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(11) **EP 1 621 652 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
01.02.2006 Bulletin 2006/05

(51) Int Cl.:
D01G 15/80 (2006.01) D01G 9/06 (2006.01)

(21) Application number: **04425578.4**

(22) Date of filing: **29.07.2004**

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IT LI LU MC NL PL PT RO SE SI SK TR**
Designated Extension States:
AL HR LT LV MK

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(54) **Fibre treatment device for a picker or carding machine**

(57) A fibre treatment device (12) linkable to a picker (1) or carding machine roller (2, 3, 4) including at least one regulating vane (17d) to compact a fibre layer (5) against a circumferential surface (9) of the roller (4) in order to limit its thickness and a compaction organ (19)

positioned before the regulating vane (17d) in the rotation (v4) direction of the roller (4), wherein this compaction organ (19) compacts the fibre layer (5) and guides it towards the circumferential roller (4) surface (9) before the regulating vane (17d).

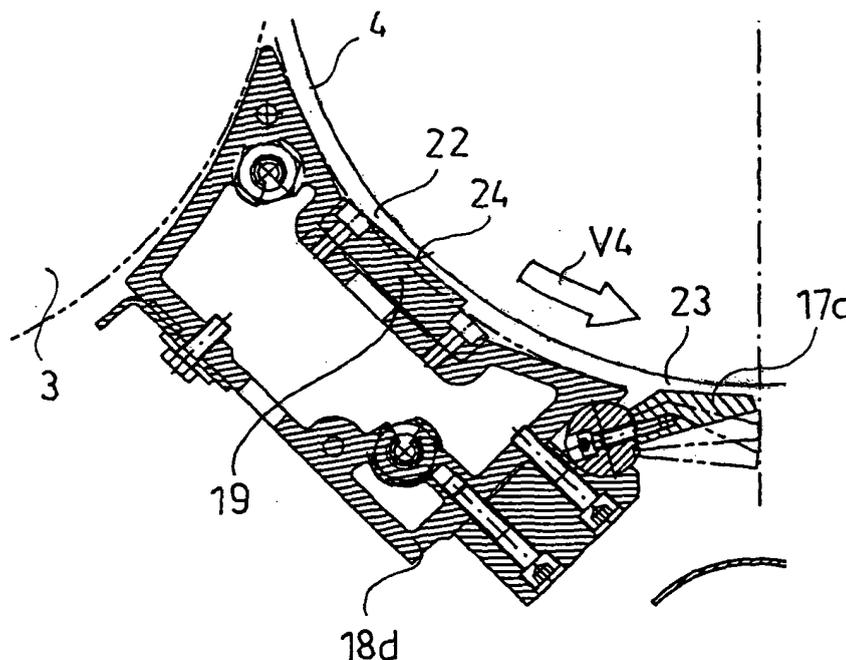


FIG. 4

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Description

[0001] The present invention refers to a treatment device linkable to a picker or carding machine roller to modify a fibre layer, especially cotton, on a circumferential surface of the roller.

[0002] In existing pickers, the cotton staples still mixed with dust, impurities and the remaining husk are fed, for example through a pair of feeder rolls, into a beater roller (or simply beater), whose circumferential surface is equipped with grippers or a saw-toothed lining to grasp the cotton fibres and pull them away.

[0003] Thanks to the centrifugal force generated by rotation of the beater roller, the fibre layer and above all its heavier components, such as the impurities and husk remnants, are moved radially outwards. This radial fibre and impurity movement is partially hindered by the grippers and saw teeth of the circumferential surface of the beater roller and/or the angled projections within the beater roller, against which the fibre layer is beaten.

[0004] One or more treatment devices are linked to the beater roller to open, dust and card or comb the cotton fibres before they are separated by the beater roller, for example using a suction device which channels the fibres thus treated into the following spinning line station or into an attached silo.

[0005] Patent DE 39 02 204 describes the use of a fixed carding segment followed by a regulating vane which guides the fibre layer, modifying its thickness (radially with respect to the beater roller rotation axis), a separation cutter placed after the regulating vane to cut (that is, separate in a fluid dynamic sense) the outermost part of the fibre layer containing the heavy impurities, which are removed by a suction mouth placed in line with the separation cutter.

[0006] The protruding free end of the fibre (still linked to the beater) rubs against the separation cutter and tends to slide between the cutter and the roller, thus being compacted, while the husk, which offers greater resistance, is sucked away.

[0007] However, especially with high rotational speed of the beater roller, separation of impurities from the fibres using a separation cutter is problematic and a high quantity of quality fibre is often sucked away with the impurities, making the picking process inefficient, whereas in other cases the separation cutter removes only a small part of the impurities contained in the fibre layer.

[0008] It is hypothesised that during rotation of the beater roller the fibre layer fed into it, by a pair of feeder rolls or by another beater roller alongside, swells radially, allowing the heavier impurities and husk pieces to separate from the fibre and move radially outwards. Specifically, at high beater roller rotation speeds, before the impurities are completely separated from the fibres centrifugal force displaces even the light fibres outwards, forming a fibre layer separated radially from the beater roller (but still held by the roller's grippers or lining) and sometimes compacted and thin, as shown in figure 6. It

is this compactness and thinness of the fibre layer which is worsened in the subsequent impurity separation by the separation cutter, with the risk of removing a high quantity of quality fibres together with the impurities.

[0009] These difficulties increase further when the fibres are fed to the roller by another beater roller, as shown in figure 6. In this case, due to the centrifugal force generated by the first beater roller, the heavy impurities accumulated in the radially outer zone of the fibre layer are found once more in the radially inner part of the fibre layer after transfer to the second roller, and thus only a fraction of the impurities is able to cross the fibre layer moving outwards before it is compacted once more.

[0010] The aim of this invention is thus to make available a fibre treatment device having features able to overcome the described problems of the known technique.

[0011] This and other aims are reached through a treatment device linkable to a picker or carding machine roller to modify a fibre layer on a circumferential surface of this roller, such device comprising at least one regulating vane to guide the fibre layer against this circumferential surface in order to limit its thickness. The device is characterised by the facts it includes a compaction organ positionable before the regulating vane seen from the roller rotation direction, in which said compaction organ compacts the fibre layer and guides it towards the circumferential roller surface before the regulating vane.

[0012] For a better understanding of the invention and to appreciate its advantages, some non limiting embodiments of the invention will be described below, with reference to the attached figures, in which:

[0013] figure 1 is a sectional view of a picker equipped with a treatment device according to this invention;

[0014] figures 2 and 3 are sectional views of a treatment device according to this invention;

[0015] figure 4 is a magnified sectional view of a detail of figure 2;

[0016] figure 5 is a magnified sectional view of a detail of figure 3;

[0017] figure 6 is a diagram showing the functioning of a treatment device using known technology;

[0018] figure 7 is a diagram showing the functioning of a treatment device according to this invention.

[0019] Figure 1 shows a picker 1 with three beater rollers 2, 3, 4 placed alongside and counter-rotatable with speeds v_2 , v_3 v_4 increasing from the first roller 2 to the last roller 4, in order to carry a fibre layer 5 and transfer it from one roller to the next.

[0020] To feed fibre 5 to the first beater roller 2 a pair of feeder rolls 6, 7 are used, whose circumferential surfaces 8 are preferably shaped; in particular the upper feeder roller 6 has the form of a cog wheel and lower feeder roller 7 has a circumferential surface 8 in the form of saw teeth.

[0021] The circumferential surfaces 9 of beater rollers 2, 3, 4 are also equipped with a so-called "trimming" 10, that is a saw-toothed lining or grippers radially protruding from the circumferential surface 9 with a rounded or point-

ed free end.

[0022] Thanks to this lining 10 or the grippers, on rotating beater roller 2 grips the fibres fed into it and pulls them away from the pair of feeder rolls 6, 7, thus already provoking an initial opening of the cotton staples and stretching of the individual fibres.

[0023] One or more treatment devices 11, 12 are linked to the beater rollers 2, 3, 4 to open, dust and card or comb the fibres, for example cotton, before they are separated by the final beater roller 4, for example using a suction device 13 which channels the fibres 5 into the subsequent device on the spinning line or into an attached silo (not shown in the figures).

[0024] After the pair of feeder rolls 6, 7 (seen in the direction of rotation of the first beater roller 2) there is a first separation cutter 14 to cut, or, in other words, separate in a fluid dynamic sense the outermost part of the fibre layer 5 containing heavy impurities. In line with this first separation cutter 14 is a first suction mouth 15 to remove the impurities separated from the fibre layer 5. After the first separation cutter 14 is a first fixed carding segment 16 followed by a first regulating vane 17 which guides the fibre layer 5, modifying its radial thickness with respect to the rotation axis R2 of the beater roller 2.

[0025] The first cutter 14, the first suction mouth 15, the first fixed carding segment 16 and the first regulating vane 17 are all mounted on a common support element 18.

[0026] After the first regulating vane 17 there is a second separation cutter 14a and a second suction mouth 15a, placed on a second support element 18a and again to separate and remove the impurities accumulated in the radially outer zone of cotton layer 5.

[0027] The second beater roller 3 rotates with a greater speed than and in the opposite direction to beater roller 2 and is side by side with it, so as to allow the transfer of the fibres 5 from the first beater roller 2 to the second beater roller 3.

[0028] After the area where the fibre is transferred to the second beater roller 3 (seen in the direction of the second beater roller 3 rotation) there is a second fixed carder segment 16b followed by a second regulating vane 17b which guides the fibre layer 5, modifying its radial thickness with respect to the rotation axis R3 of beater roller 3.

[0029] The second fixed carding segment 16b and the second regulating vane 17b are mounted on a third common support element 18b.

[0030] After the second regulating vane 17b there is a third separation cutter 14c and a third suction mouth 15c, placed on a fourth support element 18c for separation and removal of the impurities accumulated in the radially outer zone of cotton layer 5.

[0031] The following and final beater roller 4 is rotatable with speed v_4 greater than and in the opposite direction to the previous beater roller 3, and is placed alongside this in order to allow transfer of fibre 5 from the previous beater roller 3 to the final beater roller 4.

[0032] After the area of fibre transfer to the last beater

roller 4 (seen in the direction of last beater roller 4 rotation) there is a treatment device 12 which includes at least one third regulating vane 17d to guide the fibre layer 5 against the circumferential surface 9 of beater roller 4, to modify or in fact limit the thickness of fibre layer 5, as well as a compaction organ 19 positioned before the third regulating vane 17d seen in the rotation direction of beater roller 4 in which the compaction organ 19 compacts the fibre layer and guides it towards the circumferential surface 9 of the beater roller 4 before the third regulating vane 17d.

[0033] After the third regulating vane 17d there is a fourth separation cutter 14e and a fourth suction mouth 15e, to separate and remove the impurities accumulated in the radially outermost zone of cotton layer 5.

[0034] The compaction organ 19 and the third regulating vane 17d are both placed on a fifth support element 18d and the fourth separation cutter 14e and the fourth suction mouth 15e are placed on a sixth support element 18e.

[0035] At least one part of the circumference of the beater roller or rolls 2, 3, 4 has one or more angled projections 20, for example one or more projections in aluminium or blades in steel shaped in such a way as to impede the loss of fibres flung radially outwards by the centrifugal force generated by the beater roller rotation.

[0036] The previously mentioned suction device 13 or another means to remove the treated (opened, dusted, cleaned, carded etc) fibres is placed in relation to the last beater roller 4 in order to allow the removal of the fibres on the circumferential surface 9.

[0037] Specifically, the suction device 13 has a rectangular duct 21 oriented tangentially to the (last) beater roller 4 in order to produce a suction force tangential to the beater roller circumferential surface 9.

[0038] According to the embodiment shown in the figures, the compaction organ delimits, together with beater roller 4 circumferential surface 9, a passage 22 for the fibre layer 5 which is narrowed in the direction of rotation of the beater roller 4 so that the fibre layer 5 is pushed from the compaction organ 19 towards the circumferential surface 9, and specifically within the roller lining of beater 4, and is consequently compacted.

[0039] The regulating vane 17d is shaped and positioned such that it limits the displacement or radial re-swelling of the fibre layer 5 previously compacted by the compaction organ 19. The compaction organ 19 and the regulating vane 17d are preferably configured in such a way that the fibre passage 22 between the beater roller 4 and the compaction organ 19 is radially narrower than the fibre passage 23 between the beater roller 4 and the regulating vane 17d.

[0040] The compaction organ 19 ideally includes a movable and preferably adjustable shaped piece 26 fixed to a support element 18d.

[0041] According to one embodiment, the compaction organ 19 has a substantially smooth compaction surface 24, turned towards the circumferential surface 9 of the beater roller 4 and shaped in order to form the above

mentioned passage 22 which narrows in the direction of rotation of beater roller 4.

[0042] In the embodiment shown in figure 4, the compaction surface 24 is generally flat and oriented in order to approach the circumferential surface 9 of the beater roller 4 in its direction of rotation. Alternatively, the compaction surface 24 is curved towards the circumferential surface 9 of the beater roller 4 in the direction of its rotation.

[0043] In the embodiment shown in figure 5, the compaction surface 24 or more generally the compaction organ 19 has at least one discontinuity, preferably a step 25 which provokes a sudden narrowing of passage 22.

[0044] In front of the step 25 or sudden narrowing a dead zone is advantageously formed, that is a dead or stagnant angle in a fluid dynamic sense, which increases fibre compaction towards the circumferential surface 9, that is in the lining of the beater roller 4.

[0045] Preferably, the position of regulating vanes 17-17d and of separation cutters 14-14e are adjustable so as to allow regulation of the (radial) thickness of both the fibre layer 5 and its outer part which is separated by the separation cutter 14-14e.

[0046] According to one embodiment, the position of the support element 18d holding the compaction organ 19 and the regulating vane 17d is adjustable in order to vary its distance from roller 4.

[0047] Advantageously, the distance between beater roller 4 and the sixth support element 18e holding the separation cutter 14e and the suction device 15e is also adjustable.

[0048] Figure 7 is a diagram showing the functioning of a treatment device according to this invention.

[0049] During rotation of the picker's beater roller, especially a high speed roller, the fibre layer fed into it wraps around the roller's circumferential surface and swells radially due to centrifugal force, allowing the heaviest impurities and pieces of husk to separate from the fibres and move radially outwards. Specifically, at high beater roller rotation speeds, before the impurities are completely separated from the fibres centrifugal force displaces even the light fibres outwards, forming a fibre layer separated radially from the beater roller (but still held by the roller's grippers or lining) and, sometimes, compact and thin. The compaction organ 19 re-beats this fibre layer and pushes it towards the beater roller's circumferential surface, forming, in front of the regulating vane, a generally compact fibre layer, in close contact with the beater roller circumferential surface and penetrating sufficiently within the lining.

[0050] Before passing through passage 23 delimited by the regulating vane 17d, the fibre layer re-swells radially due to centrifugal force, allowing heavy impurities to travel further outwards and to separate definitively from the fibre.

[0051] The regulating vane guides the fibre-impurity layer or film thus obtained and adjusts its thickness to allow correct impurity separation (radially outer part)

through the separation cutter.

[0052] Thanks to the invention's treatment device, more complete separation of the impurities from the fibres is obtained as well as a fibre layer more compacted towards the lining and thicker radially, with a clearer separation of the impurities.

[0053] This facilitates impurity removal by the separation cutter and reduces the quantity of quality fibres removed with the impurities, thus increasing the overall productivity of the picker or carding machine.

[0054] In alternative to the description and illustration given herein, the picker may include only one, or two or more beater rollers, depending on the fibre treatment needs. The treatment device including the compaction organ may be linked to one only, or more than one, or all the picker's beater rollers and the means feeding the cotton staples or fibres to the beater rollers may include one or more channelling belts or only one feed roller.

[0055] Obviously, to satisfy contingent and specific requirements, a person skilled in the art could make further modifications and variations to the picker described in this invention, all however contained within the scope of protection of the invention, as defined in the following claims.

Claims

1. Treatment device (12) suitable for being associated to a picker (1) or carding machine roller (2, 3, 4) to modify a fibre layer (5) on a circumferential surface (9) of this roller (2, 3, 4), said device (12) comprising at least one regulating vane (17d) to guide the fibre layer (5) against this circumferential surface in order to limit its thickness, **characterised by** the fact it comprises a compaction organ (19) positionable before the regulating vane (17d) in the direction of rotation (v4) of the roller (4), wherein said compaction organ (19) is intended to compact the fibre layer (5) and to guide it towards the circumferential roller (4) surface (9) before the regulating vane (17d).
2. Device (12) according to claim 1, wherein said compaction organ (19) is adapted to push the fibre layer (5) against the circumferential surface (9) in order to compact it.
3. Device (12) according to claim 1 or 2, wherein said compaction organ (19) is adapted to delimit, together with the circumferential surface (9) of the roller (4), a zone of passage (22) for the fibre layer (5) which narrows in the direction of roller (4) rotation.
4. Device (12) according to any of the previous claims, wherein the regulating vane (17d) is adapted to limit the displacement and/or radial re-swelling of the fibre layer (5) previously compacted by the compaction organ (19).

5. Device (12) according to any of the previous claims, wherein the compaction organ (19) and the regulating vane (17d) are configured so that the fibre (5) passage (22) between the roller (4) and the compaction organ (19) is radially narrower than a fibre (5) passage (23) between the roller (4) and the regulating vane (17d). 5
6. Device (12) according to any of the previous claims, wherein the compaction organ (19) includes a shaped piece (26) removably fixed to a support element (18d). 10
7. Device (12) according to any of the previous claims, wherein the regulating vane (17d) and the compaction organ (19) are placed on a common support element (18d). 15
8. Device (12) according to the previous claim, wherein the distance between the support element (18d) and the roller (4) is adjustable. 20
9. Device (12) according to any of the previous claims, wherein the compaction organ (19) has a generally smooth compaction surface (24), turned towards the circumferential surface (9) of the roller (4) and shaped to form a passage (22) which narrows in the direction of rotation of the roller (4). 25
10. Device (12) according to the previous claim, wherein the compaction surface (24) is basically flat. 30
11. Device (12) according to claim 9, wherein the compaction surface (24) is curved towards the circumferential surface (24) of the beater roller (4) in the direction of its rotation. 35
12. Device (12) according to claim 9, wherein the compaction surface (24) has at least one discontinuity, for example a step (25), which forms a sudden narrowing of the passage (22) between the compaction organ (19) and the circumferential surface (9) of the roller (4). 40
13. Device (12) according to any of the previous claims, wherein the compaction organ (19) has at least one step (25), which forms a sudden narrowing of the passage (22) between the compaction organ (19) and the circumferential surface (9) of the roller (4). 45
14. Device (12) according to any of the previous claims, including at least one separation cutter (14e) linkable to the circumferential surface (9) of the roller (4) and positionable after the regulating vane (17d), wherein said separation cutter (14e) is adapted to separate the (radially) outermost part of the fibre layer (5) on the circumferential surface (9) of the roller (4). 50
15. Device (12) according to the previous claim, wherein the separation cutter (14e) is adjustable to allow modification of the (radial) thickness of the outermost part separated from the fibre layer (5). 5
16. Device (12) according to claims 14 or 15, including at least one suction device (15e) positionable in line with the separation cutter (14e) and adapted to remove the part separated from the fibre layer (5). 5
17. Device (12) according to any of the previous claims, wherein the separation cutter (14e) and the suction device (15e) are placed on a common support element (18e) linkable to the circumferential surface (9) of roller (4) after the regulating vane (17d) seen in the direction of roller (4) rotation. 10
18. Device (12) according to the previous claim, wherein the distance between the support element (18e) and the roller (4) is adjustable. 15
19. Picker (1) for picking of fibres (5), for example cotton, including:
 - at least one rotatable beater roller (4) whose circumferential surface (9) is equipped with a means (10) to transport and hold a fibre layer (5)
 - at least one treatment device (12) according to any of the previous claims linked to this beater roller (4) to modify the fibre layer (5) on this circumferential surface (9). 20
20. Picker (1) according to claim 19, wherein the circumferential surface (9) is formed by saw teeth, the so-called "lining", or wherein the circumferential surface (9) is equipped with a number of grippers with rounded or pointed free ends. 25
21. Picker (1) according to claim 19 or 20, wherein the beater roller (4) is a fast rotating roller. 30
22. Picker (1) according to one of the claims from 19 to 21, including a series of two or more beater rollers (2, 3, 4) side by side and with opposite rotation directions from one to the next with an angular velocity increasing from the first roller (2) to the last (4), such that the fibres (5) are carried by the circumferential roller (2, 3, 4) surfaces (9) and transferred from one roller (2; 3) to the next (3; 4), wherein the treatment device (12) is linked to the last beater roller (4). 35
23. Picker (1) according to one of the claims from 19 to 22, including further treatment means (11, 14, 14a...14e, 15, 15a...15e, 17, 17a...17d, 18, 18a...18e), for example:
 - fixed carding sections (16, 16a...16b), regulating vanes (17, 17a...17d), separation cutters 40

(14, 14a...14e) and suction devices (15, 15a...15e) linked to one or more beater rollers to treat the fibres on their circumferential surfaces (9).

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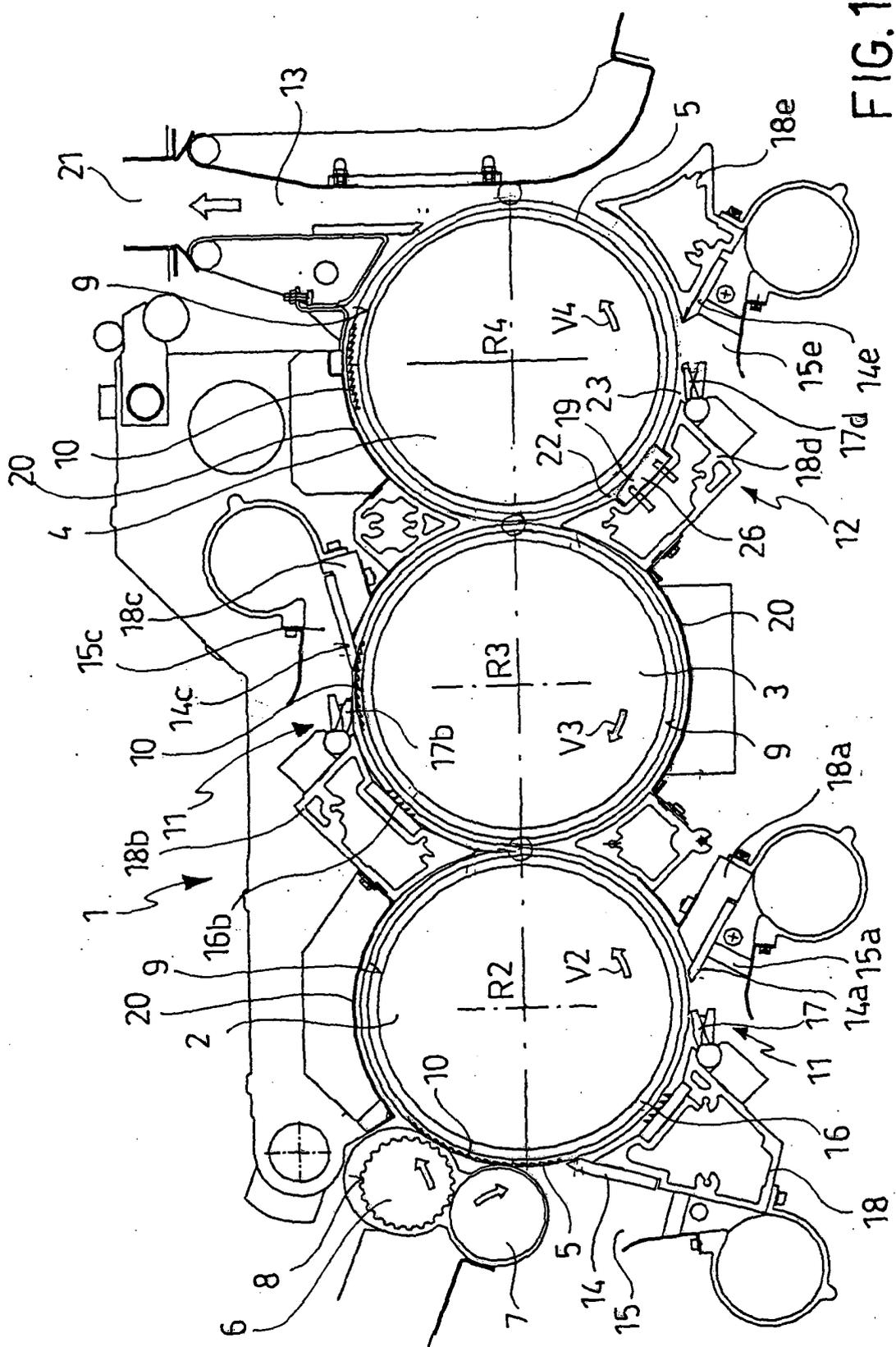


FIG.1

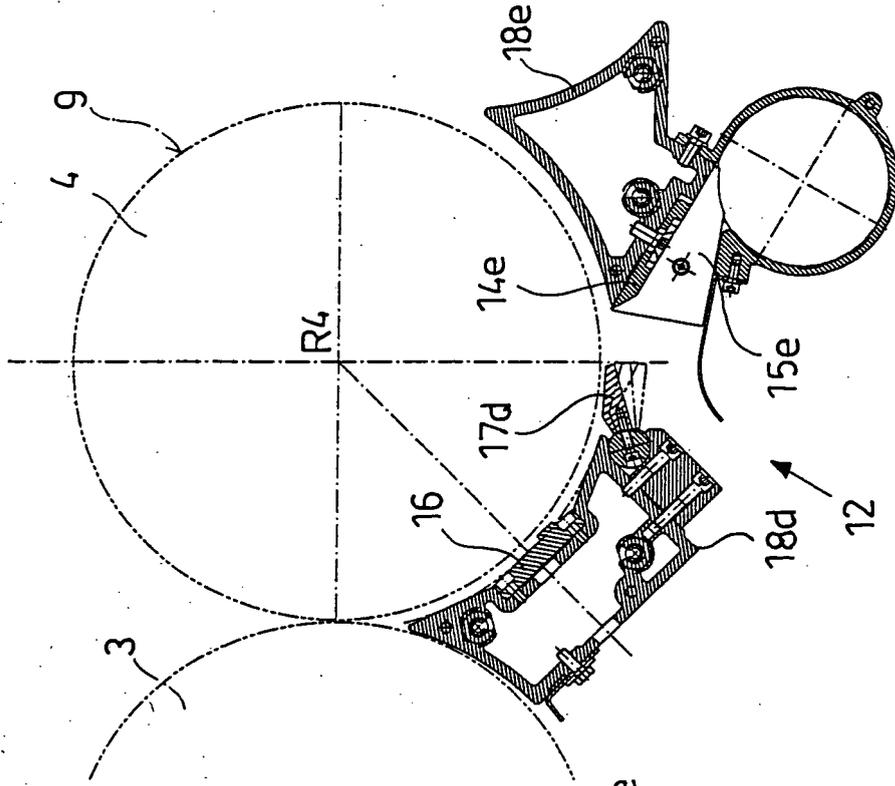


FIG. 2

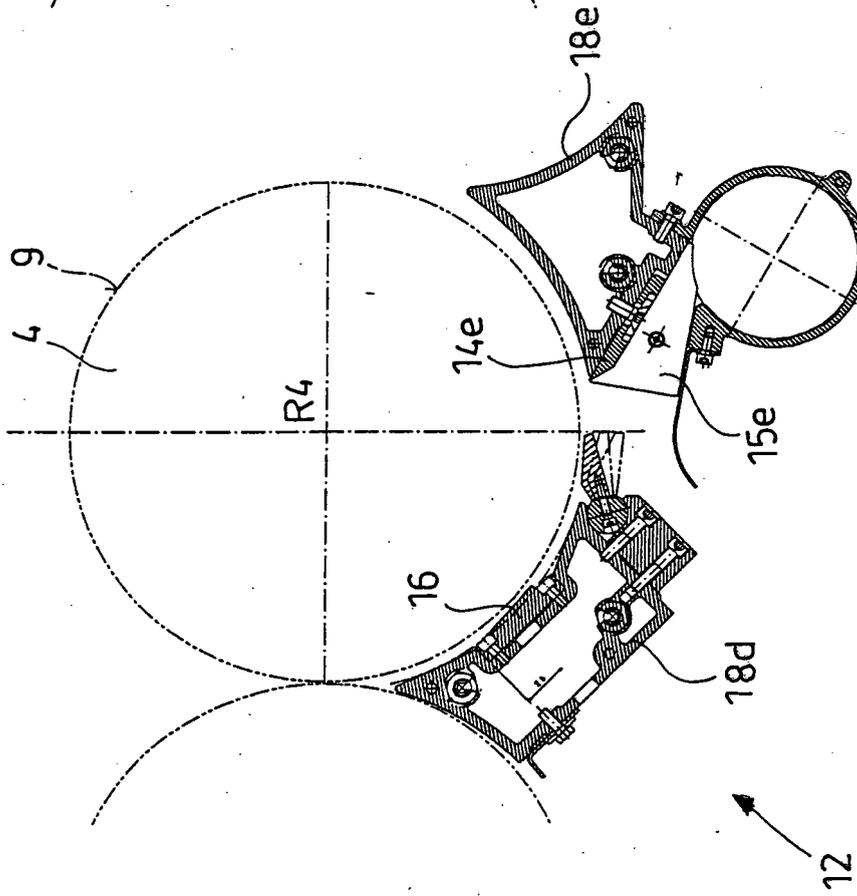


FIG. 3

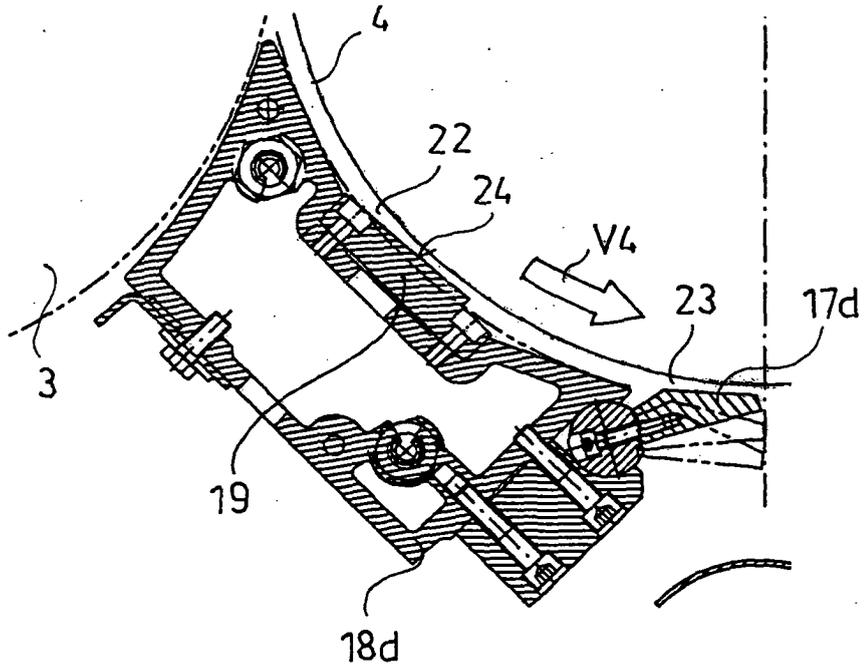


FIG. 4

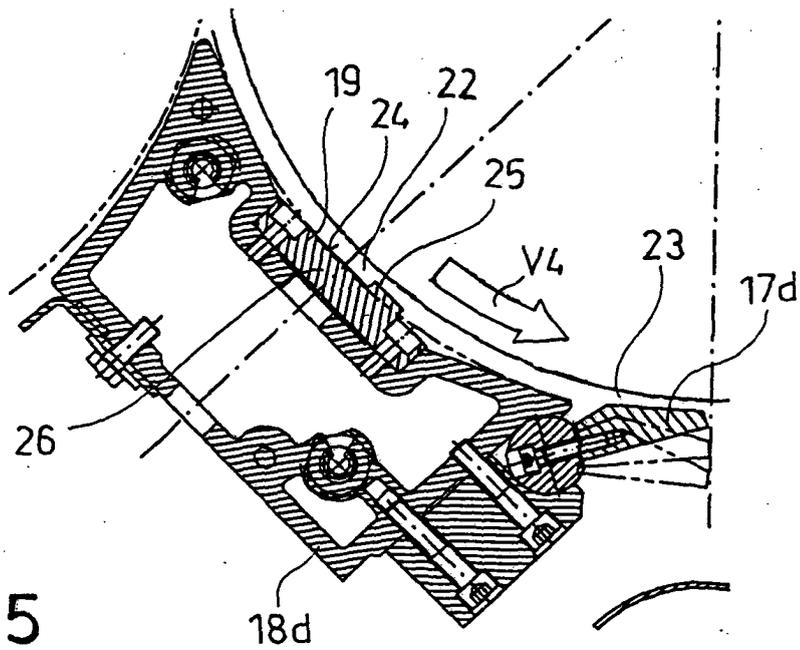


FIG. 5

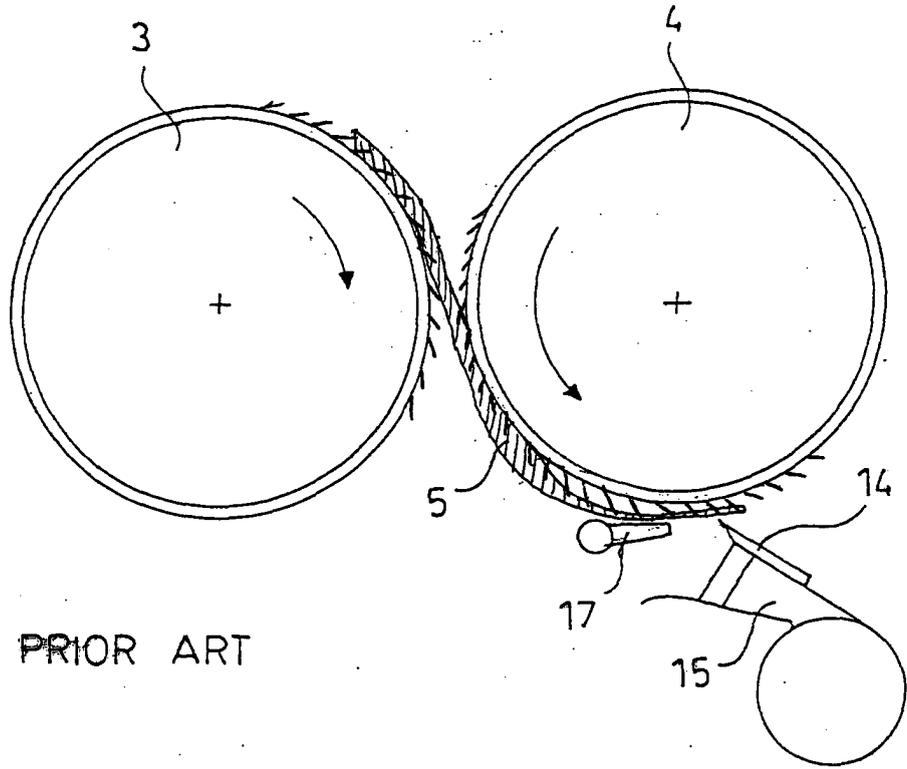


FIG. 6 PRIOR ART

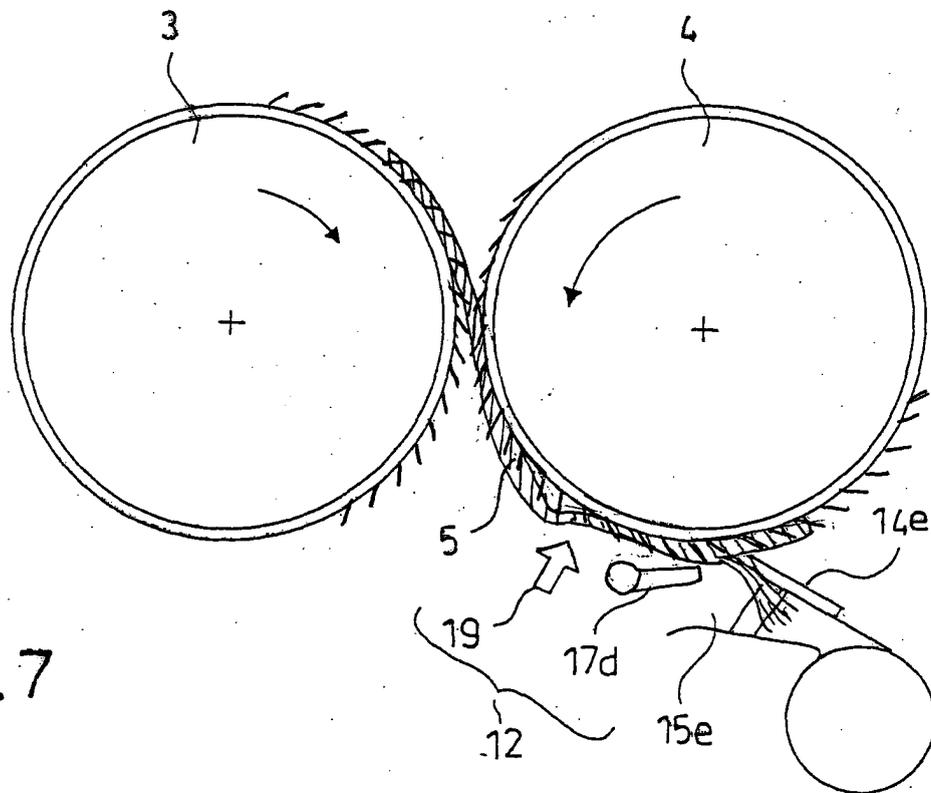


FIG. 7



DOCUMENTS CONSIDERED TO BE RELEVANT			
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 21 December 2004	Examiner D'Souza, J
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 04 42 5578

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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