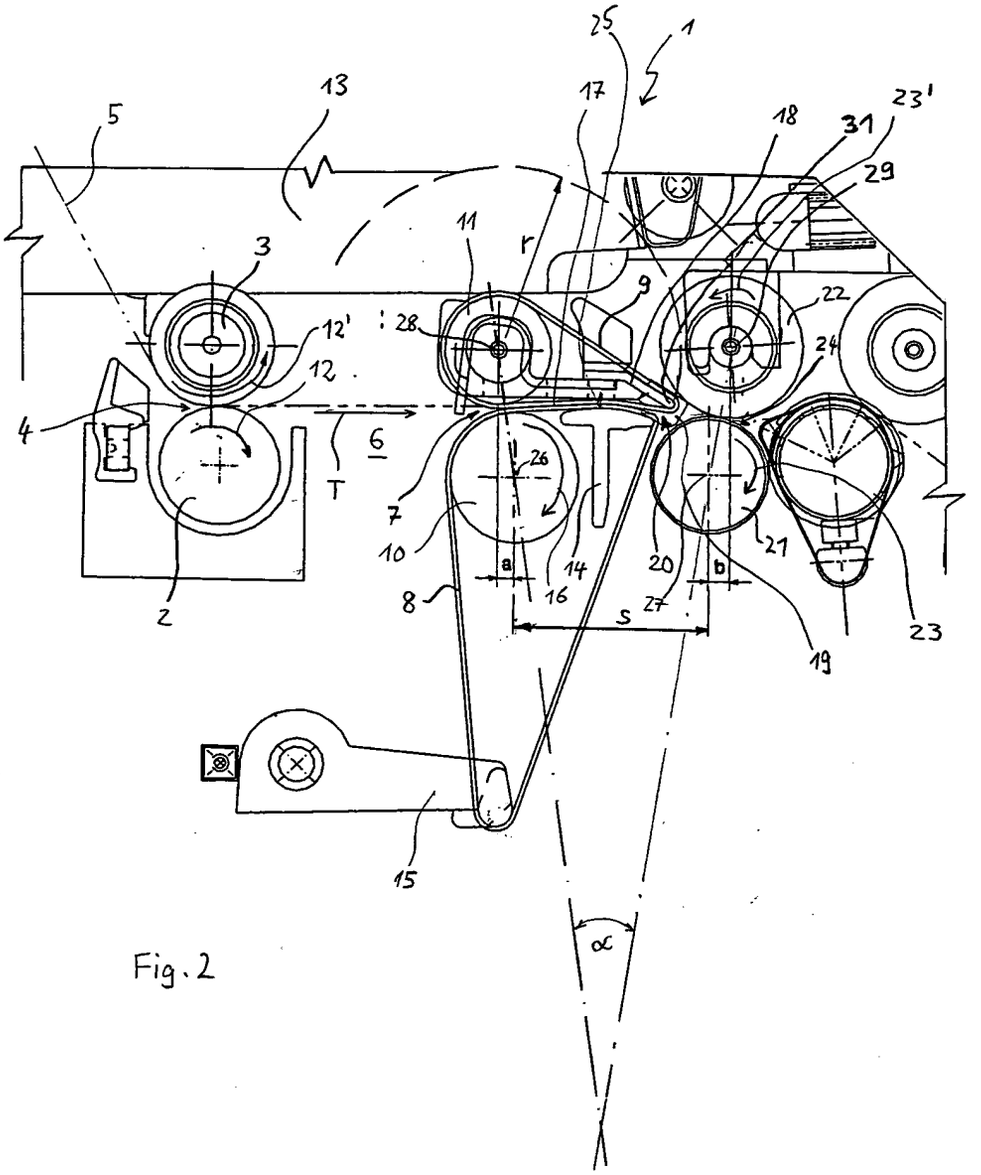
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Fig. 2

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 04 42 5391

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TECHNICAL FIELDS SEARCHED (Int.Cl.7)

D01H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	26 October 2004	D'Souza, J

CATEGORY OF CITED DOCUMENTS

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