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(54) **APPARATUS FOR SCREENING FIBRE SUSPENSIONS**

VORRICHTUNG ZUM SCREENING VON FASERSUSPENSIONEN

APPAREIL DE CLASSAGE DE SUSPENSIONS FIBREUSES

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(56) References cited:
EP-A2- 0 275 967
EP-A2- 0 455 312
WO-A1-87/03024
WO-A1-93/07334
US-A- 1 631 585
US-A- 3 713 541
US-A1- 2004 004 032

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Description

[0001] The present invention relates to an apparatus for screening fibers and corresponding in the chemical pulp and paper industry, especially coarse screening for separating coarse particles, such as knots, stones and other solid particles from fiber suspension. The invention relates to an apparatus having a rotating screen drum.

[0002] In the treatment of wood pulp sorters, screens are used to separate acceptable fibers from non-desired substances in a suspension. A typical screen structure has a feed conduit for fiber suspension that may have been produced in digestion of wood chips or in a defibrator for secondary pulp fibers. A suspension can include knots, slivers, bark particles, dirt, metal particles and other non-desired substances.

[0003] Inside the casing of a screen the fiber suspension flows in the vicinity of a cylindrical screen, often referred to as a plate or a basket, whereby acceptable fiber fraction, the accept; passes through the screen plate, while the reject remains on the first side of the screen plate and exits via a reject opening in the casing. When the cylindrical screen plate, i.e. screen drum, rotates, it passes by impulse or turbulence elements for intensifying the flow of the fiber suspension through the surface of the screen plate, and thus also the screening is intensified. The screen plate has apertures, either holes or slots, having a size suitable for the screening process. The size of the screen plate apertures has to be appropriate so that the accepted fibers get through the screening surface while the non-desired substance is prevented from passing through.

[0004] EP-patent publication 275967 (FI76139) presents a method and an apparatus for knot separation, wherein approximately a lower MC-consistency level (6-8 %) is achieved. The increase of usable consistency range is achieved by proper dimensioning and design of the profile of the screening surface and by optimizing the rotational speed of the screen drum and the feed velocity of the pulp in respect to each other. In the apparatus according to said publication the direction of rotation of the drum is the same as the feed direction of the pulp and the reject discharge direction is the same as the direction of rotation of the drum. Further the screen drum is profiled so that ridges are provided on the outer surface of the drum between the screen apertures, which ridges are comprised of front surfaces ascending in a declined position from the outer surface of the drum and of rear surfaces that are essentially perpendicular against the outer surface. The declination angle of the ridges in relation to the drum axis is between -45 and +45 degrees. The apertures on the drum can be holes or slots, but typically the screening surface of this kind of screens is provided with round holes, the diameter of which can vary in the range of 5-15 mm depending on the object of application.

[0005] EP 1357222 (US2004004032) describes a fine screen for fiber suspension having a stationary screen drum, inside which a blade member rotates cleaning the screening surface. The screening surface is provided with elongated apertures having a width of 1-8 mm, and a ratio of length and width between 2 and 20. An object of this publication is to increase the proportion of long fibers in the accept. Also US-patent 490417 presents a screen having a stationary screen drum. Slots in the screening surface are parallel to each other, but can de declined with respect to the axis of the drum.

[0006] An object of the present invention is to provide a rotating screen drum for a coarse screen, by means of which high consistencies (even over 6 %) can be reached, but in a way that is more energy-efficient than before.

[0007] The present invention relates to an apparatus for screening fiber suspension, especially coarse screening for removing coarse particles, such as knots, comprising a casing, a feed conduit for fiber suspension and outlet conduits for reject and accept, a drum arranged inside the casing and rotating with respect to the vertical axis, the screening surface of which drum is provided with apertures, wherethrough the accept fraction flows, the feed and outlet conduits of said apparatus being arranged so that the fiber suspension is fed in a space between the casing and the screen drum and the accept is discharged from the interior of the screen drum, wherein the apertures in the screening surface are slots, said slots form rows of slots and the outer side of the screening surface is profiled such that ridges are provided between the rows of slots. According to the invention, the longitudinal direction of the slots in relation to the direction of rotation of the drum is between -40 degrees and +40 degrees and the ratio of the length and the width of the slots is 1.05-10.

[0008] According to a preferred embodiment the longitudinal direction/longitudinal axis of the apertures is between -30 and +30 degrees with respect to the direction of rotation of the drum, preferably between -15 and +15 degrees. According to a preferred embodiment the direction of the longitudinal extension of the apertures is essentially the same as the direction of rotation of the drum, i.e. perpendicular to the longitudinal axis of the screen drum.

[0009] The slots are of rectangular or oval shape. The edges of their ends are rectangular or rounded. A typical slot is elongated. The width is typically 4-12 mm. The ratio of the length and the width of the slots is 1.05-10, preferably 2-8.

[0010] The slots are arranged one above another in the axial direction of the drum, whereby rows/zones of slots are formed, which are located at a distance from each other in the circumferential direction of the drum. Typically vertical rows of slots are in a declined position.

[0011] According to a preferred embodiment, the outer side of the screening surface of the drum is profiled such that ridges are arranged between the rows/zones of slots. The outer surface refers to the side of the drum whereto the fiber suspension is fed and wherefrom the accept

fraction flows through the apertures to the other surface, and whereon the reject fraction remains. The profile ridges are preferably arranged so that they are at an angle of -5...+20 degrees, typically 15 degrees with respect to the vertical axis of the drum. The line of the vertical rows of slots with respect to the vertical axis of the drum may vary so that the ends of the slots form a line that is essentially parallel to the ridges, i.e. typically in a declined position in respect to the longitudinal axis of the drum.

[0012] The profile is formed of ridges having a front surface and a rear surface at a certain angle with respect to the plane of the screen surface and possibly therebetween a surface essentially parallel to the plane of the plate. By means of the declination angle of the ridges, the direction of the declination with respect to the direction of rotation, the rotational speed of the drum and the angle of elevation of the front surface of the ridges it is possible to optimize the circulation time of the pulp and the turbulence in proportion to the final result of the separation (accept/reject). When the front surface of the profile ridge receiving the flow is declined backwards, i.e. it ascends from the screening surface plane and the rear surface is perpendicular, an even flow through the screening surface apertures is obtained. This eliminates disturbing flow of the suspension in the opposite direction, which happens under some circumstances. The front surface of the profile ridge can according to an embodiment be also perpendicular against the plane of the screen surface, whereby the rear surface is descending. In this case the front surface opposes to and mixes the flow, whereby the flow through the screening surface increases, and thus the capacity of the apparatus increases, but simultaneously the separating capacity decreases. The front surface and the rear surface of the ridge of the profile can also be symmetrically declined.

[0013] According to a preferred embodiment of the invention, profile ridges are arranged also in the slot zone so that ridges are provided between the slots located one above another. Thus, in that case the profile is formed by a row of ridges broken by slots. The slot zone may be provided with one or more thus formed profiles, which are at the same declination angle with respect to the vertical axis of the drum as the rows/zones of slots and the profiles between them. That is, the ridges are parallel to the rows of slots.

[0014] According to an embodiment, the slots of the vertical rows of slots are in the horizontal direction arranged so that the slots of every second row of slots are located on the same horizontal lines, i.e. in a first group of horizontal lines, and respectively the slots of every second row of slots are located in a second group of horizontal lines.

[0015] According to a preferred embodiment of the invention, the longitudinal position/angle of the slots located in one row of slots with respect to the direction of rotation of the drum changes from above downwards seen along the axis of the drum. The longitudinal direction of the uppermost slot is parallel to the direction of rotation of the drum. Meanwhile, the longitudinal direction of a lower slot is declined downwards, starting from the front end of the slot in the direction of rotation of the drum, whereby the front end of the slot is located higher than its trailing end (in the direction of rotation of the drum). Typically a lower slot is declined downwards more than an upper one. The angle of declination of the lower slot is 1-5, typically 2-4 degrees larger. According to another embodiment, the longitudinal direction of the uppermost slot is also parallel to the direction of rotation of the drum, while the following lower slot is declined upwards with respect to the direction of rotation, whereby the front end of said slot, in the direction of rotation of the drum, is located lower than its trailing end. Thus, the next lower slot is declined at the trailing end upwards to a greater extent than the upper slot. The declination angle of the lower slot is 1-5, typically 2-4 degrees larger. In these embodiments, two slots located one above another can be essentially parallel, but it is pertinent that most of the slots in a row of slots are located at different declination angles with respect to each other.

[0016] According to a preferred embodiment of the invention, the position/angle of the longitudinal direction of the slots in one row of slots with respect to the direction of rotation changes from down upwards seen along the drum axis so that the longitudinal direction of the lowermost slot is parallel to the direction of rotation of the drum, while a slot located above is declined with respect to the direction of rotation. Thus, the next upper slot can be declined upwards, whereby the front end of the slot in the direction of rotation of the drum is located lower than the trailing end of the slot. Typically the upper slot is more declined than the lower slot. The declination angle of the upper slot is 1-5, typically 2-4 degrees larger. According to a preferred embodiment of the invention, an upper slot can be declined correspondingly so that the front end of the slot in the direction of rotation of the drum is located higher than the trailing end of the slot. In that case, the slots are declined downwards with respect to the direction of rotation. In these embodiments, two slots located one above another can be essentially parallel, such as two lowermost, but it is pertinent that most of the slots in a row of slots are located at different declination angles with respect to each other.

[0017] In the above embodiments, where the declination is directed downwards, the capacity of the apparatus increases and the consistency is higher. When the declination is directed upwards, the separating capacity of the apparatus is increased, i.e. cleaner accept is obtained.

[0018] The apparatus according to the embodiments of the present invention allows separation of coarse particles, such as knots and corresponding, from the fiber suspension more efficiently than before and at a higher consistency (even over 6%). Thanks to the elongated slots, the speed of the screen drum can be increased, because the "projections" of the slots remain adequately large. A greater speed allows a higher consistency. If the

screening surface is provided with circular holes, the upper speed limit is met earlier, because with increasing speed the holes get clogged faster, as their projection is decreased. In the apparatus according to the embodiments of the invention, the screening is more energy efficient, typically due to either a decreased rotational speed or increased capacity.

[0019] The invention will be described in more detail, providing examples only, with reference to the appended figures, of which

Figure 1 illustrates the apparatus according to the invention as a schematic side view,
Figure 2 illustrates a screening surface according to an embodiment as a view from above,
Figures 3a and b illustrate a screening surface according to another embodiment as a view from above,
Figure 4 illustrates a screening surface according to an embodiment as a view from above,
Figure 5 illustrates a screening surface profile according to an embodiment as a straightened and cut side view, and
Figures 6 a, b, c and d illustrate screening surfaces according to some embodiments as a view from above.

[0020] Figure 1 illustrates a screen according to a preferred embodiment of the invention, which screen comprises an essentially cylindrical outer casing 1, to which casing a fiber suspension inlet conduit 2, an accept outlet conduit 3 and a reject outlet conduit 4 are connected, a screen drum 5 and one or more stationary blades 6 inside the screen drum 5, which extend in the vicinity of the screen drum's surface. The rotating screen drum 5 is attached in a way known per se to a shaft 7 functioning e.g. by belt drive (not shown). The space 8 between the screen drum 5 and the outer casing 1 is annular. The above mentioned conduits 2 and 4 are connected to the outer casing 1 of the annular space. The fiber suspension is fed into the space 8 and the accept flown through the screening surface is discharged from the interior of the screen drum. The blades 6 are attached by means of arms 9 to a stationary frame 10, which also forms a support for the shaft 7 via bearings. The blades 6 are located inside the drum 5. Here said blades generate a suitable impulse, positive and negative, onto the drum 5, thus cleaning the screening surface of the drum.

[0021] Figure 2 illustrates a straightened screening surface profile according to a preferred embodiment. The profile plate 20 is formed of apertures 21 and profiles 22 between them. As seen from the figure, the apertures 21 are slots in accordance with the invention. The form of the slots is rectangular, whereby the edges of their ends can be either rectangular or rounded. The ratio of the length L and width W of the slots is 1.05-10, preferably 2-8, depending on the object of application. The width W is typically 4-12 mm. In this embodiment the longitudinal direction 23 of the slots 21 is parallel to the direction 24 of rotation of the drum 5.

[0022] In the axial direction of the drum, slots are arranged one above another, whereby rows/zones 11 of slots are formed at a distance from each other in the circumferential direction of the drum. The profile ridges 22 and the vertical rows of slots are not aligned with respect to the vertical axis of the drum, but they are declined rows. The ridges and rows of slots are at an angle of -5... +20 degrees, typically 15 degrees, angle β, with respect to the vertical shaft 7 of the drum.

[0023] The slots of the vertical rows 11 of slots can be arranged in the horizontal direction so that they form parallel horizontal rows. Figure 2 illustrates an alternative embodiment, where the slots 21 of the vertical rows 11 of slots are in the horizontal direction arranged so that the slots of every second row of slots are located on the same horizontal lines. Thereby, the slots of the vertical rows of slots are in the horizontal direction arranged so that the slots of every second vertical row 11 of slots are located on the same horizontal lines, i.e. in a first group of horizontal lines, and respectively the slots of every second row of slots are located in a second group of horizontal lines.

[0024] In Figure 3 the longitudinal direction/longitudinal axis 23 of the slots 21 is at an angle α with respect to the direction 24 of rotation of the drum, which angle is between -40 and +40 degrees. In Figure 3a the angle α is approximately +25 degrees and in Figure 3b approximately -24 degrees.

[0025] Figure 4 illustrates profiles of the outer surface of the plate 20. The screening surface can be regarded to be formed of a plate with ridges 22 and planar portions 26 therebetween, which are provided with machined apertures 21. In the embodiment of Figure 4, profile ridges are additionally provided in the zone of slots so that ridges 25 are arranged between slots located one above another. Thus, in that case the profile is formed by a row of ridges broken by slots. The slot zone may be provided with one or more thus formed profiles, which are preferably at the same declination angle with respect to the vertical axis of the drum as the rows/zones 11 of slots and the profiles 22 between them.

[0026] Figure 5a and b illustrate a screening surface profile as a straightened and cut side view. The inner surface 27 plate 20 is flat, except for the apertures. In Figure 5b the outer surface profile ridge 22 of the plate 20 is formed of front surfaces 29 ascending at a certain angle from the plane 28 of the plate 20, surfaces 30 essentially parallel to the plane 28 of the plate 20, rear surfaces 31 essentially perpendicular to the plane 28 of the plate 20 and portions of the plane 28 between the apertures 21. On the other hand, the screen plate can be regarded as being formed of a plate provided with ridges 22 formed of said parts 29, 30 and 31, and between them planar parts 28 provided with machined apertures 21. In the embodiment of Figure 5a the front surface 29 is perpendicular against the plane 28 of the plate and the rear

surface is declined.

[0027] When the front surface of the profile ridge, which receives the flow, is declined backwards, i.e. it ascends from the screening surface plane, and the rear surface is perpendicular (Fig. 5b), the declined front surface receives the pulp entering the drum, aiming e.g. to accelerate its speed, but an even flow through the screening surface apertures in the screening surface is obtained anyway. This eliminates disturbing flow of the suspension in the opposite direction, which happens under some circumstances. When the front surface of the profile ridge is perpendicular against the plane of the screening surface and the rear surface of the ridge is descending (Figure 5a) the front surface resists and mixes the flow, whereby the flow through the screening surface increases, and thus the capacity of the apparatus increases.

[0028] It is seen in Figures 2-4 that the ridges 22 are somewhat declined with respect to the axis of the drum, as well as with respect to the direction of rotation of the drum. By means of the declination angle of the ridges, the direction of declination with respect to the direction of rotation, the rotational speed of the drum and the angle of elevation of part 29 of the ridges it is possible to optimize the circulation time of the pulp in the screen with respect to the final result of the separation. The direction of the ridges 22 has the influence that if the ridges 22 on the screen drum 5 are declined backwards, they tend to lift the fiber suspension upwards on the screen drum, whereby the circulation time of the fiber suspension in the screen is increased, separation becomes more exact and the reject amount is decreased while the accept amount is increased. Whereas with forward declined ridges the circulation time is decreased and the capacity is increased. In addition to said factors, also the height of the screen drum has an influence on the operational speeds, declination angles etc.

[0029] According to the embodiments of Figure 6, the position of the longitudinal direction 23 of the slots 21 in one row of slots with respect to the direction 24 of rotation of the drum changes from up downwards seen along the shaft 7 of the drum (Figure 6a). The longitudinal direction of the uppermost slot 21' is parallel to the direction of rotation of the drum (i.e. perpendicular with respect to the axis of the drum). Meanwhile, the longitudinal direction of a next lower slot 21" is declined (with respect to the axis of the drum), starting from the front end 32 of the slot in the direction of rotation of the drum, whereby the front end 32 of the slot is located higher than its trailing end 33 (in the direction of rotation of the drum). Thus, the next lower slot is declined downwards more than the upper one. The declination angle of the lower slot is typically 1-5 degrees, typically 2-4 degrees larger. In this kind of embodiment, the change in the direction of the slots can be regarded as descending from above downwards. According to another embodiment (Fig. 6 b), the longitudinal direction of the uppermost slot is also parallel to the direction of rotation of the drum, while a following lower slot is declined upwards with respect to the direction of rotation, whereby the front end 32' of said slot, in the direction of rotation of the drum, is located lower than its trailing end 33'. Thus, the next lower slot is declined at the trailing end upwards to a greater extent than the upper slot. The declination angle of the lower slot is 1-5, typically 2-4 degrees larger. In this kind of embodiment, the change in the direction of the slots can be regarded as ascending from above downwards. In these embodiments, two slots located one above another can be essentially parallel, but it is pertinent that most of the slots in a row of slots are located at different declination angles with respect to each other.

[0030] According to a preferred embodiment of the invention (Figure 6c, d), the position/angle of the longitudinal direction of the slots in one row of slots with respect to the direction of rotation of the drum changes from down upwards seen along the drum's axis so that the longitudinal direction of the lowermost slot is parallel to the direction of rotation of the drum, while a slot located next above is declined with respect to the direction of rotation. Thus, the next upper slot can be declined upwards (Figure 6c), whereby the front end 32" of the slot in the direction of rotation of the drum is located lower than the trailing end 33" of the slot. Typically the upper slot is more declined than the lower slot. The declination angle of the upper slot is 1-5, typically 2-4 degrees larger. In this kind of embodiment, the change in the direction of the slots can be regarded as from down upwards ascending. According to a preferred embodiment of the invention (Figure 6d), an upper slot can be declined correspondingly so that the front end 32"' of the slot in the direction of rotation of the drum is located higher than the trailing end 33"' of the slot. In that case, the slots are declined downwards with respect to the direction of rotation. In this kind of embodiment, the change in the direction of the slots can be regarded as from down upwards descending.

[0031] In embodiments, where the slots are declined downwards (Fig. 6a and d), a greater capacity is obtained. In embodiments, where the slots are declined upwards (Fig. 6b and c), higher cleanliness is achieved, as contaminated particles flow from above downwards.

[0032] As becomes obvious from the above, the method and apparatus according to the invention have allowed deleting the drawbacks of the prior art apparatuses and methods and thus increasing the capacity of the screening apparatus. It is, however, to be noted that in the above only some most important embodiments of the invention have been described in more detail, which are by no means meant to limit the invention from what is presented in the claims, which alone define the scope of protection of the invention.

Claims

1. An apparatus for screening fiber suspension, especially for removing coarse particles, such as knots, comprising a casing (1), a feed conduit (2) for fiber

suspension and outlet conduits (4, 3) for reject and accept, a screen drum (5) arranged rotatably with respect to the vertical shaft (7) inside the casing and having a screening surface (20) provided with apertures (21), through which the accept fraction flows, in which apparatus the feed and outlet conduits are arranged so that the fiber suspension is fed into a space (8) between the casing and the screen drum and the accept is discharged from the interior of the screen drum,
wherein the apertures in the screening surface are slots (21), which slots form rows (11) of slots, and the outer side of the screening surface is profiled so that ridges (22) are arranged between the rows of slots,
characterized in that
the slots (21) have a longitudinal direction with respect to the direction of rotation of the drum between -40 and +40 degrees, and a ratio of the length and width between 1.05 and 10.

2. An apparatus according to claim 1, in which the longitudinal direction of the slots (23) is between -30 and +30 degrees with respect to the direction of rotation of the drum, preferably between -15 and +15 degrees.

3. An apparatus according to claim 1 or 2, in which the longitudinal direction of the slots (21) is parallel to the direction of rotation of the drum.

4. An apparatus according to any one of the preceding claims, in which the slots (21) are one above another in the vertical direction.

5. An apparatus according to any one of the preceding claims, in which the ratio of the length and width of the slots (21) is 2-8.

6. An apparatus according to any one of the preceding claims, in which the profile ridges (22) are arranged so that they are at an angle of -5...+20 degrees, preferably + 15 degrees with respect to the vertical axis (7) of the screen drum.

7. An apparatus according to claim 6, in which the slots (21) located one above another form vertical rows of slots, wherein the ends of the slots form a line that is parallel to the profile ridges (22).

8. An apparatus according to any one of the preceding claims, in which the slots (21) of the vertical rows (11) of slots are in the horizontal direction arranged so that the slots of every second vertical row of slots are located on the same horizontal lines, i.e. in a first group of horizontal lines, and respectively the slots of every second row of slots are located in a second group of horizontal lines.

9. An apparatus according to claim 6 or 7, in which the outer side of the screening surface (20) is profiled so that one or more ridges (25) are provided in the zone of slots also between the slots located one above another.

10. An apparatus according to any one of the preceding claims, in which the profile is formed of ridges (22, 25) having a front surface (29) and a rear surface (31) at a certain angle with respect to the screening surface plane and possibly therebetween a surface (30) essentially parallel to the plane of the plate.

11. An apparatus according to claim 10, in which the front surface (29) of the profile ridge receiving the flow is declined backwards, i.e. it ascends from the screening surface plane and the rear surface (31) is perpendicular.

12. An apparatus according to claim 10, in which the front surface (29) of the profile ridge is perpendicular against the screening surface plane and the rear surface (31) is descending.

13. An apparatus according to claim 10, in which the front surface and rear surface of the profile ridge are declined.

14. An apparatus according to any one of the preceding claims, in which the longitudinal (23) position of the slots (21', 21 '') located in one row (11) of slots with respect to the direction of rotation (24) of the drum changes from above downward seen along the axis of the drum.

15. An apparatus according to claim 14, in which the longitudinal position of a slot (21 '') in a row of slots is declined more than the longitudinal position of an upper or a lower slot (21') .

Patentansprüche

1. Vorrichtung zum Sieben einer Fasersuspension, insbesondere zum Entfernen von groben Partikel, wie Knoten, mit
einem Gehäuse (1),
einer Zuführleitung (2) für die Fasersuspension und Auslassleitungen (4, 3) für Spuckstoffe und Gutstoffe, und
einer Siebtrommel (5), die bezüglich der vertikalen Achse (7) drehbar innerhalb des Gehäuses angeordnet ist und eine Siebfläche (20) aufweist, die mit Öffnungen (21) versehen ist, durch welche die Gutstofffraktion strömt, wobei
in der Vorrichtung die Zuführ- und Auslassleitungen so angeordnet sind, dass die Fasersuspension einem Raum (8) zwischen dem Gehäuse und der Sieb-

trommel zugeführt wird, und der Gutstoff aus dem Inneren der Siebtrommel abgegeben wird,
wobei
die Öffnungen in der Siebfläche Schlitze (21) sind, die Schlitze Schlitzreihen (11) ausbilden, und die äußere Seite der Siebfläche so profiliert ist, dass Rippen (22) zwischen den Schlitzreihen angeordnet sind,
dadurch gekennzeichnet, dass
die Schlitze (21) eine Längsrichtung bezüglich der Drehrichtung der Trommel zwischen -40 und +40 Grad, und ein Verhältnis von Länge zu Breite zwischen 1,05 und 10 aufweisen.

2. Vorrichtung nach Anspruch 1, bei der
die Längsrichtung der Schlitze (23) zwischen -30 und +30 Grad, vorzugsweise zwischen -15 und +15 Grad bezüglich der Drehrichtung der Trommel liegt.

3. Vorrichtung nach Anspruch 1 oder 2, bei der
die Längsrichtung der Schlitze (21) parallel zu der Drehrichtung der Trommel ist.

4. Vorrichtung nach einem der vorhergehenden Ansprüche, bei der
die Schlitze (21) in der vertikalen Richtung übereinander liegen.

5. Vorrichtung nach einem der vorhergehenden Ansprüche, bei der
das Verhältnis von Länge zu Breite der Schlitze (21) 2-8 beträgt.

6. Vorrichtung nach einem der vorhergehenden Ansprüche, bei der
Profilrippen (22) so angeordnet sind, dass sie in einem Winkel von -5...+20 Grad, vorzugsweise +15 Grad zu der vertikale Achse (7) der Siebtrommel stehen.

7. Vorrichtung nach Anspruch 6, bei der
die übereinander angeordneten Schlitze (21) vertikale Reihen von Schlitzen ausbilden, wobei die Enden der Schlitze eine Linie ausbilden, die parallel zu den Profilrippen (22) liegt.

8. Vorrichtung nach einem der vorhergehenden Ansprüche, bei der
die Schlitze (21) der vertikalen Reihen (11) von Schlitzen so in der horizontalen Richtung angeordnet sind, dass sich die Schlitze jeder zweiten vertikalen Reihe von Schlitzen auf der selben horizontalen Linie liegen, d.h. in einer ersten Gruppe von horizontalen Linien, und die Schlitze jeder zweiten Reihe von Schlitzen entsprechend in einer zweiten Gruppe von horizontalen Linien angeordnet sind.

9. Vorrichtung nach Anspruch 6 oder 7, bei der
die Außenseite der Siebfläche (20) so profiliert ist, dass eine oder mehrere Rippen (25) im Bereich der Schlitze, auch zwischen den übereinander angeordneten Schlitzen, vorgesehen sind.

10. Vorrichtung nach einem der vorhergehenden Ansprüche, bei der,
das Profil aus Rippen (22, 25), die eine Vorderseite (29) und eine Rückseite (31), unter einem bestimmten Winkel bezüglich der Siebflächenebene, und eventuell dazwischen eine Fläche (30), die im Wesentlichen parallel zu der Ebene der Platte ist, aufweisen.

11. Vorrichtung nach Anspruch 10, bei der
die Vorderseite (29) der Profilrippe, welche die Strömung aufnimmt, nach hinten geneigt ist, d.h., dass diese von der Siebflächenebene ansteigt und die Rückseite (31) senkrecht ist.

12. Vorrichtung nach Anspruch 10, bei der
die Vorderseite (29) der Profilrippe senkrecht zu der Siebflächenebene steht und die Rückseite (31) geneigt ist.

13. Vorrichtung nach Anspruch 10, bei der
die Vorderseite und die Rückseite der Profilrippe geneigt sind.

14. Vorrichtung nach einem der vorhergehenden Ansprüche, bei der
sich die Längsposition (23) der Schlitze (21', 21"), die in einer Reihe (11) von Schlitzen bezüglich der Drehrichtung (24) der Trommel angeordnet sind, von oben nach unten betrachtet entlang der Achse der Trommel ändert.

15. Vorrichtung nach Anspruch 14, bei der
die Längsposition eines Schlitzes (21") in einer Reihe von Schlitzen mehr geneigt ist als die Längsposition eines oberen oder unteren Schlitzes (21').

Revendications

1. Appareil destiné à classer une suspension fibreuse, particulièrement à éliminer les particules grossières, telles que les noeuds, comprenant un boîtier (1), un conduit d'alimentation (2) pour la suspension fibreuse et des conduits de sortie (4, 3) pour les rejetés et les acceptés, un tambour de classage (5) agencé en rotation par rapport à l'arbre vertical (7) à l'intérieur du boîtier et ayant une surface de classage (20) pourvue d'ouvertures (21), à travers lesquelles la fraction acceptée s'écoule, dans lequel appareil les conduits d'alimentation et de sortie sont agencés de sorte que la suspension fibreuse soit alimentée dans un espace (8) entre le boîtier et le tambour de classage et

l'accepté soit déchargé de l'intérieur du tambour de classage,
où les ouvertures dans la surface de classage sont des fentes (21), lesquelles fentes forment des rangées (11) de fentes, et le côté extérieur de la surface de classage est profilé de sorte que des arêtes (22) soient agencées entre les rangées de fentes,
caractérisé en ce que
les fentes (21) ont une direction longitudinale par rapport à la direction de rotation du tambour entre -40 et +40 degrés, et un rapport de la longueur et de la largeur entre 1,05 et 10.

2. Appareil selon la revendication 1, dans lequel la direction longitudinale des fentes (23) se trouve entre -30 et +30 degrés par rapport à la direction de rotation du tambour, de préférence entre -15 et +15 degrés.

3. Appareil selon la revendication 1 ou 2, dans lequel la direction longitudinale des fentes (21) est parallèle à la direction de rotation du tambour.

4. Appareil selon l'une quelconque des revendications précédentes, dans lequel les fentes (21) sont situées les unes sur les autres dans la direction verticale.

5. Appareil selon l'une quelconque des revendications précédentes, dans lequel le rapport de la longueur et de la largeur des fentes (21) est de 2 à 8.

6. Appareil selon l'une quelconque des revendications précédentes, dans lequel les arêtes de profil (22) sont agencées de sorte qu'elles soient à un angle de -5... +20 degrés, de préférence de +15 degrés par rapport à l'axe vertical (7) du tambour de classage.

7. Appareil selon la revendication 6, dans lequel les fentes (21) situées les unes sur les autres forment des rangées verticales de fentes, où les extrémités des fentes forment une ligne qui est parallèle aux arêtes de profil (22).

8. Appareil selon l'une quelconque des revendications précédentes, dans lequel les fentes (21) des rangées verticales (11) de fentes sont, dans la direction horizontale, agencées de sorte que les fentes de chaque deuxième rangée verticale de fentes soient situées sur les mêmes lignes horizontales, c'est-à-dire dans un premier groupe de lignes horizontales, et respectivement les fentes de chaque deuxième rangée de fentes soient situées dans un deuxième groupe de lignes horizontales.

9. Appareil selon la revendication 6 ou 7, dans lequel le côté extérieur de la surface de classage (20) est profilé de sorte qu'une ou plusieurs arêtes (25) soient aussi prévues dans la zone de fentes entre les fentes situées les unes sur les autres.

10. Appareil selon l'une quelconque des revendications précédentes, dans lequel le profil est formé d'arêtes (22, 25) ayant une surface avant (29) et une surface arrière (31) à un certain angle par rapport au plan de la surface de classage et éventuellement entre elles une surface (30) essentiellement parallèle au plan de la plaque.

11. Appareil selon la revendication 10, dans lequel la surface avant (29) de l'arête de profil recevant l'écoulement est inclinée vers l'arrière, c'est-à-dire elle monte du plan de la surface de classage et la surface arrière (31) est perpendiculaire.

12. Appareil selon la revendication 10, dans lequel la surface avant (29) de l'arête de profil est perpendiculaire au plan de la surface de classage et la surface arrière (31) est descendante.

13. Appareil selon la revendication 10, dans lequel la surface avant et la surface arrière de l'arête de profil sont inclinées.

14. Appareil selon l'une quelconque des revendications précédentes, dans lequel la position longitudinale (23) des fentes (21', 21") situées dans une rangée (11) de fentes par rapport à la direction de rotation (24) du tambour passe de haut en bas en regardant le long de l'axe du tambour.

15. Appareil selon la revendication 14, dans lequel la position longitudinale d'une fente (21") dans une rangée de fentes est inclinée plus que la position longitudinale d'une fente supérieure ou inférieure (21')

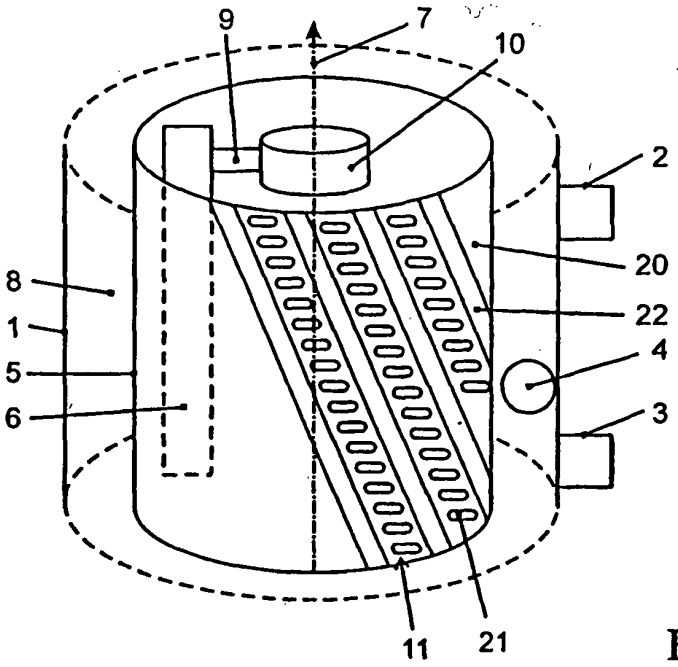

FIG. 1

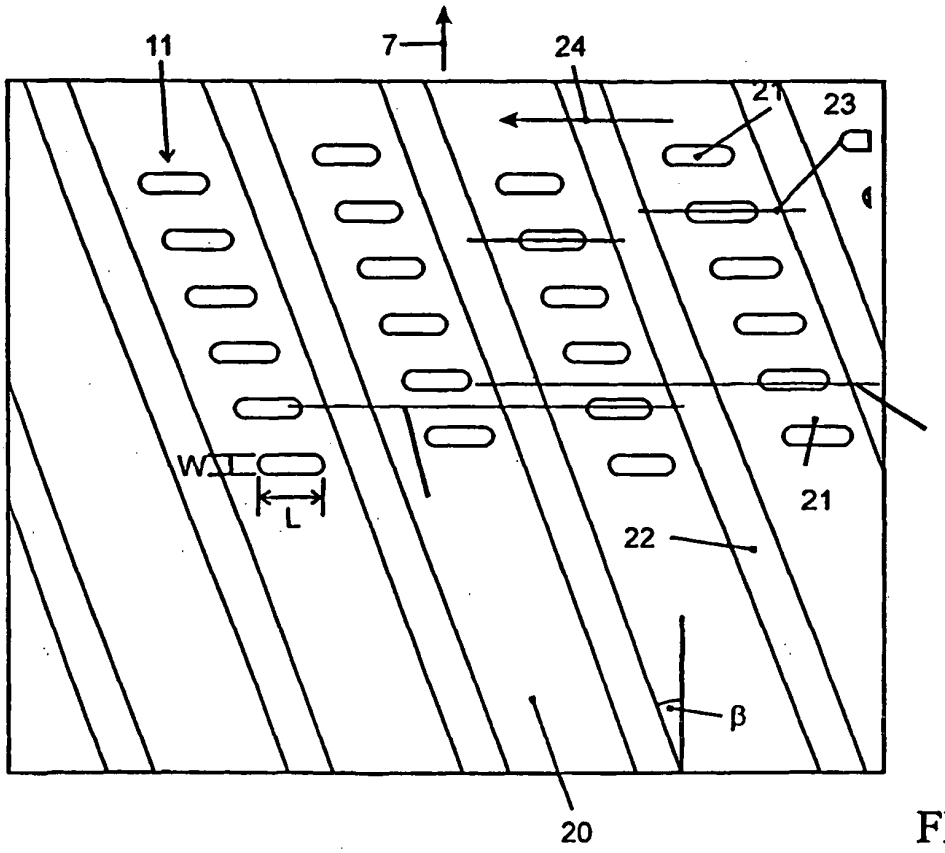

FIG. 2

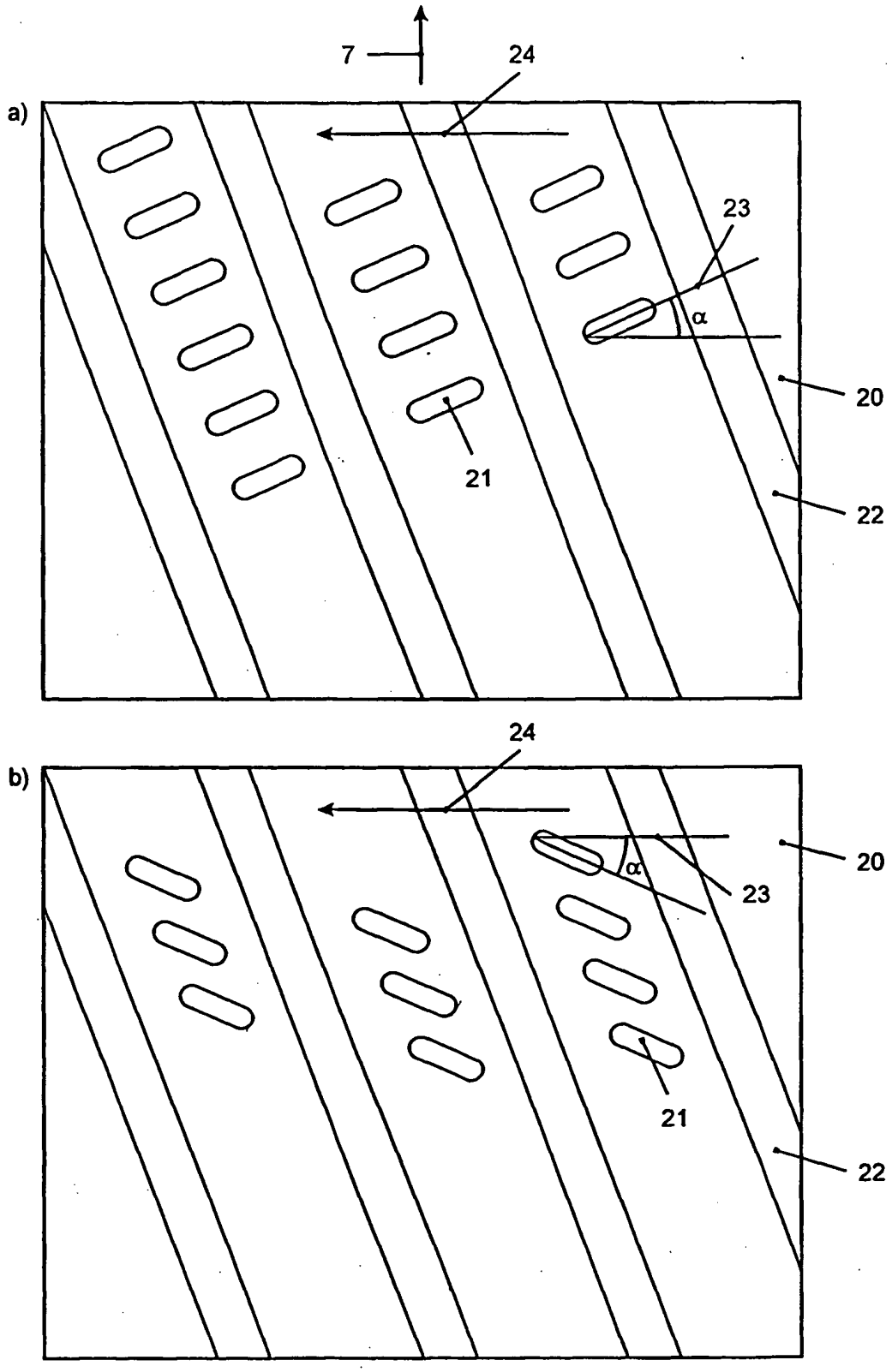

FIG. 3

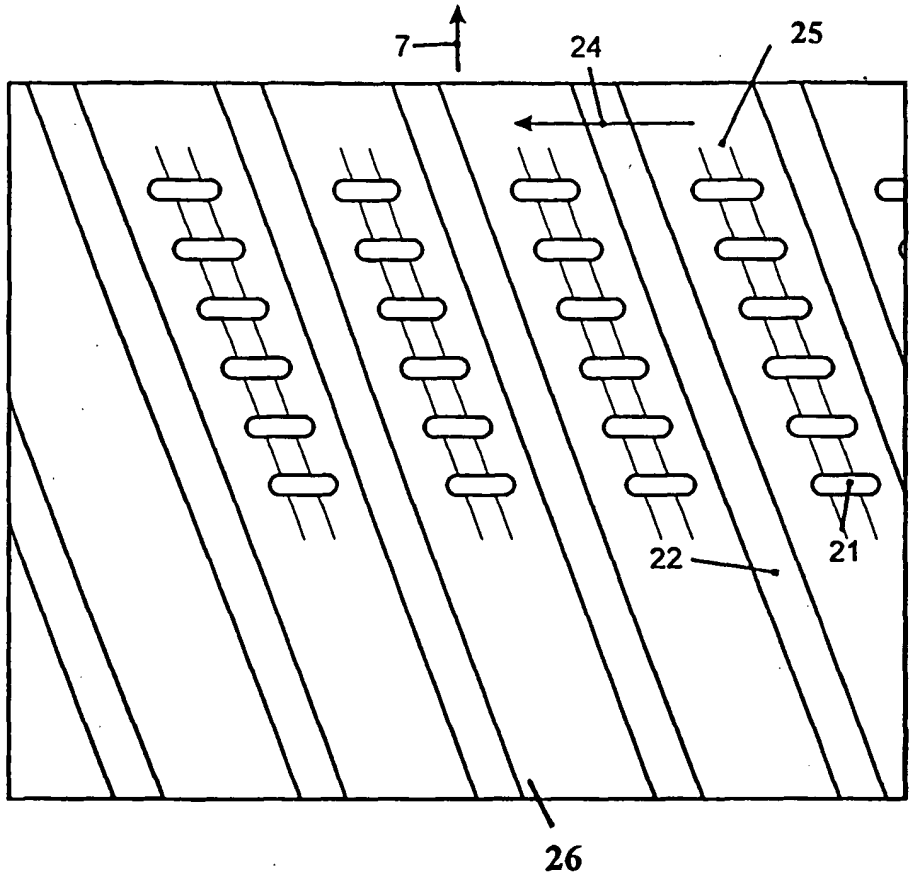

FIG. 4

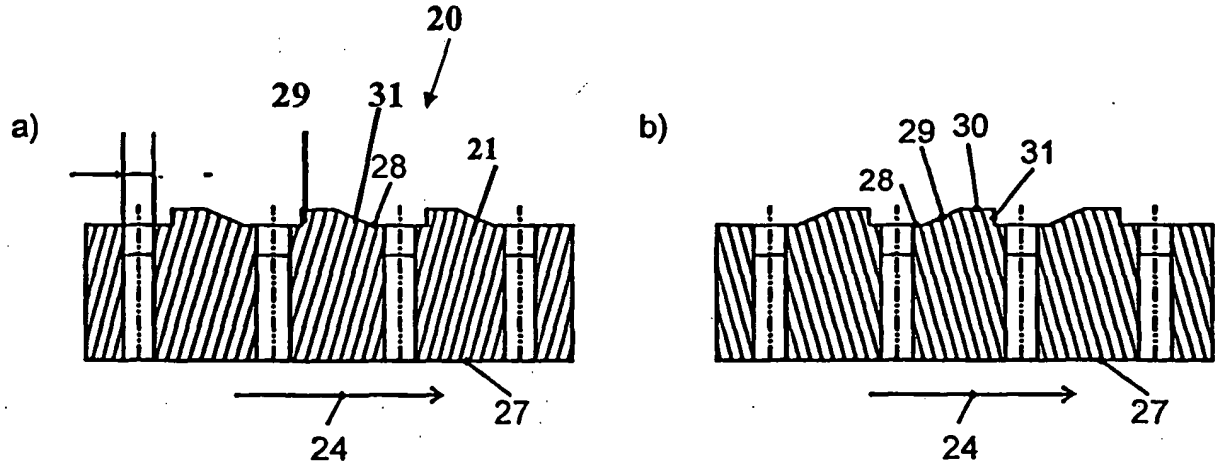

FIG. 5

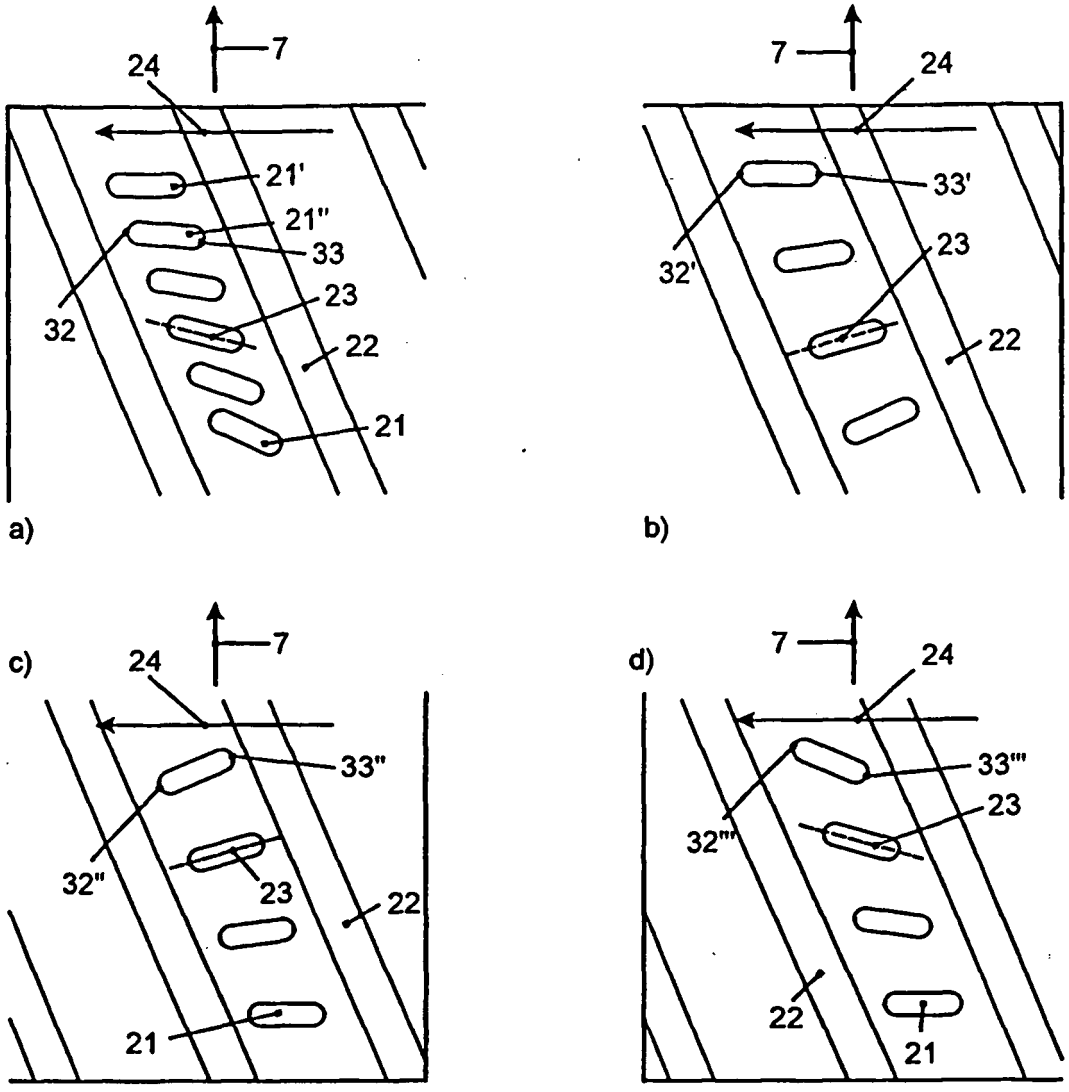
a)
7
24
21'
21"
33
32
23
22
21
b)
7
24
33'
32'
23
22
c)
7
24
33"
32"
23
22
21
d)
7
24
33'''
32'''
23
22
21

FIG. 6

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 275967 A **[0004]**
- FI 76139 **[0004]**
- EP 1357222 A **[0005]**
- US 2004004032 A **[0005]**
- US 490417 A **[0005]**