(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 1 115 945 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
27.01.2010 Bulletin 2010/04

(21) Application number: **99944666.9**

(22) Date of filing: **14.09.1999**

(51) Int Cl.:
D21C 9/06 *(2006.01)* ***D21C 9/18*** *(2006.01)*
D21F 1/80 *(2006.01)*

(86) International application number:
PCT/FI1999/000751

(87) International publication number:
WO 2000/015900 (23.03.2000 Gazette 2000/12)

(54) METHOD AND APPARATUS FOR WASHING FIBRE PULP MIXTURE

VERFAHREN UND VORRICHTUNG ZUM WASCHEN EINER MISCHUNG VON FASERSTOFFSUSPENSIONEN

PROCEDE ET DISPOSITIF DE LAVAGE DE MELANGE DE PATE A FIBRES

(84) Designated Contracting States:
AT DE FR GB IT SE

(30) Priority: **14.09.1998 FI 981974**

(43) Date of publication of application:
18.07.2001 Bulletin 2001/29

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Description

[0001] The invention relates to a method for washing fibre pulp, in which method fibre pulp is fed into a dewatering section and water and, with it, ash and/or other impurities are removed through a wire running in the same direction as the fibre pulp in the dewatering section, wherein the fibre pulp being washed is fed into a dewatering section formed between two wires and the wires are arranged to run in such a way that the dewatering section converges from the feed end to the outlet end, whereby water and, with it, impurities are removed in the dewatering section through both wires, and after the dewatering section, the wires and the pulp between them are led to run along a curving surface in such a way that pressure caused by the tightness of the wires and the centrifugal force produced by the curved movement cause the removal of any extra water from the pulp.

[0002] The invention further relates to an apparatus for washing a fibre pulp mixture, which apparatus comprises a dewatering section which is restricted by a wire moving longitudinally along it and to the other end of which the fibre pulp mixture is fed and correspondingly removed at the other end, and water and, with it, ash and/or other impurities are removed from the fibre pulp mixture through the wire in the dewatering section, the apparatus comprising a first wire and a second wire, whereby the dewatering section formed between the wires and water and, with it, impurities are removed through both wires, the wires are arranged to run in such a manner that the dewatering section converges from the feed end of the fibre pulp mixture to the outlet end of the dewatering section, and the apparatus comprises a curved surface located after the dewatering section, along which both wires and the fibre pulp mixture between them is led to turn to remove any extra water from the fibre pulp by means of pressure caused by the tightness of the wires and the centrifugal force produced by the curving movement

[0003] Fibre pulp, such as recycled fibre, is washed while being processed. When fibre pulp is washed, water is removed from it in a manner that aims at removing particle-type material, such as ash, with the water while useful fibres are retained in the fibre pulp.

[0004] Apparatuses like this were presented in the Tappi Conference 15 to 19 June 1998, for instance, and according to a presentation given in the conference, a good washing result is achieved by two wire-type apparatuses only. One apparatus comprises two separate large-diameter rolls around which runs a wire. In this solution, the fibre matter being washed is fed into a gap between the roll and the wire. The other apparatus comprises only one large-diameter roll and a separate wire section with associated apparatuses. In this solution, too, the fibre matter is fed into a gap between the roll and the wire. In both apparatuses, a majority of the water is removed through one wire.

[0005] A problem with both apparatuses is the small fibre matter washing capacity per width meter of apparatus. A further problem with both apparatuses is a poor wire durability, because, in both solutions, the finer side of the wire is against the roll. In addition, neither solution provides the possibility of substantially adjusting the level of dewatering or thereby the quantity of fines lost during washing by other means than changing wires. A yet further problem with both apparatuses is that the dry stuff content of the washed fibre material exiting the apparatus is relatively low and thus usually requires a separate concentration prior to further processing. A yet another problem with both apparatuses is that they require a high wire speed which is , disadvantageous with respect to both energy consumption and wire durability.

[0006] DE 42 18 174 A1 discloses an equipment to extract fluid from a mixture of solids in suspension, particularly fibre in suspension, which utilises revolving press rollers having inner and outer endless filter bands. The input tube by which a suspension of fibre in water, which may be washing water, is formed across and between the two filter bands. The outer filter band is separated from the inner band by means of two rollers. Both bands surround the roller which may be perforated, and have an extraction system in the interior. It revolves in the direction by means of the bands, which both surround the following roller, which is driven by an electric motor. The filter bands may be made from plastic, felt, or perforated steel with the outer band being made to allow the fluid to flow rapidly, and the other band forming pressure, or a rearrangement to suit the circumstances. Between the two filter bands coming from the drive roller is the receptacle for the solid material. It may be necessary to have a blade to separate the material from the band. The scroll drive in the receptacle transfers the solid material from the equipment.

[0007] US 4 491 521 A discloses a method and an apparatus for dewatering fibre suspensions wherein the fibre pulp is fed into a dewatering section formed between two wires.

[0008] It is an object of this invention to produce a method and apparatus with which it is possible to simply and efficiently wash impurities from fibre pulp and, at the same time, to raise the consistency of the washed fibre pulp to a level sufficient for further processing.

[0009] The method of the invention is characterized by the features of claim 1. The pulp being washed is fed into a dewatering section in which at least one of the wires is led to run in the dewatering section along a convex path making the dewatering substantially more efficient at the forward end of the dewatering section than at the tail end.

[0010] The apparatus of the invention is characterized by the features of claim 10. At least one of the wires is arranged to run in the dewatering section along a convex path.

[0011] The essential idea of the invention is that the fibre pulp is fed between two wires, whereby dewatering and thus also washing occurs in both directions in the dewatering section. A further essential idea of the inven-

tion is that the fibre pulp coming out of the dewatering section between the wires is led together with both wires to run along a curved surface, preferably a turning roll, whereby the removal of any extra water is achieved by means of pressure caused by the tightness of the wires and the centrifugal force produced by the curved movement. According to the invention, the fibre pulp is preferably fed to a closed dewatering chamber through which the wires run in such a manner that produces a convergent dewatering section between the wires. One preferred embodiment of the invention is based on the idea that turbulence is caused in the fibre pulp before it is fed into the dewatering section, whereby dewatering and thus also washing is performed as efficiently as possible and as far as possible along the length of the dewatering section without causing layers of fibres on top of the wires.

[0012] An essential idea of one preferred embodiment of the invention is that the dewatering in the beginning of the dewatering zone is performed in such a manner that the flow rate of the fibre pulp differs from the motion speed of the wires in the beginning of the dewatering section. This way, turbulence caused in the fibre pulp before it is fed into the section can be efficiently maintained for as long as possible. A yet another essential idea of the invention is that the dewatering section is made so as to curve towards the inside in such a manner that its cross-profile decreases quicker at the forward end than at the tail end. The invention provides the advantage that this way a very efficient dewatering is achieved, which combined with the dewatering performed by means of the turning roll results in preferably achieving a high enough dry stuff content in the washed fibre material for the purpose of further processing. A further advantage of the invention is that when washing the fibre pulp, ash and other particle-type material can very efficiently be removed from the fibre pulp along with water while the fibres of desired length remain efficiently in the fibre pulp mixture. A yet further advantage of the invention is that a sufficiently high concentration of the fibre pulp is achieved after washing without additional presses or corresponding mechanical apparatuses.

[0013] By means of the method of the invention, dewatering and thus also the washing result can substantially be adjusted with control valves or other control elements in the area of the dewatering chamber, which also improves the washing result and fines loss.

[0014] If a strong wash is required, dewatering is adjusted in such a manner that more water per length of fibre pulp mixture in the motion direction is removed in the forward end than in the tail end of the dewatering zone. Correspondingly, if a careful/fines-saving wash is required, dewatering is adjusted in such a manner that approximately the same amount of water or less per length of fibre pulp mixture in the motion direction is removed in the forward end than in the tail end of the dewatering zone.

[0015] The apparatus of the invention also enables additional dewatering by means of a curved surface, such as a turning roll, located after the dewatering section. No edge sealing is necessary after the actual dewatering section, because the clearance in the outlet end of the section is adjusted in such a manner that the dry stuff content of the fibre pulp mixture in the outlet end is already sufficiently high. The actual additional dewatering is done based on wire tightness and centrifugal force on the curved surface.

[0016] The apparatus of the invention provides considerable advantages in comparison with other corresponding apparatuses. Dewatering and washing with the apparatus of the invention occurs in two directions, which provides a considerable capacity increase in comparison with the working width of the apparatuses described above. The apparatus also preferably contains a separate turbulence element. With the apparatus, the flow rate of the fibre pulp mixture in the dewatering section is kept suitable in relation to the wire speed. Both factors thus contribute to effectively preventing an earlier than necessary infiltration of the fibre pulp mixture on the surface of the wires, thus maintaining a good washing result. The washing result and fines loss can also effectively be adjusted by controlling the dewatering in different ways in the longitudinal direction of the apparatus.

[0017] The invention will be described in -greater detail in the attached drawings in which

Figure 1 shows a schematic sectional side view of an embodiment of the apparatus of the invention,
Figures 2a and 2b show schematically a structure of the apparatus of the invention after the outlet opening of the dewatering section and a detail of it,
Figure 3 shows a schematic sectional side view of a second embodiment of the apparatus of the invention,
Figure 4 shows a sectional side view of a third embodiment of the apparatus of the invention, and
Figure 5 shows schematically the effect of washing on the fibre distribution of a fibre pulp implemented by the apparatus and method of the invention.

[0018] Figure 1 shows a schematic sectional side view of an embodiment of the apparatus of the invention. The apparatus comprises a first wire 1 and a second wire 2, between which a dewatering section 3 is formed. The first wire 1 runs as a closed loop around guide rolls 4a to 4d and the second wire 2 correspondingly around a turning roll 5 and guide rolls 6a and 6b. The number and location of guide rolls can be any suitable one, which fact is known per se and obvious to a person skilled in the art. The fibre pulp mixture to be washed is fed into a feeder chamber 7 from which it is preferably fed for instance through turbulence generator 8, known per se, to the dewatering section 3 formed between the first and second wire 1 and 2. On both sides of the dewatering section 3, against the outer surfaces of the wires 1 and 2, there are dewatering boxes 9 and 10 or the like, through

which water is drained from the fibre pulp mixture in the dewatering section 3, as schematically illustrated by arrows 9a and 10a. The dewatering section 3 is preferably a closed chamber formed by sides and support structures between the sides, along which the wires 1 and 2 run inside the dewatering chamber. The dewatering boxes 9, 10 or the like are installed on the support structures in such a manner that the water draining through the wires runs through the support structures into the dewatering boxes or the like. Such wire support structures, which can be of perforated plate, various foil structures or the like, are generally known per se to a person skilled in the art and they or their operation need, therefore, not be described in greater detail. In this application and in the associated claims, a closed dewatering chamber refers specifically to a structure in which the fibre pulp and the water it contains cannot exit the dewatering section along other than the desired dewatering routes.

[0019] Because both sides of the dewatering section are closed and the area between the wires 1 and 2 and the guide rolls 4a and 6b are sealed so as to prevent the fibre pulp mixture from running in any other direction, the fibre pulp mixture has to flow from the dewatering section 3 onward in the same direction as the wires 1 and 2. Simultaneously, water is removed from it along the entire way. Dewatering occurs in the dewatering section for instance in such a manner that preferably more water per length of fibre pulp mixture in the motion direction is removed in the forward end of the dewatering section 3, i.e. the incoming end of the fibre pulp, than in the tail end of the dewatering section 3. Turbulence caused in the fibre pulp mixture in advance can also be maintained by adjusting the dewatering based on the speed ratio difference and the fibres stay suitably mixed without any significant infiltration on the surfaces of the wires 1 and 2. When the fibre pulp mixture arrives at the turning roll 5, more water is removed from it by means of the centrifugal force and the tightness of the wires up through the wire 1 to a dewatering tray 11 resulting in a fibre pulp with a suitable dry stuff content. Since the concentration of the fibre pulp mixture when coming out of the dewatering section 3 is rather high, the fibre pulp mixture stays between the wires 1 and 2 without gushing out from the side. Thus, this apparatus does not need any separate sealing after the dewatering section. Making the fibre pulp follow the lower wire 2 requires some kind of a force affecting in that direction. This can be advantageously achieved by using a smooth roll as the turning roll 5. Thus, a negative pressure forms on the left side of the turning roll 5 in the space between the wire 2 and the turning roll 5 where the wire 2 detaches from the roll. This space is marked with reference number 12 in the figure. This, for its part, causes the low pressure to suck the fibre pulp against the wire 2 and thus the fibre pulp is detached from the top wire 1.

[0020] By designing the upper and lower surfaces of the dewatering section suitable for dewatering, the dewatering distribution along the length of the dewatering section can be altered in many ways. If, in the forward end of the dewatering section, water is drained from the fibre pulp mixture faster than the speed with which the cross-sectional area of the dewatering section decreases, the flow speed of the fibre pulp decreases in this area. Another consequence is that closer to the outlet opening -of the dewatering section, water is drained slower than the speed with which the cross-sectional area of the dewatering section decreases, which results in a fibre pulp mixture speed at the outlet opening which equals the motion speed of the wires. Correspondingly, if, in the forward end of the dewatering section, less water is drained than should in relation to the decreasing of the cross-sectional area of the dewatering section, the speed of the fibre pulp mixture becomes higher than the motion speed of the wires, and in this case dewatering closer to the outlet opening of the dewatering section must be greater in relation to the decrease in the cross-sectional area of the dewatering section so that the speed of the fibre pulp mixture at the outlet opening is the same as the motion speed of the wires 1 and 2. Both alternatives can be achieved for instance by constricting the dewatering channels and thus adjusting the outflow, or by various other generally known measures. However, the result is that a flow speed of fibre pulp mixture differing from the motion speed of wires maintains/causes turbulence and thus aids the operation of the apparatus in certain conditions.

[0021] In a fibre pulp wash in which ash and other material in the fibre pulp mixture need to be removed as thoroughly as possible, water can be fed into the fibre pulp mixture before the turning roll 5 from nozzles 13 below the wire 2, in which case water, while flowing through the fibre pulp mixture, transports these particle-type solids to the other side of the fibre pulp mixture and on through the wire 1, after which both water and particles are hurled into the dewatering tray 11.

[0022] Figure 2a shows schematically a structure of the apparatus of the invention immediately after the outlet opening of the dewatering section before the wires and the fibre pulp arrive at the turning roll 5. The figure shows how the dewatering zone is everywhere surrounded by either the higher or the lower support structure, such as cover part 3a or 3b or sides 3c, and the wires 1 and 2 correspondingly press against the higher and the lower support structures. The fibre pulp mixture, for its part, fills the space between the wires 1 and 2 and the dewatering section from the wires towards the edges. The first wire 1 higher in the figure is preferably slightly narrower than the lower second wire 2. This is due to the fact that when wires 1 and 2 and the fibre pulp mixture come out of the dewatering section 3, water jets 14 on the side of the higher wire wash away the portion of the fibre pulp mixture which remains outside the wire 1, whereby the edges of the second wire 2 are cleaned of the fibre pulp mixture and the mixture cannot stick to other parts of the apparatus and thus unnecessarily dirty the apparatus. This is described more closely in Figure 2b illustrating this detail.

A dashed line surrounds the portion of the fibre pulp mixture between the wires 1 and 2, which due to the water jets 14 moves towards the direction shown by arrow A and thus leaves the edge of the wire 2 clean.

[0023] Figure 3 shows a sectional side view of a second embodiment corresponding to the embodiment of the apparatus in Figure 1, except that a separate dewatering shoe 15 has been added to it between the dewatering section and the turning roll 5, along which shoe the wires 1 and 2 run to remove water from the fibre pulp mixture. The dewatering shoe 15 has advantageously a curved surface, preferably so that its curve is smaller than the curve of the turning roll 5 following it, or of any other corresponding curved surface. This way, dry stuff content can be raised even further without.complex and expensive presses or other corresponding apparatuses. Further, the figure shows pressure pulse elements, in this case separate strips 16, located in the dewatering section at the second wire 2. These strips produce an alternating pressure pulse through the wire, in which one pulse part pushes the fibre pulp on the surface of the wire 2 away from the wire and a counter-directional pressure pulse causes suction towards the wire; whereby the fibre matter layer accumulating on the surface of the wires is broken thus considerably reducing its effect which prevents dewatering. This way, too, turbulence can be maintained in the dewatering section thus improving dewatering without flocking and layering on the wire surface. Instead of the strips 16, various rotating pressure pulse elements or other solutions known per se can be used to produce pressure pulses on one or both sides of the dewatering section.

[0024] Figure 4 shows a third embodiment of the apparatus of the invention, in which the turning roll 5 is replaced by a curved shoe 17 around which the wires and the fibre pulp mixture turn. The shoe can have a surface with strips, or be implemented in any other manner known per se, whereby water can also be sucked through the wire 2, or strips can be used to produce suction to improve dewatering.

[0025] Figure 5 shows schematically the effect of washing on the fibre distribution of a fibre pulp implemented by the apparatus and method of the invention. In the test in question, the distribution of fibres of different lengths is measured by a measuring method known per se and the figure illustrates the proportion of the fibres of different lengths in the fibre pulp used in the test before and after washing. In this figure, I represents the proportion of the longest fibres and V the proportion of the fines and ash in the pulp. As shown in the figure, a significant amount of parts in the V group, i.e. ash and fines, are removed during washing, and as a result, their relative proportion in the washed fibre pulp is substantially reduced. At the same time, the proportion of other fibre contents in the washed pulp is correspondingly higher. The figure shows clearly that washing removes the part of the pulp being washed that it is supposed to, and other fibres remain well in the pulp being washed.

[0026] In the above description and drawings, the invention has been described in an exemplary manner only and is not to be so limited and the scope of protection is defined in the manner set forth in the claims.

Claims

1. A method for washing fibre pulp, in which method fibre pulp is fed into a dewatering section (3) and water and, with it, ash and/or other impurities are removed through a wire running in the same direction as the fibre pulp in the dewatering section,

wherein the fibre pulp being washed is fed into a dewatering section (3) formed between two wires (1, 2) and the wires are arranged to run in such a way that the dewatering section (3) converges from the feed end to the outlet end, whereby water and, with it, impurities are removed in the dewatering section (3) through both wires (1, 2), and
after the dewatering section (3), the wires (1, 2) and the pulp between them are led to run along a curving surface in such a way that pressure caused by the tightness of the wires and the centrifugal force produced by the curved movement cause the removal of any extra water from the pulp,
the pulp being washed is fed into a dewatering section (3) in which at least one of the wires (1, 2) is led to run in the dewatering section (3) along a convex path ,

characterized in that

the pulp is fed in the dewatering section which is made so as to curve towards the inside in such a manner that its cross-profile decreases quicker at the forward end than at the tail end, and
the washing can be substantially adjusted by controlling the dewatering in different ways in the longitudinal direction of the apparatus.

2. A method as claimed in claim 1, **characterized by** using as the dewatering section (3) a dewatering chamber closed on the sides, inside which the wires (1,2) are arranged to run.

3. A method as claimed in claim 1 or 2, **characterized in that** turbulence is caused in the pulp being washed before it is fed into the dewatering section (3).

4. A method as claimed in claim 3, **characterized in that** the turbulence is generated by a separate turbulence generation element (8).

5. A method as claimed in any one of the preceding claims, **characterized in that** the pulp being washed is led between the wires (1, 2) to turn along the surface of a turning roll (5) located after the dewatering section (3).

6. A method as claimed in any one of the preceding claims, **characterized in that** the pulp being washed is led between the wires to turn along the surface of a curved shoe (15, 17) located after the dewatering section (3).

7. A method as claimed in any one of the preceding claims, **characterized in that** water is fed between the curved surface and the wire running along it to improve washing.

8. A method as claimed in any one of the preceding claims, **characterized in that** pressure pulses are caused in the pulp being washed on at least one side along the length of the dewatering section (3).

9. A method as claimed in claim 8, **characterized in that** the pressure pulses are caused by a separate pressure pulse element located at the dewatering section (3) on the wire side opposite to the pulp being washed.

10. An apparatus for washing a fibre pulp mixture, which apparatus comprises a dewatering section (3) which is restricted by a wire moving longitudinally along it and to the other end of which the fibre pulp mixture is fed and correspondingly removed at the other end, and water and, with it, ash and/or other impurities are removed from the fibre pulp mixture through the wire in the dewatering section (3), the apparatus comprising a first wire (1) and a second wire (2), whereby the dewatering section (3) formed between the wires (1 ,2) and water and, with it, impurities are removed through both wires (1, 2), the wires (1, 2) are arranged to run in such a manner that the dewatering section (3) converges from the feed end of the fibre pulp mixture to the outlet end of the dewatering section, and the apparatus comprises a curved surface located after the dewatering section (3), along which both wires (1, 2) and the fibre pulp mixture between them is led to turn to remove any extra water from the fibre pulp by means of pressure caused by the tightness of the wires (1, 2) and the centrifugal force produced by the curving movement,
characterized in that

the dewatering section is made so as to curve towards the inside in such a manner that its cross-profile decreases quicker at the forward end than at the tail end and
the washing can be substantially adjusted by controlling the dewatering in different ways in the longitudinal direction of the apparatus.

11. An apparatus as claimed in claim 10, **characterized in that** the dewatering section (3) is a dewatering chamber closed on the sides, inside which the wires (1, 2) are arranged to run.

12. An apparatus as claimed in claim 10 or 11, **characterized in that** it comprises a separate turbulence element (8) for generating turbulence in the fibre pulp fed into the dewatering section (3).

13. An apparatus as claimed in any one of claims 10 to 12, **characterized in that** said curved surface is a turning roll (5).

14. An apparatus as claimed in any one of claims 10 to 13, **characterized in that** it comprises at least one curved shoe (15, 17) which is located after the dewatering section (3) and along whose surface both wires (1, 2) and the fibre pulp mixture between them is arranged to run.

15. An apparatus as claimed in any one of claims 10 to 14, **characterized in that** it comprises elements (16) for producing pressure pulses in the pulp being washed when the pulp is in the dewatering section (3).

16. An apparatus as claimed in any one of claims 10 to 15, **characterized in that** the wires (1, 2) are of different width so that when the wires (1, 2) and the fibre pulp mixture between them have come out of the dewatering section (3), the fibre pulp outside the narrower wire (1) can be washed off from the surface of the wider wire.

Patentansprüche

1. Verfahren zum Waschen von Faserpulpe, wobei in dem Verfahren Faserpulpe in einer Entwässerungspartie (3) zugeführt wird, und Wasser und mit diesem Asche und / oder andere Verunreinigungen durch ein Sieb entfernt werden, das in der gleichen Richtung wie die Faserpulpe in der Entwässerungspartie läuft,

wobei die Faserpulpe, die gewaschen wird, in die Entwässerungspartie (3) zugeführt wird, die zwischen zwei Sieben (1, 2) ausgebildet ist und wobei die Siebe so eingerichtet sind, dass sie in derartiger Weise laufen, dass die Entwässerungspartie (3) von dem Zuführende zu dem Auslassende konvergiert, wodurch Wasser und mit diesem Verunreinigungen in der Entwässerungspartie (3) durch beide Siebe (1, 2) entfernt werden und

nach der Entwässerungspartie (3) die Siebe (1, 2) und die Pulpe zwischen ihnen so geleitet werden, dass sie entlang einer gekrümmten Fläche in einer derartigen Weise laufen, dass ein Druck, der durch die Dichtheit der Siebe bewirkt wird, und die Zentrifugalkraft, die durch die Krümmungsbewegung erzeugt wird, das Entfernen von jeglichem zusätzlichem Wasser aus der Pulpe bewirken,
wobei die Pulpe, die gewaschen wird, in einer Entwässerungspartie (3) zugeführt wird, in der zumindest eines der Siebe (1, 2) so geleitet wird, dass es in der Entwässerungspartie (3) entlang einer konvexen Laufbahn läuft,

dadurch gekennzeichnet, dass

die Pulpe in der Entwässerungspartie geführt wird, die so gestaltet ist, dass sie sich zu der Innenseite in einer derartigen Weise krümmt, dass ihr Querprofil an dem vorderen Ende schneller abnimmt als an dem Endstückende, und
das Waschen im Wesentlichen eingestellt werden kann, indem das Entwässern in verschiedenen Weisen in der Längsrichtung der Vorrichtung gesteuert wird.

2. Verfahren gemäß Anspruch 1,
gekennzeichnet durch
als die Entwässerungspartie (3) erfolgendes Anwenden einer Entwässerungskammer, die an den Seiten geschlossen ist, wobei im Inneren von ihr die Siebe (1, 2) so eingerichtet sind, dass sie laufen.

3. Verfahren gemäß Anspruch 1 oder 2,
dadurch gekennzeichnet, dass
eine Turbulenz in der Pulpe, die gewaschen wird, bewirkt wird, bevor sie in die Entwässerungspartie (3) zugeführt wird.

4. Verfahren gemäß Anspruch 3,
dadurch gekennzeichnet, dass
die Turbulenz durch ein separates Turbulenzerzeugungselement (8) erzeugt wird.

5. Verfahren gemäß einem der vorherigen Ansprüche,
dadurch gekennzeichnet, dass
die Pulpe, die gewaschen wird, zwischen die Siebe (1, 2) so geleitet wird, dass sie entlang der Oberfläche einer Umkehrwalze (5) herum gelangt, die nach der Entwässerungspartie (3) angeordnet ist.

6. Verfahren gemäß einem der vorherigen Ansprüche,
dadurch gekennzeichnet, dass
die Pulpe, die gewaschen wird, zwischen den Sieben so geleitet wird, dass sie entlang der Oberfläche eines gekrümmten Schuhs (15, 17) herum gelangt, der nach der Entwässerungspartie (3) angeordnet ist.

7. Verfahren gemäß einem der vorherigen Ansprüche,
dadurch gekennzeichnet, dass
Wasser zwischen die gekrümmte Oberfläche und das Sieb zugeführt wird, das entlang dieser läuft, um das Waschen zu verbessern.

8. Verfahren gemäß einem der vorherigen Ansprüche,
dadurch gekennzeichnet, dass
Druckimpulse in der Pulpe, die gewaschen wird, an zumindest einer Seite entlang der Länge der Entwässerungspartie (3) bewirkt werden.

9. Verfahren gemäß Anspruch 8,
dadurch gekennzeichnet, dass
die Druckimpulse durch ein separates Druckimpulselement bewirkt werden, das an der Entwässerungspartie (3) an der Siebseite angeordnet ist, die zu der Pulpe, die gewaschen wird, entgegengesetzt ist.

10. Vorrichtung zum Waschen eines Faserpulpegemisches, wobei die Vorrichtung eine Entwässerungspartie (3) aufweist, die durch ein Sieb begrenzt ist, das sich in Längsrichtung entlang dieser bewegt, und wobei zu dem anderen Ende von ihr das Faserpulpegemisch zugeführt wird und in entsprechender Weise an dem anderen Ende entfernt wird, und wobei Wasser und mit diesem Asche und / oder andere Verunreinigungen aus dem Faserpulpegemisch durch das Sieb in der Entwässerungspartie (3) entfernt werden, wobei die Vorrichtung ein erstes Sieb (1) und ein zweites Sieb (2) aufweist, wobei die Entwässerungspartie (3) zwischen den Sieben (1, 2) ausgebildet ist und Wasser und mit diesem Verunreinigungen durch beide Siebe (1, 2) entfernt werden, wobei die Siebe (1, 2) so eingerichtet sind, dass sie in einer derartigen Weise laufen, dass die Entwässerungspartie (3) von dem Zuführende des Faserpulpegemisches zu dem Auslassende der Entwässerungspartie konvergiert und wobei die Vorrichtung eine gekrümmte Fläche aufweist, die nach der Entwässerungspartie (3) angeordnet ist, entlang der beide Siebe (1, 2) und das Faserpulpegemisch zwischen ihnen so geführt wird, dass sie um diese herum gelangen, um jegliches zusätzliches Wasser aus der Faserpulpe mittels eines Druckes, der durch die Dichtheit der Siebe (1, 2) bewirkt wird, und der Zentrifugalkraft zu entfernen, die durch die Krümmungsbewegung erzeugt wird,
dadurch gekennzeichnet, dass

die Entwässerungspartie so gestaltet ist, dass sie zu der Innenseite hin in einer derartigen Weise gekrümmt ist, dass ihr Querprofil an dem vorderen Ende schneller abnimmt als an dem End-

stückende, und
das Waschen im Wesentlichen eingestellt werden kann, indem das Entwässern in verschiedenen Weisen in der Längsrichtung der Vorrichtung gesteuert wird.

11. Vorrichtung gemäß Anspruch 10, **dadurch gekennzeichnet, dass**

die Entwässerungspartie (3) eine Entwässerungskammer ist, die an den Seiten geschlossen ist, wobei im Inneren von ihr die Siebe (1, 2) so eingerichtet sind, dass sie laufen.

12. Vorrichtung gemäß Anspruch 10 oder 11, **dadurch gekennzeichnet, dass**

sie ein separates Turbulenzelement (8) zum Erzeugen einer Turbulenz in der Faserpulpe, die in die Entwässerungspartie (3) zugeführt wird, aufweist.

13. Vorrichtung gemäß einem der Ansprüche 10 bis 12, **dadurch gekennzeichnet, dass**

die gekrümmte Fläche eine Umkehrwalze (5) ist.

14. Vorrichtung gemäß einem der Ansprüche 10 bis 13, **dadurch gekennzeichnet, dass**

sie zumindest einen gekrümmten Schuh (15, 17) aufweist, der nach der Entwässerungspartie (3) angeordnet ist, und entlang dessen Oberfläche beide Siebe (1, 2) und das Faserpulpegemisch zwischen ihnen so eingerichtet sind, dass sie laufen.

15. Vorrichtung gemäß einem der Ansprüche 10 bis 14, **dadurch gekennzeichnet, dass**

sie Elemente (16) zum Erzeugen von Druckimpulsen in der Pulpe, die gewaschen wird, wenn die Pulpe in der Entwässerungspartie (3) ist, aufweist.

16. Vorrichtung gemäß einem der Ansprüche 10 bis 15, **dadurch gekennzeichnet, dass**

die Siebe (1, 2) eine unterschiedliche Breite derart haben, dass, wenn die Siebe (1, 2) und das Faserpulpegemisch zwischen ihnen aus der Entwässerungspartie (3) heraus gelangen, die Faserpulpe an der Außenseite des schmaleren Siebes (1) von der Oberfläche des breiteren Siebes weg gewaschen werden kann.

Revendications

1. Procédé de lavage d'une pâte à fibres, dans lequel procédé une pâte à fibres est amenée dans une section d'essorage (3) et l'eau et, avec elle, la cendre et/ou d'autres impuretés sont retirées à travers un câble s'étendant dans la même direction que la pâte à fibres dans la section d'essorage,

dans lequel la pâte à fibres lavée est amené dans une section d'essorage (3) formée entre deux câbles (1, 2) et les câbles sont agencés pour s'étendre de manière à ce que la section d'essorage (3) converge de l'extrémité d'alimentation vers l'extrémité de sortie, moyennant quoi l'eau et, avec elle, les impuretés sont retirées dans la section d'essorage (3) à travers les deux câbles (1, 2), et
après la section d'essorage (3), les câbles (1, 2) et la pâte entre eux sont amenés à s'étendre le long d'une surface incurvée de manière à ce que la pression due à l'étroitesse des câbles et la force centrifuge produite par le mouvement incurvé entraînent le retrait de toute eau excédentaire de la pâte,
la pâte lavée est amenée dans une section d'essorage (3) dans laquelle au moins l'un des câbles (1, 2) est amené à s'étendre dans la section d'essorage (3) le long d'un trajet convexe, **caractérisé en ce que**
la pâte est amenée dans la section d'essorage qui est réalisée de manière à s'incurver vers l'intérieur d'une manière telle que son profil transversal diminue plus rapidement à l'extrémité avant qu'à l'extrémité arrière, et
le lavage peut être sensiblement ajusté en commandant l'essorage de différentes manières dans la direction longitudinale du dispositif.

2. Procédé selon la revendication 1, **caractérisé par** l'utilisation en tant que section d'essorage (3) d'une chambre d'essorage fermée sur les côtés, à l'intérieur de laquelle les câbles (1, 2) sont agencés pour s'étendre.

3. Procédé selon la revendication 1 ou 2, **caractérisé en ce qu'**une turbulence est provoquée dans la pâte lavée avant qu'elle ne soit amenée dans la section d'essorage (3).

4. Procédé selon la revendication 3, **caractérisé en ce que** la turbulence est générée par un élément de génération de turbulence (8) séparé.

5. Procédé selon l'une quelconque des revendications précédentes, **caractérisé en ce que** la pâte lavée est amenée entre les câbles (1, 2) pour tourner le long de la surface d'un rouleau tournant (5) situé

après la section d'essorage (3).

6. Procédé selon l'une quelconque des revendications précédentes, **caractérisé en ce que** la pâte lavée est amenée entre les câbles pour tourner le long de la surface d'un sabot incurvé (15, 17) situé après la section d'essorage (3).

7. Procédé selon l'une quelconque des revendications précédentes, **caractérisé en ce que** de l'eau est amenée entre la surface incurvée et le câble s'étendant le long de celle-ci pour améliorer le lavage.

8. Procédé selon l'une quelconque des revendications précédentes, **caractérisé en ce que** des pulsations de pression sont générées dans la pâte lavée au moins d'un côté le long de la longueur de la section d'essorage (3).

9. Procédé selon la revendication 8, **caractérisé en ce que** les pulsations de pression sont générées par un élément séparé pour pulser la pression situé au niveau de la section d'essorage (3) du côté du câble opposé à la pâte lavée.

10. Dispositif de lavage d'un mélange de pâte à fibres, lequel dispositif comprend une section d'essorage (3) qui est limitée par un câble mobile longitudinalement le long de celle-ci et à l'autre extrémité de laquelle le mélange de pâte à fibres est avancé et retiré en correspondance à l'autre extrémité, et l'eau et, avec elle, la cendre et/ou d'autres impuretés sont retirées du mélange de pâte à fibres à travers le câble dans la section d'essorage (3), le dispositif comprenant un premier câble (1) et un deuxième câble (2), moyennant quoi la section d'essorage (3) est formée entre les câbles (1, 2) et l'eau et, avec elle, les impuretés sont retirées à travers les deux câbles (1, 2), les câbles (1, 2) sont agencés pour s'étendre d'une manière telle que la section d'essorage (3) converge de l'extrémité d'alimentation en mélange de pâte à fibres vers l'extrémité de sortie de la section d'essorage, et le dispositif comprend une surface incurvée située après la section d'essorage (3), le long de laquelle les deux câbles (1, 2) et le mélange de pâte à fibres entre eux sont amenés à tourner pour retirer toute eau excédentaire de la pâte à fibres au moyen d'une pression générée par l'étroitesse des câbles (1, 2) et de la force centrifuge produite par le mouvement incurvé,
caractérisé en ce que

la section d'essorage est réalisée de manière à s'incurver vers l'intérieur d'une manière telle que son profil transversal diminue plus rapidement à l'extrémité avant qu'à l'extrémité arrière, et
le lavage peut être sensiblement ajusté en commandant l'essorage de différentes manières dans la direction longitudinale du dispositif.

11. Dispositif selon la revendication 10, **caractérisé en ce que** la section d'essorage (3) est une chambre d'essorage fermée sur les côtés, à l'intérieur de laquelle les câbles (1, 2) sont agencés pour s'étendre.

12. Dispositif selon la revendication 10 ou 11, **caractérisé en ce qu'**il comprend un élément de génération de turbulence (8) séparé pour générer une turbulence dans la pâte à fibres amenée dans la section d'essorage (3).

13. Dispositif selon l'une quelconque des revendications 10 à 12, **caractérisé en ce que** ladite surface incurvée est un rouleau tournant (5).

14. Dispositif selon l'une quelconque des revendications 10 à 13, **caractérisé en ce qu'**il comprend au moins un sabot incurvé (15, 17) qui est situé après la section d'essorage (3) et le long de la surface duquel les deux câbles (1, 2) et le mélange de pâte à fibres entre eux sont agencés pour s'étendre.

15. Dispositif selon l'une quelconque des revendications 10 à 14, **caractérisé en ce qu'**il comprend des éléments (16) pour produire des pulsations de pression dans la pâte lavée lorsque la pâte est dans la section d'essorage (3).

16. Dispositif selon l'une quelconque des revendications 10 à 15, **caractérisé en ce que** les câbles (1, 2) sont de différente largeur de sorte que, lorsque les câbles (1, 2) et le mélange de pâte à fibres entre eux sont sortis de la section d'essorage (3), la pâte à fibres à l'extérieur du câble plus étroit (1) peut être enlevée de la surface du câble plus large.

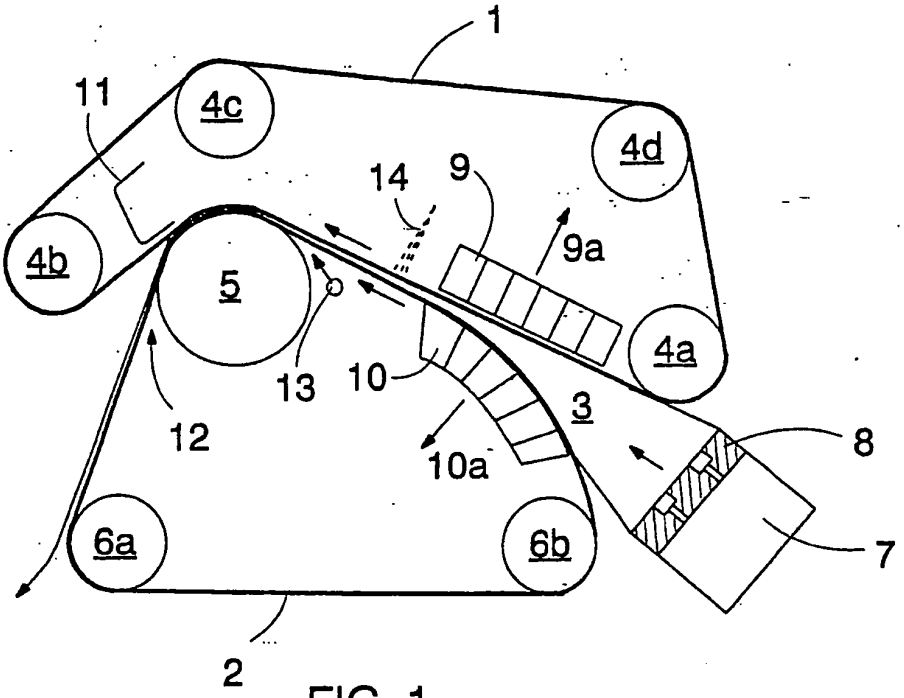

FIG. 1

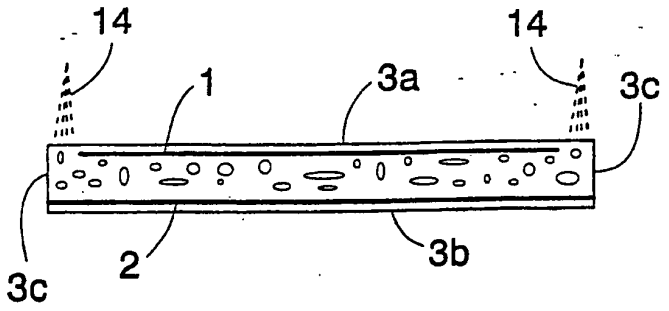

FIG. 2a

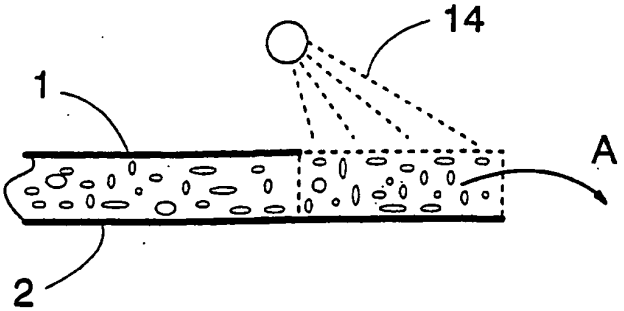

FIG. 2b

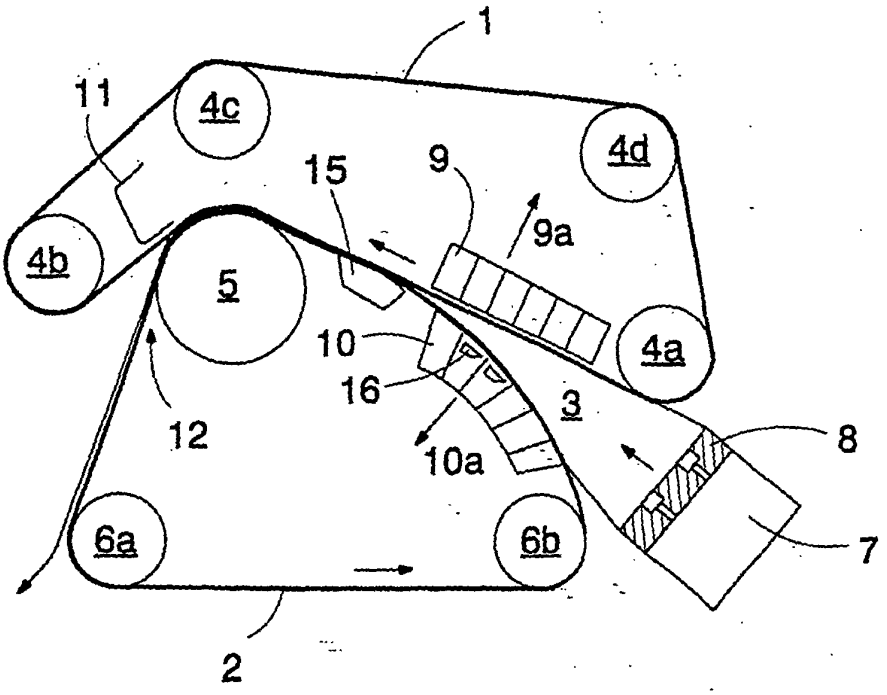
1
11
4c
4d
15
9
9a
4b
5
10
4a
16
3
8
12
10a
6a
6b
7
2

FIG. 3

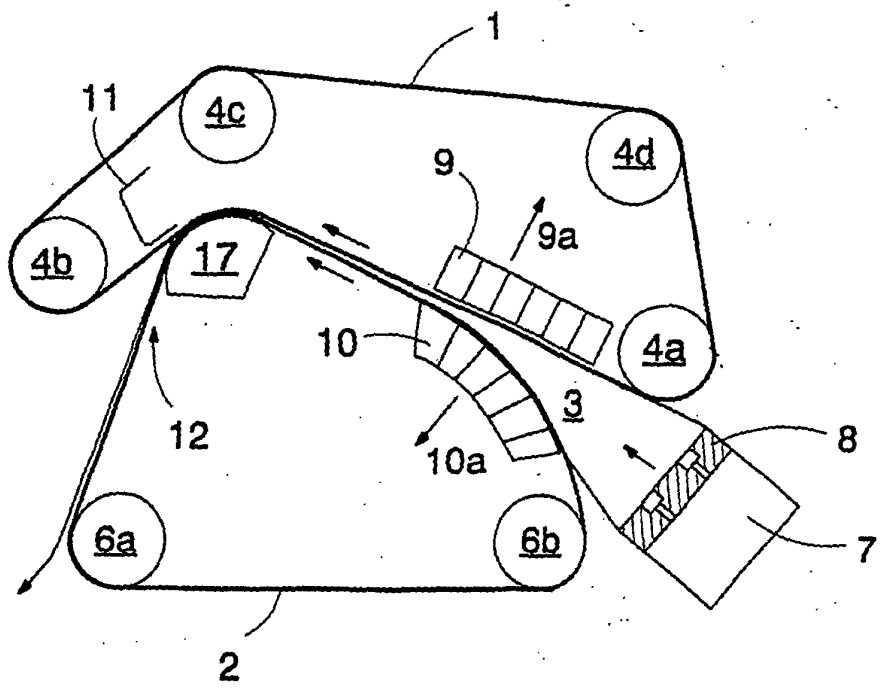
1
11
4c
4d
9
9a
4b
17
10
4a
3
8
12
10a
6a
6b
7
2

FIG. 4

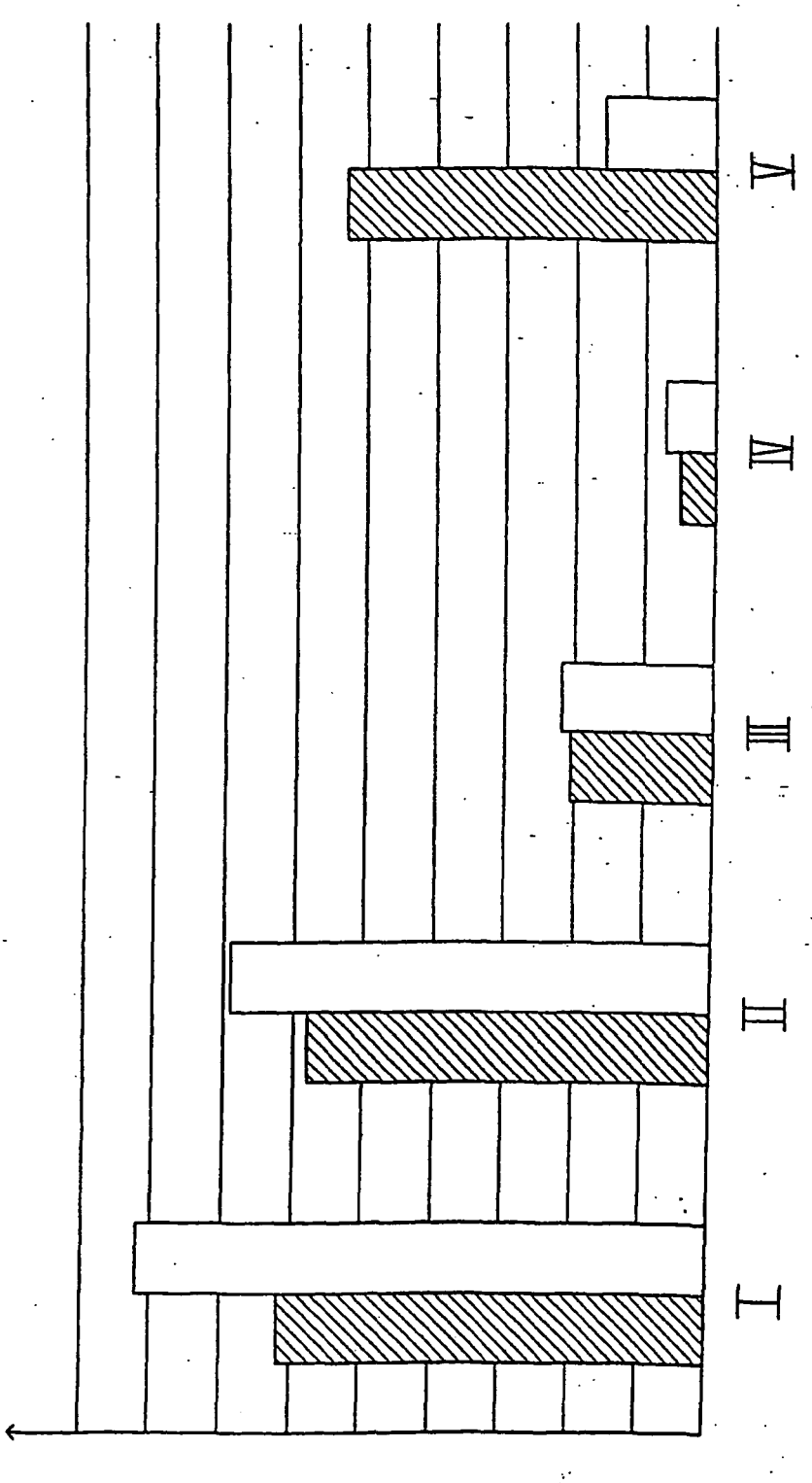

FIG. 5

REFERENCES CITED IN THE DESCRIPTION

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