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(54) LIQUID DISTRIBUTOR FOR A WASHING APPARATUS

FLÜSSIGKEITSVERTEILER FÜR EINE WASCHMASCHINE

DISTRIBUTEUR DE LIQUIDE POUR UN APPAREIL DE LAVAGE

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(56) References cited:
WO-A1-2007/073310 JP-A- H08 229 439
SE-B- 448 524 SE-B- 448 524
US-A- 4 697 292 US-A- 4 951 879
US-A- 5 183 536 US-A1- 2002 179 745

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Description

TECHNICAL FIELD

[0001] The invention relates to a liquid distributor for a washing apparatus according to the preamble of claim 1 and to a washing apparatus according to the preamble of claim 14.

BACKGROUND

[0002] Pulp washing is a key operation in the pulping line. There are many different types of washing apparatuses available, some of which are based on press washing and comprise means for pressing the pulp to remove liquid. After pressing, the pulp can, if suitable, be diluted to a desired consistency.

[0003] A well-known washing machine is a twin-roll press of the general type disclosed in US 3,980,518, for example. It has two counter-rotating rolls with perforated outer surfaces. A web of pulp is formed on the respective rolls and is transported in the direction of rotation in a vat partially surrounding the rolls, to the so-called press nip between the rolls. The liquid removed from the pulp, i.e. the filtrate, passes through the perforated roll surface in a radial inwards direction and is, by means of axial filtrate channels, led to the ends of the press roll, where it is output. Washing liquid or other treatment liquid may be supplied to the pulp web through inlets in the vat.

[0004] Another known washing equipment is a drum washer, as in e.g. US 5,046,338 or SE 502815, where the cellulose-containing pulp is deposited and dewatered on a single rotating filter drum with a permeable outer surface, after the addition of washing liquid, which displaces the liquid remaining on the pulp web after the preceding process step, for example a cooking step or bleaching step. The static pressure causes the contaminated liquid, called filtrate, to pass through the outer surface permeable to liquid. A further development of the original drum washer is the pressurized displacement washer, where the filtrate, under overpressure, is forced to pass through the permeable outer surface. In these examples washing liquid is fed through a nozzle and is then output through a slot in a baffle.

[0005] A problem with directing the washing liquid perpendicular to the pulp web is that it passes right through the pulp web with high velocity and with the smallest possible contact route with the fibres. This gives longitudinal tracks in the fibre web and the washing is ineffective, since the washing liquid is mixed with the filtrate.

[0006] In SE 448524 a liquid distributor is shown with an output perpendicular to the input and where the output channel is enlarging towards the output. The purpose is to slow down the washing liquid, by having a conical nozzle. Since the cross section area is continuously increasing towards the outlet, the washing liquid will slow down. A problem is that a cone needs to be long in order to have effect and thus takes a lot of place and will thus not

be efficient enough for this purpose.

[0007] The inlet to the conical nozzle is tangential to the cone which redirects the flow. The cross section area right after the flow redirection is the same as before the flow redirection and the flow redirection will therefore not in itself cause any decrease in velocity. Instead, the purpose to cause whirls.

SUMMARY

[0008] An object of the invention is to provide an improved liquid distributor for an apparatus for washing and/or dewatering of cellulose pulp. This object is achieved in accordance with the appended claims.

[0009] The invention builds on the insight that a tangential inlet to a nozzle or other liquid distributor where the incoming washing liquid is redirected by a flow redirecting wall, does not slow down the washing liquid, unless also the cross section area in the channel after the flow redirecting wall is everywhere larger than before the flow redirecting wall. Otherwise the only effect is to cause whirls, which will have a limited effect to improve the washing.

[0010] The invention also teaches to further reduce the energy and momentum of the washing liquid by slowing it down by means of a second flow redirecting wall. The cross section area in the channel after the second flow redirecting wall is everywhere larger than before the second flow redirecting wall. According to a particular advantageous embodiment the liquid distributor is arranged such that a part of the flow hits the second flow redirecting wall, whereas another part goes above.

[0011] An advantage is that the washing liquid can be provided with a high pressure, which makes the distribution to a number of nozzles or other liquid distributors easier, without having to have a separate valve to each nozzle. At the same time the velocity of the washing liquid will not be too high when it meets the pulp. This causes the washing liquid to make a layer on the outside of the pulp, instead of going right through the pulp at isolated points. This also minimises mixing of the filtrate pressed from the pulp, which is not desired. The washing liquid is both calmed down and spread, which makes the washing of the pulp more effective. Since the solution is compact it does not take much place.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] The invention, together with further objects and advantages thereof, may best be understood by reference to the following description and appended drawings, in which:

Fig. 1 is a schematic cross-sectional view illustrating a washing/dewatering apparatus with a liquid distributor according to the invention.

Fig. 2 is a schematic cross-sectional view of a first embodiment of a liquid distributor according to the

invention.

Fig. 3 is a schematic cross-sectional view of a second embodiment of a liquid distributor according to the invention.

Fig. 4 is a schematic cross-sectional view of a third embodiment of a liquid distributor according to the invention.

Fig. 5a, b is a schematic cross-sectional view and a side view of a fourth embodiment of a liquid distributor according to the invention.

Fig. 6a, b, c is a schematic cross-sectional view of a fifth embodiment of a liquid distributor according to the invention with variants.

Fig. 7 is a schematic cross-sectional view of a sixth embodiment of a liquid distributor according to the invention.

Fig. 8 is a schematic cross-sectional view of a seventh embodiment of a liquid distributor according to the invention.

DETAILED DESCRIPTION

[0013] In the drawings, similar or corresponding elements are denoted by the same reference numbers.

[0014] In this disclosure, a *channel* refers to a space where the washing liquid flows in the liquid distributor, when the apparatus for washing cellulose pulp is in operation.

[0015] Fig. 1 illustrates an example apparatus 100 for washing of cellulose pulp. A twin roll press 100 comprising two co-operating cylindrical press rolls/drums 2 is shown. The press rolls 2 are arranged to rotate in opposite directions R, R' during operation and each has a permeable outer surface 4, such as a perforated metal sheet. The press rolls 2 are partially enclosed by a vat 5 comprising a vat wall 5 and a vat chamber 8, which vat 5 is arranged at a distance from the permeable outer surfaces 4 so as to partially enclose the press rolls 2 in the circumferential direction.

[0016] During operation, pulp enters a pulp distribution device 1 of the respective press roll 2. The input consistency of the pulp is typically in the range of 2-13%. A pulp web is formed on the permeable roll surface 4. The pulp web is transported, guided by the vat 5, in the direction of rotation R, R' to be pressed in a nip 3 where the distance between the press rolls 2 is smallest. The press rolls 2 comprise axial filtrate channels 6, which receive filtrate from the pulp web. The filtrate passes through the permeable roll surface 4 and is transported towards the ends of the press rolls 2, where it is output. Washing liquid is supplied to the pulp web in the vat chamber 8 through liquid distributors 10. The pulp is output by means of a discharge screw 7.

[0017] In Fig. 2 a liquid distributor 10 is shown for the supply of washing liquid, according to a first embodiment of the invention. The liquid distributor 10 comprises an inlet 12, an outlet 13, a first flow redirecting wall 14 that redirects the liquid, a second flow redirecting wall 15 after

the first flow redirecting wall 14, and a channel 11 with a first channel section 11a, a second channel section 11b and a third channel section 11c. In this example, the second channel section 11b is also the penultimate channel section 11b and the third channel section 11c is also the last channel section 11c.

[0018] The first channel section 11a has a first channel cross section area A1 and is placed between the inlet 12 and the first flow redirecting wall 14. The second channel section 11b has a second channel cross section area $A_{21}+A_{22}$, which is larger than the first channel cross section area A1, and is placed between the first flow redirecting wall 14 and the outlet 13. More specifically, the second channel section 11b is placed between the first flow redirecting wall 14 and the second flow redirecting wall 15. The third channel section 11c has a third channel cross section area A3, A3', which is larger than the second channel cross section area $A_{21}+A_{22}$, and is placed between the second flow redirecting wall 15 and the outlet 13.

[0019] In this embodiment the second and penultimate channel section 11b is divided into two parallel penultimate subchannels after the first flow redirecting wall 14, which penultimate subchannels have the second channel cross section areas A21 and A22. Thus, the penultimate channel section 11 has a total second channel cross section area $A_{21} + A_{22}$.

[0020] Of course, also other areas than the second channel cross section area may be divided into a number of areas in a similar way. In each case it is the total flow area that counts. There are, however, special advantages with having subchannels in the penultimate channel section 11b, since this improves the spreading of the liquid onto the pulp web. It may sometimes be appropriate to have more than two penultimate subchannels in the penultimate channel section 11b, e.g. four subchannels, because the more subchannels the less it matters how the subchannel are directed, when the nozzle 20 is mounted. It is, however, of course also possible in this embodiment to have a second channel section 11b, which is not divided into subchannels.

[0021] The second channel cross section area $A_{21}+A_{22}$ in the second channel section 11b is everywhere larger than the first channel cross section area A1 in the first channel section 11a. In Fig. 2 the second channel cross section area is constant from the first flow redirecting wall 14 to the outlet of the nozzle 20. The second channel cross section area is, according to an alternative embodiment (not shown), continuously increasing. The second channel cross section area may also be partly constant and partly increasing. The second channel cross section area is, however, preferably not decreasing, since that would again increase the velocity.

[0022] The inlet 12 receives the liquid in a first direction v1 at a first velocity v1 with a first pressure P1 in the first channel section 11a. The first flow redirecting wall 14 redirects the liquid in a second direction v2 at a second velocity v2 with a second pressure P2 in the second chan-

nel section 11b. The second flow redirecting wall 15 re-directs the liquid in a third direction v_3 at a third velocity v_3 with a third pressure P_3 . Since the second channel cross section area $A_{21} + A_{22}$ after the first flow redirecting wall 14 is larger than the first channel cross section area A_1 before the first flow redirecting wall 14, the second velocity v_2 will be lower than the first velocity v_1 . Correspondingly, the third velocity v_3 will be lower than the second velocity v_2 . By reducing the velocity of the washing liquid, its momentum is reduced, resulting in an improved spreading.

[0023] The combination of having a flow redirecting wall and an area increase makes it possible to have a high pressure on the washing liquid from the start, so that it spreads well to all the liquid distributors. The liquid distributors will then both spread the washing liquid and calm it down. This means that the washing liquid will be applied on one side of the pulp web and does not mix unnecessarily with the filtrate, which gives a more efficient washing.

[0024] The second flow redirecting wall 15 results in an even more improved spreading of the washing liquid as compared to cases with only the first redirecting wall 14. The momentum of the liquid hitting two redirecting walls is considerably reduced, i.e. the washing liquid is calmed down. The washing liquid forms a layer on the outside of the pulp, instead of going right through the pulp at isolated points.

[0025] Laboratory studies with colored washing liquid show that a surprisingly good washing result is achieved when one portion of the flow is redirected by the second flow redirection wall 15 and another portion of the flow goes above the second flow redirecting wall 15. The latter will not have its velocity reduced due to contact with the second flow redirecting wall 15, but forms an inclined jet spreading the washing liquid over a larger area. This flow portion has a small vertical force component, which means that it does not go straight through the pulp but forms a layer on the outside of the pulp. Hence, the combination of one subflow hitting the wall and another subflow shooting above provides excellent application of the washing liquid which forms a wide-spread layer propagating through the pulp.

[0026] Thus, according to a preferred embodiment, the liquid distributor 10 is arranged such that a first part of the flow of liquid is redirected by the second flow redirecting wall 15, whereas a second part of the flow of liquid goes above the second flow redirecting wall 15 and directly into the vat chamber 8. Referring to Fig. 2, this may be achieved by arranging the nozzle 20 of the liquid distributor 10 at appropriate height and appropriate distance to the second flow redirecting wall 15. Preferably the nozzle 20 (or corresponding part of the liquid distributor 10) is essentially in line with the surface of the vat wall 5 facing the vat chamber 8 (as illustrated in Fig. 4). The advantageous combination of one subflow being redirected a second time and another subflow shooting directly into the vat chamber 8 is then achieved while dis-

turbing the pulp as little as possible, since the liquid distributor 10 essentially does not extend from the vat wall 5.

[0027] The third channel cross section area A_3 , A_3' in the third channel section 11c is everywhere larger than the second channel cross section area $A_{21} + A_{22}$ in the second channel section 11b. In Fig. 2 the third cross section area A_3 , A_3' comprises two parts with different constant areas A_3 , A_3' from the second flow redirecting wall 15 to the outlet 13, since the nozzle 20 does not go all the way to the surface of the vat wall 5. But the third cross section area A_3 , A_3' may of course also be constant all the way or be continuously increasing (e.g. in two parts as in Fig. 3) from the second flow redirecting wall 15 to the outlet 13 or be partly constant and partly increasing from the second flow redirecting wall 15 to the outlet 13. The third cross section area A_3 , A_3' is, however, preferably not decreasing from the second flow redirecting wall 15 to the outlet 13, since that would again increase the velocity and the pressure.

[0028] Preferably, the third cross section area A_3 is at least twice the second cross section area $A_{21} + A_{22}$. Preferably, also the second cross section area $A_{21} + A_{22}$ is at least twice the first cross section area A_1 .

[0029] In the embodiment in Fig. 2, the liquid distributor 10 comprises a nozzle 20 which comprises the first channel section 11a, the second channel section 11b, the inlet 12 and the first flow redirecting wall 14. The third channel section 11c and the second flow redirecting wall 15 are provided in the vat wall 5. This solution makes it possible to exchange prior art nozzles having only a straight inlet with the new improved nozzle 20. An alternative is that the complete liquid distributor 10 is a nozzle 20. Any combination of what is made in the vat wall 5 and/or a nozzle 20 is possible. This applies to all embodiments. However, the first flow redirecting wall 14 will wear more than any subsequent flow redirecting walls, since the liquid meets the first flow redirecting wall 14 with higher velocity than any subsequent flow redirecting walls. Therefore a cheap solution is to have the first flow redirecting wall 14 in a wear part that is easily replaceable.

[0030] In Fig. 2 the liquid distributor 10 has an outlet 13, which is perpendicular to the vat wall 5. This is preferable, because the washing liquid will be distributed better in that way. Embodiments which instead has an outlet which is essentially parallel to the vat wall 5 are also possible. Also the following embodiments may be arranged with an outlet essentially parallel to the wall or at any angle there between.

[0031] Fig. 4 shows a liquid distributor which has a cut-off portion 17 (or cavity) in the area around the second channel section 11b outlet. The cut-off portion 17 results in a comparatively wide plume of washing liquid and an improved spreading of the washing liquid. A larger portion of the flow will go above the second flow redirecting wall 15.

[0032] The cut-off portion 17 of Fig. 4 has a circular shape. This provides for efficient spreading of the liquid both in the vertical and the horizontal plane. The latter

means that, seen from above, the nozzle 20 of Fig. 4 spreads the liquid over a larger sector than, for example, the nozzle of Fig. 2. This reduces or eliminates the need for special means for arranging the nozzle 20 in the correct orientation.

[0033] Other shapes than circular are of course possible, for example elliptical cut off portions, cut off portions with straight edges, etc.

[0034] An advantage of having two subchannels in the second (or penultimate) channel section 11b, like in the embodiments of Fig. 2, 3, 4, 7, is that the cross section area of each subchannel can be larger than as compared with, for example, the embodiment with four subchannels. A larger cross section area means more widely spread washing liquid.

[0035] Thus, a preferred embodiment has two subchannels in the penultimate channel section 11b and the cross section area of each subchannel is, at the outlet portion, large enough to obtain an oblique jet of washing liquid. The liquid distributor 10 may have a cut-off portion at each subchannels, such as in Fig. 4, to further improve the spreading of the washing liquid.

[0036] Another advantage of having two penultimate subchannels is that there is less risk of plugging as compared to the case with a larger number of subchannels, e.g. four penultimate subchannels. With a plurality of subchannels, there may sometimes be plunging in the area where different subchannels meet, in particular when the washing liquid contains a high amount of cellulose fiber.

[0037] Fig. 5a, b illustrate another advantageous liquid distributor 10 in accordance with the invention. (Fig. 5b being a side view, turned 90 degrees as compared to Fig. 5a.) The channel 11 comprises a first channel section 11a, a second channel section 11b', and a third channel section 11c. The first channel section 11a has a first channel wall 16a and is placed between the inlet 12 and the first flow redirecting wall 14. The second channel section 11b' has a second channel wall 16b and is placed between the first flow redirecting wall 14 and the outlet 13. The second channel wall 16b interconnects the flow redirecting wall 14 and the first channel wall 16a. The second channel section 11b' is an open channel section which is everywhere wider than the first channel section 11a. The third channel section 11c is placed between the second flow redirecting wall 15 and the outlet 13 and is everywhere wider than the second channel section 11b'.

[0038] The second channel section 11b' provides a less restricted flow space than the first channel section 11a, such that the velocity v_2 of the liquid after the first flow redirecting wall 14 is smaller than the velocity v_1 of the liquid before the first flow redirecting wall 14.

[0039] The embodiment of Fig. 5 results in a wide plume of washing liquid both as seen from above and from the side. Due to the open second channel section 11b', there is also a minimum risk of plugging.

[0040] The second channel wall 16b is preferably arranged such that a flow space covering a sector of about

180 degrees is provided in the second channel section 11b' (as seen from above, i.e. in a horizontal plane in the drawings).

[0041] In the illustrated example of Fig. 5, the first channel section 11a is a cylindrical space defined by the first channel wall 16a and the second channel wall 16b is curved, e.g. shaped as half a cylinder. Other shapes are possible.

[0042] In Fig. 6a-c is shown a liquid distributor 10 with another way of spreading out the washing liquid on the pulp web. The same nozzle 20 as in Figs. 2 and 3 is used, but as an example having four penultimate subchannels in the second and penultimate channel section 11b in each nozzle 20. The number of penultimate subchannels may of course be any number also in this embodiment.

[0043] The liquid distributor 10 is here arranged to comprise a number of nozzles 20. For simplicity, Fig. 6b and c only shows three nozzles 20, but preferably there are nozzles 20 all the way along the press rolls 2 in Fig. 1 in a direction perpendicular to the view in Fig. 1. This may be seen as one large liquid distributor 10, where both the first channel section 11a and the penultimate channel section 11b are divided into subchannels. The total cross section area of the first channel section 11a then becomes $A_{11} + A_{12} + A_{13}$.

[0044] This means that the third and last channel section 11c becomes very large, which both slows down the washing liquid considerably and spreads the washing liquid in a large area. This may be further improved with an increasing third channel cross section area as in Fig. 3.

[0045] There may, however, still be flow concentrations of liquid in the case where the penultimate channel sections 11b from different nozzles face each other like in Fig. 6b. When the flows from two different nozzles 20 meet, there will be a concentrated flow upwards towards the pulp web. This is more pronounced the fewer the penultimate subchannels are in each nozzle 20. A similar flow concentration will occur where the distance from the outlet of the penultimate channel section 11b is close to the second flow redirecting wall 15. Said flow concentrations are, however, not the fraction as hard as what is known in prior art and most of the liquid will still be put in a layer of the pulp web, without going right through the pulp web in concentrated beams as in prior art.

[0046] But the spreading out of the liquid onto the pulp web may be improved by mounting the nozzles 20 so that the penultimate channel sections 11b from different nozzles 20 does not face each other, see Fig. 6c.

[0047] In Fig. 6c is also shown that the last channel section 11c may have enlarged end parts 21 in order to increase the distance from the outlet of the penultimate channel section 11b to the second flow redirecting wall 15.

[0048] In Fig. 7 is shown an embodiment with a single nozzle 20 having a penultimate channel section 11b with two penultimate subchannels pointing towards two enlarged end parts 21.

[0049] Fig. 8 illustrates another embodiment, which

like Fig. 7 has a single nozzle 20 arranged to output washing liquid into a large third (and last) channel section 11c. The nozzle 20 comprises a second channel section 11b without subchannels and the washing liquid is output in a direction towards the center of the third channel section 11c. In the third channel section 11c, the washing liquid slows down and spreads over a large area, whereby practically the entire third channel section 11c is filled with washing liquid from the nozzle 20. Means to arrange the nozzle 20 in the correct orientation in the third channel section 11c should preferably be provided.

[0050] The embodiments disclose two flow redirecting walls and redirections with accompanying area increases, but three or more flow redirecting walls and redirections with accompanying area increases are also possible and are especially very good in case of large velocity decreases, which otherwise would be very space consuming. If there for example are four channel sections, then the fourth channel section will be the last channel section and the third channel section will be the penultimate channel section. This applies in a corresponding way also when there are even more channel sections.

[0051] A further advantage, particularly with the embodiment in Fig. 6a-c, is that larger and/or fewer nozzles may be used than in prior art, which makes a cheaper solution.

[0052] In Fig. 2-8 the liquid distributor 10 is arranged in the vat wall 5, without extending into the vat chamber 8. This is preferable in order to decrease the mixing of the washing liquid with the filtrate and to decrease the disturbance of the pulp web transportation.

[0053] The cross section of the subchannels in the liquid distributor channel 11 may with advantage be circular. The invention is of course not restricted to the shown embodiments, but may be varied within the scope of the claims.

Claims

1. A liquid distributor (10) for an apparatus (100) for washing of cellulose pulp, where pulp is arranged to be transported in a vat (5) comprising a vat wall (5) and a vat chamber (8), said liquid distributor (10) comprising an inlet (12) arranged to receive liquid in a first direction (v1), a first flow redirecting wall (14) arranged to redirect the liquid in a second direction (v2), an outlet (13) arranged to output the liquid into the vat chamber (8), and a channel (11) with a first channel section (11a), which first channel section (11a) has a first channel cross section area (A1, A11+A12+A13) and is placed between the inlet (12) and the first flow redirecting wall (14), and with a second channel section (11b), which second channel section (11b) has a second channel cross section area (A21+A22) and is placed between the first flow redirecting wall (14) and the outlet (13), **characterized in that** the second channel cross section area (A21+A22) is everywhere larger than the first channel cross section area (A1, A11+A12+A13); **in that** the liquid distributor (10) further comprises a second flow redirecting wall (15) after the first flow redirecting wall (14); **in that** the channel (11) comprises a third channel section (11c) with a third channel cross section area (A3, A3') being placed between the second flow redirecting wall (15) and the outlet (13); **in that** the second flow redirecting wall (15) is arranged to redirect the liquid in a third direction (v3); and **in that** the third channel cross section area (A3, A3') is everywhere larger than the second channel cross section area (A21+A22).
2. A liquid distributor (10) according to claim 1, **characterized in that** the second channel cross section area (A21+A22) is constant and/or increasing, but not decreasing from the first flow redirecting wall (14) to the outlet (13).
3. A liquid distributor (10) according to claim 1 or 2, **characterized in that** the third channel cross section area (A3, A3') is constant and/or increasing, but not decreasing, from the second flow redirecting wall (15) to the outlet (13).
4. A liquid distributor (10) according to any of the claims 1-3, **characterized in that** the liquid distributor (10) is arrangeable in the vat wall (5), without extending into the vat chamber (8).
5. A liquid distributor according to any of the claims 1-4, **characterized by** being arrangeable such that a first part of the flow of liquid is redirected by the second flow redirecting wall (15), whereas a second part of the flow of liquid goes above the second flow redirecting wall (15) and directly into the vat chamber (8).
6. A liquid distributor according to any of the claims 1-5, **characterized by** a cut-off portion (17) in the outlet area of a penultimate channel section (11).
7. A liquid distributor according to any of the claims 1-6, **characterized in that** a section (11a, 11b, 11c) of the channel (11) is divided into parallel subchannels.
8. A liquid distributor according to claim 7, **characterized in that** a penultimate channel section (11b) is divided into parallel penultimate subchannels, which different penultimate channel sections are not facing each other.
9. A liquid distributor according to any of the claims 1-8, **characterized in that** the inlet (12), the first flow redirecting wall (14), the first channel section (11a) and the second channel section (11b) are arranged in a nozzle (20).

10. A liquid distributor according to claim 9, **characterized in that** the liquid distributor (10) comprises a number of nozzles (20) arranged in a common last channel section (11c).
11. A liquid distributor according to claim 10, **characterized in that** the common last channel section (11c) comprises at least one enlarged end part (21).

Patentansprüche

1. Flüssigkeitsverteiler (10) für eine Vorrichtung (100) zum Waschen von Cellulosepulpe, wobei Pulpe zum Transport in einem Behältnis (5) angeordnet ist, umfassend eine Behältniswand (5) und eine Behältniskammer (8), wobei der Flüssigkeitsverteiler (10) einen Einlass (12) umfasst, der zur Aufnahme von Flüssigkeit in einer ersten Richtung (v1) angeordnet ist, eine erste stromablenkende Wand (14), die zur Ablenkung der Flüssigkeit in eine zweite Richtung (v2) angeordnet ist, einen Auslass (13), der zum Ausstoss der Flüssigkeit in die Behältniskammer (8) angeordnet ist, und einen Kanal (11) mit einem ersten Kanalabschnitt (11a), welcher erste Kanalabschnitt (11a) einen ersten Kanalquerschnittsbereich (A1, A11+A12+A13) aufweist und zwischen dem Einlass (12) und der ersten stromablenkenden Wand (14) angeordnet ist, und mit einem zweiten Kanalabschnitt (11b), welcher zweite Kanalabschnitt (11b) einen zweiten Kanalquerschnittsbereich (A21+A22) aufweist und zwischen der ersten stromablenkenden Wand (14) und dem Auslass (13) angeordnet ist, **dadurch gekennzeichnet, dass** der zweite Kanalquerschnittsbereich (A21+A22) überall größer ist als der erste Kanalquerschnittsbereich (A1, A11+A12+A13); dass der Flüssigkeitsverteiler (10) weiters eine zweite stromablenkende Wand (15) nach der ersten stromablenkenden Wand (14) umfasst; dass der Kanal (11) einen dritten Kanalabschnitt (11c) mit einem dritten Kanalquerschnittsbereich (A3, A3') umfasst, der zwischen der zweiten stromablenkenden Wand (15) und dem Auslass (13) angeordnet ist; dass die zweite stromablenkende Wand (15) zur Ablenkung der Flüssigkeit in eine dritte Richtung (v3) angeordnet ist; und dass der dritte Kanalquerschnittsbereich (A3, A3') überall größer ist als der zweite Kanalquerschnittsbereich (A21+A22).
2. Flüssigkeitsverteiler (10) nach Anspruch 1, **dadurch gekennzeichnet, dass** der zweite Kanalquerschnittsbereich (A21+A22) konstant ist und/oder zunimmt, aber nicht abnimmt von der ersten stromablenkenden Wand (14) bis zum Auslass (13).
3. Flüssigkeitsverteiler (10) nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** der dritte Kanalquerschnittsbereich (A3, A3') konstant ist und/oder

zunimmt, aber nicht abnimmt von der zweiten stromablenkenden Wand (15) bis zum Auslass (13).

4. Flüssigkeitsverteiler (10) nach einem der Ansprüche 1 bis 3, **dadurch gekennzeichnet, dass** der Flüssigkeitsverteiler (10) in der Behältniswand (5) anordbar ist, ohne sich in die Behältniskammer (8) zu erstrecken.
5. Flüssigkeitsverteiler nach einem der Ansprüche 1 bis 4, **gekennzeichnet dadurch, dass** er anordbar ist, so dass ein erster Teil des Flüssigkeitsstroms durch die zweite stromablenkende Wand (15) abgelenkt wird, wogegen ein zweiter Teil des Flüssigkeitsstroms über die zweite stromablenkende Wand (15) und direkt in die Behältniskammer (8) verläuft.
6. Flüssigkeitsverteiler nach einem der Ansprüche 1 bis 5, **gekennzeichnet durch** einen abgeschnittenen Abschnitt (17) im Auslassbereich eines vorletzten Kanalabschnitts (11b).
7. Flüssigkeitsverteiler nach einem der Ansprüche 1 bis 6, **dadurch gekennzeichnet, dass** ein Abschnitt (11a, 11b, 11c) des Kanals (11) in parallele Subkanäle unterteilt ist.
8. Flüssigkeitsverteiler nach Anspruch 7, **dadurch gekennzeichnet, dass** ein vorletzter Kanalabschnitt (11b) in parallele vorletzte Subkanäle unterteilt ist, welche verschiedenen vorletzten Kanalabschnitte einander nicht zugewandt sind.
9. Flüssigkeitsverteiler nach einem der Ansprüche 1 bis 8, **dadurch gekennzeichnet, dass** der Einlass (12), die erste stromablenkende Wand (14), der erste Kanalabschnitt (11a) und der zweite Kanalabschnitt (11b) in einer Düse (20) angeordnet sind.
10. Flüssigkeitsverteiler nach Anspruch 9, **dadurch gekennzeichnet, dass** der Flüssigkeitsverteiler (10) eine Anzahl von Düsen (20) umfasst, die in einem gemeinsamen letzten Kanalabschnitt (11c) angeordnet sind.
11. Flüssigkeitsverteiler nach Anspruch 10, **dadurch gekennzeichnet, dass** der gemeinsame letzte Kanalabschnitt (11c) mindestens einen vergrößerten Endteil (21) umfasst.

Revendications

1. Distributeur de liquide (10) pour un appareil (100) de lavage de pâte de cellulose, où la pâte est agencée pour être transportée dans une cuve (5) comprenant une paroi de cuve (5) et une chambre de cuve (8), ledit distributeur de liquide (10) comprenant un ori-

- fice d'entrée (12) agencé pour recevoir un liquide dans une première direction (v1), une première paroi de redirection d'écoulement (14) agencée pour rediriger le liquide dans une deuxième direction (v2), un orifice de sortie (13) agencé pour fournir en sortie le liquide dans la chambre de cuve (8), et un canal (11) avec une première section de canal (11a), laquelle première section de canal (11a) a une première aire en coupe de canal (A1, A11 + A12 + A13) et est placée entre l'orifice d'entrée (12) et la première paroi de redirection d'écoulement (14), et avec une deuxième section de canal (11b), laquelle deuxième section de canal (11b) a une deuxième aire en coupe de canal (A21 + A22) et est placée entre la première paroi de redirection d'écoulement (14) et l'orifice de sortie (13), **caractérisé en ce que** la deuxième aire en coupe de canal (A21 + A22) est partout plus grande que la première aire en coupe de canal (A1, A11 + A12 + A13) ; **en ce que** le distributeur de liquide (10) comprend en outre une seconde paroi de redirection d'écoulement (15) après la première paroi de redirection d'écoulement (14) ; **en ce que** le canal (11) comprend une troisième section de canal (11c) avec une troisième aire en coupe de canal (A3, A3') placée entre la seconde paroi de redirection d'écoulement (15) et l'orifice de sortie (13) ; **en ce que** la seconde paroi de redirection d'écoulement (15) est agencée pour rediriger le liquide dans une troisième direction (v3) ; et **en ce que** la troisième aire en coupe de canal (A3, A3') est partout plus grande que la deuxième aire en coupe de canal (A21 + A22).
2. Distributeur de liquide (10) selon la revendication 1, **caractérisé en ce que** la deuxième aire en coupe de canal (A21 + A22) est constante et/ou croissante, mais non décroissante de la première paroi de redirection d'écoulement (14) à l'orifice de sortie (13).
 3. Distributeur de liquide (10) selon la revendication 1 ou 2, **caractérisé en ce que** la troisième aire en coupe de canal (A3, A3') est constante et/ou croissante, mais non décroissante, de la seconde paroi de redirection d'écoulement (15) à l'orifice de sortie (13).
 4. Distributeur de liquide (10) selon l'une quelconque des revendications 1 à 3, **caractérisé en ce que** le distributeur de liquide (10) peut être agencé dans la paroi de cuve (5), sans s'étendre dans la chambre de cuve (8).
 5. Distributeur de liquide selon l'une quelconque des revendications 1 à 4, **caractérisé en ce qu'il** peut être agencé de sorte qu'une première partie de l'écoulement de liquide soit redirigée par la seconde paroi de redirection d'écoulement (15), tandis qu'une seconde partie de l'écoulement de liquide passe au-dessus de la seconde paroi de redirection d'écoulement (15) et directement dans la chambre de cuve (8).
 6. Distributeur de liquide selon l'une quelconque des revendications 1 à 5, **caractérisé par** une portion de découpe (17) dans la zone d'orifice de sortie d'une pénultième section de canal (11b).
 7. Distributeur de liquide selon l'une quelconque des revendications 1 à 6, **caractérisé en ce qu'une** section (11a, 11b, 11c) du canal (11) est divisée en sous-canaux parallèles.
 8. Distributeur de liquide selon la revendication 7, **caractérisé en ce qu'une** pénultième section de canal (11b) est divisée en pénultièmes sous-canaux parallèles, lesquelles pénultièmes sections de canal différentes ne se font pas face les unes les autres.
 9. Distributeur de liquide selon l'une quelconque des revendications 1 à 8, **caractérisé en ce que** l'orifice d'entrée (12), la première paroi de redirection d'écoulement (14), la première section de canal (11a) et la deuxième section de canal (11b) sont agencés dans une buse (20).
 10. Distributeur de liquide selon la revendication 9, **caractérisé en ce que** le distributeur de liquide (10) comprend un certain nombre de buses (20) agencées dans une dernière section de canal commune (11c).
 11. Distributeur de liquide selon la revendication 10, **caractérisé en ce que** la dernière section de canal commune (11c) comprend au moins une partie d'extrémité agrandie (21).

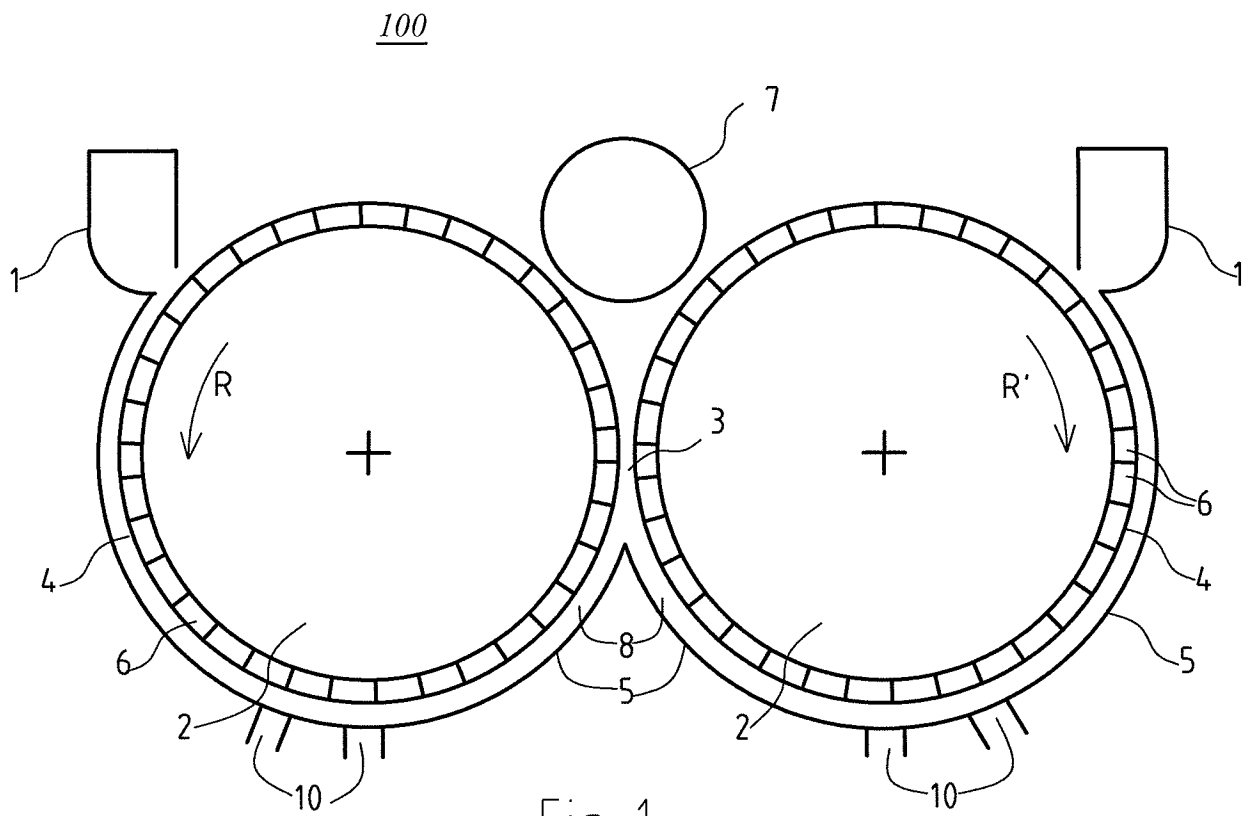


Fig. 1

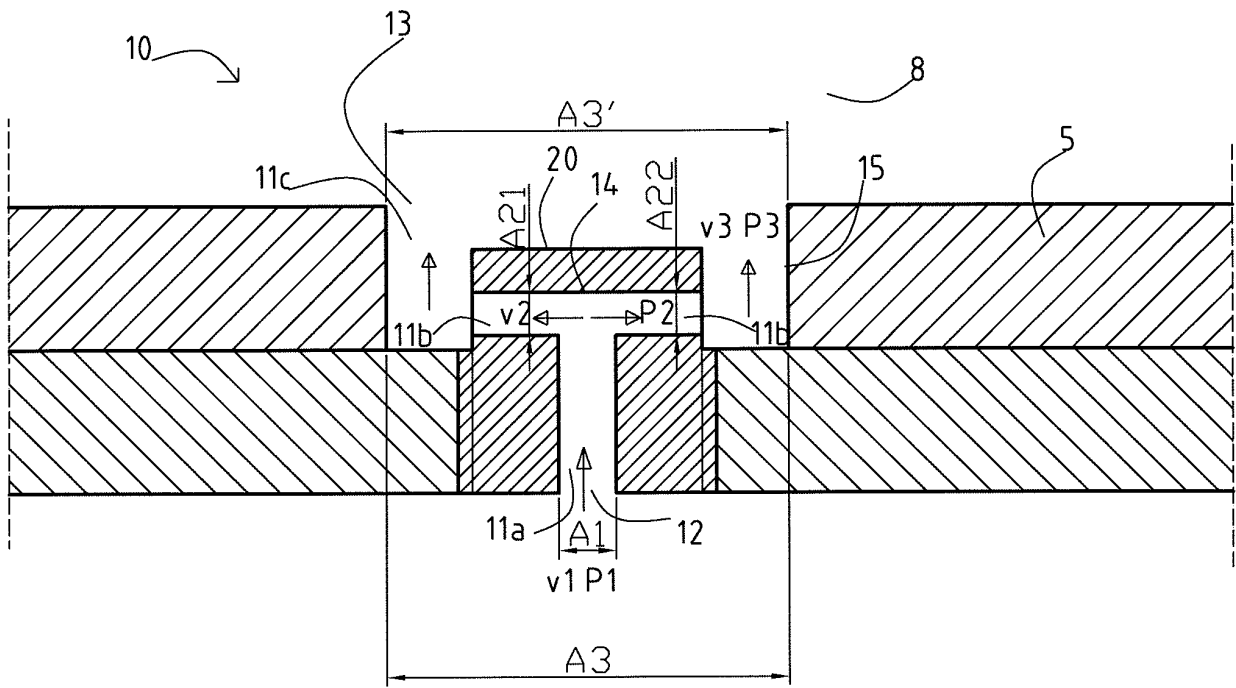


Fig. 2

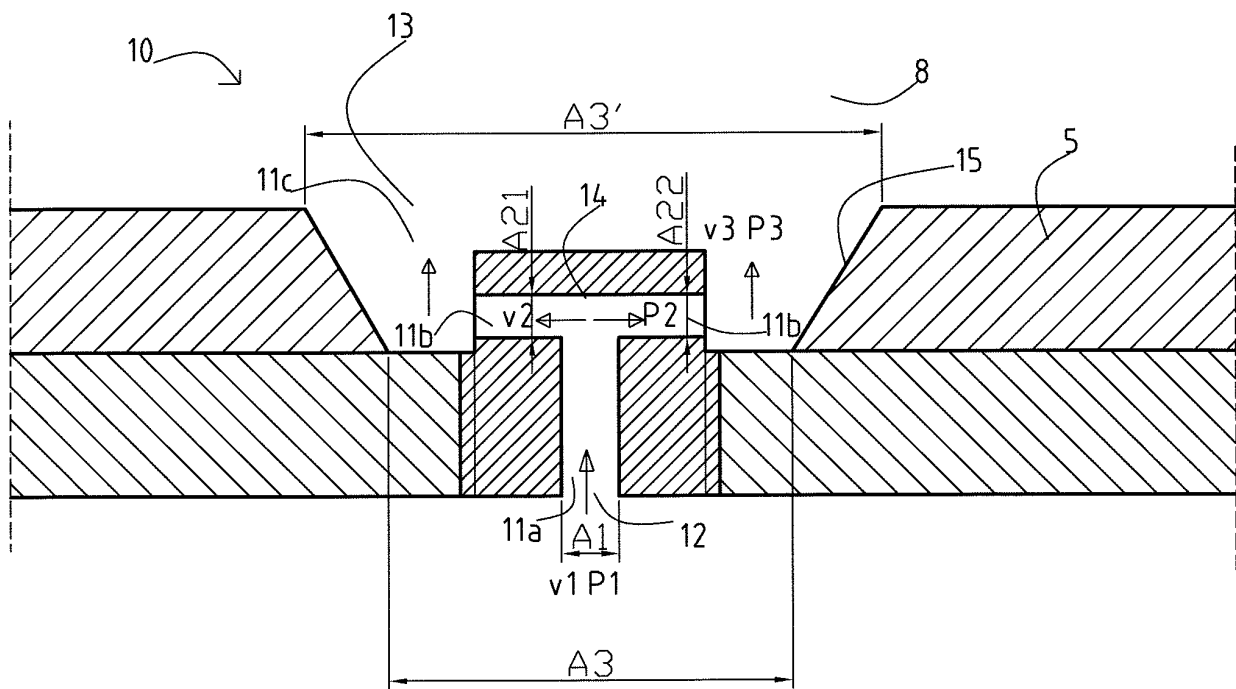
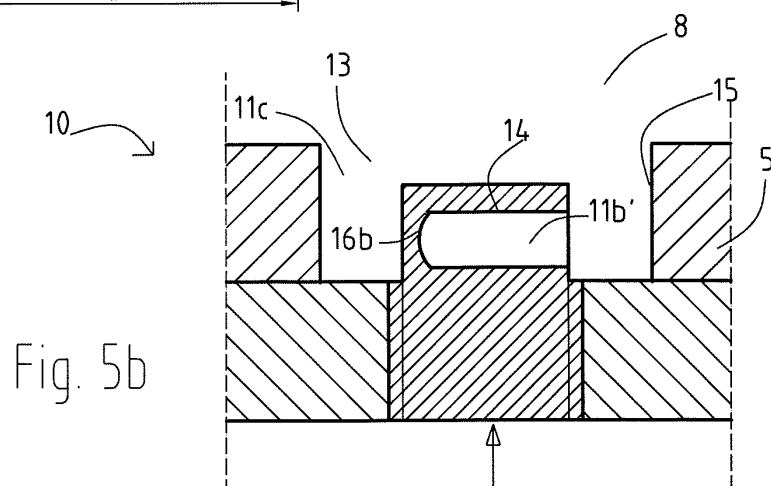
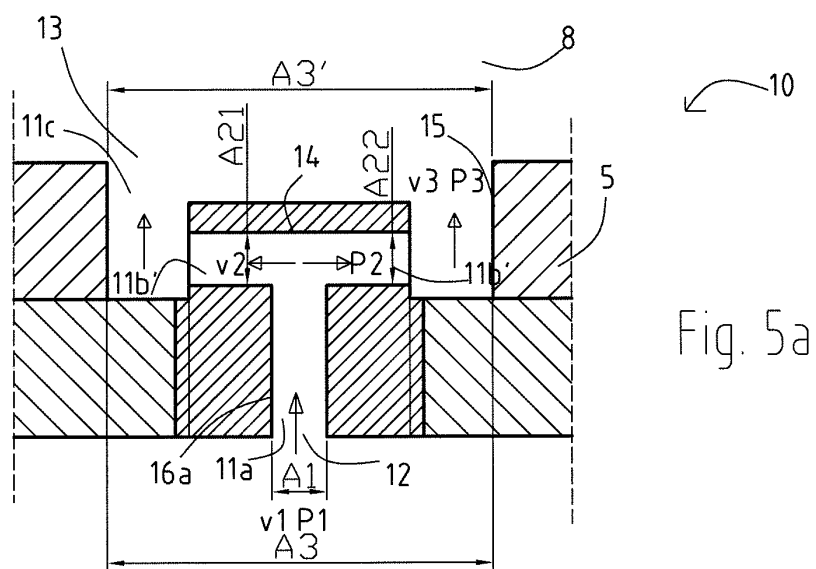
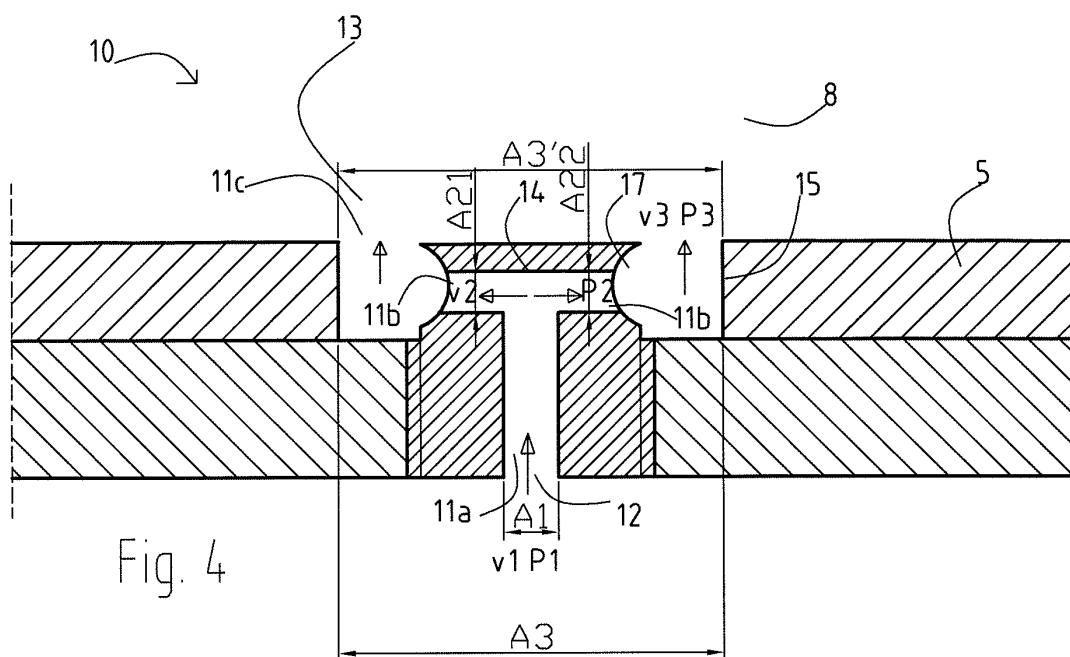


Fig. 3



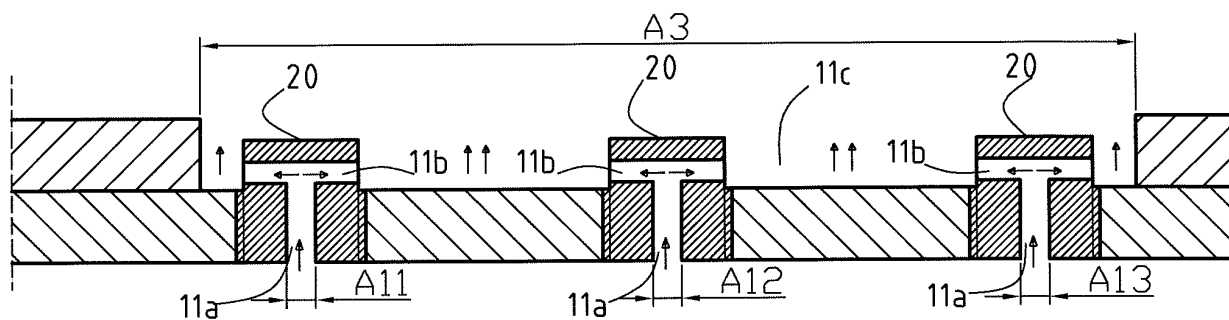


Fig. 6a

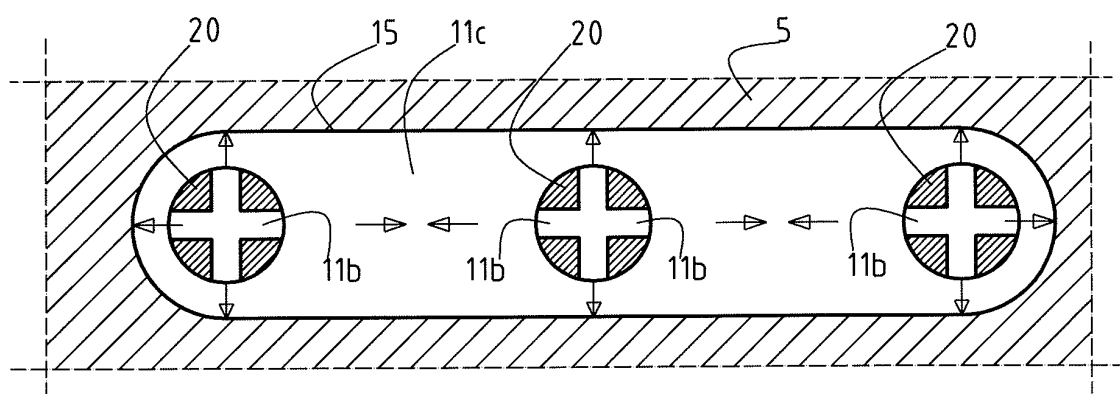


Fig. 6b

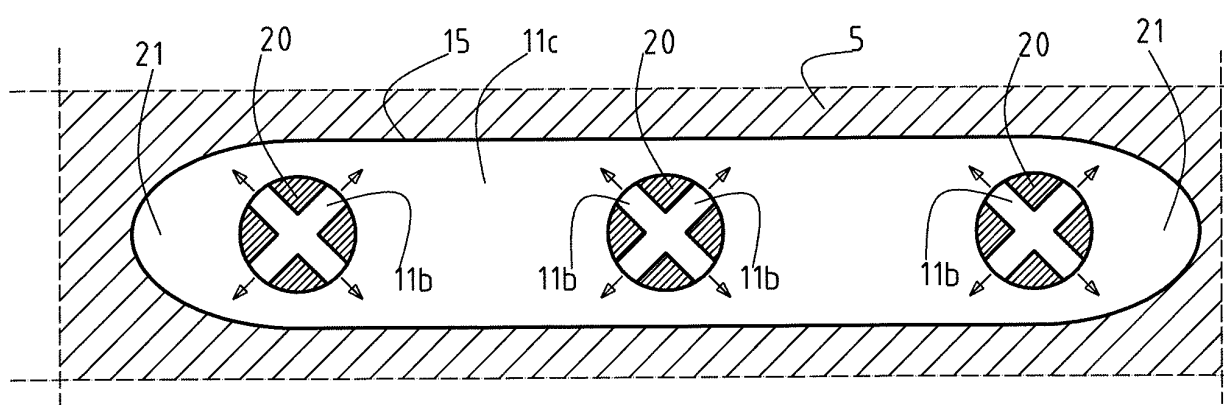


Fig. 6c

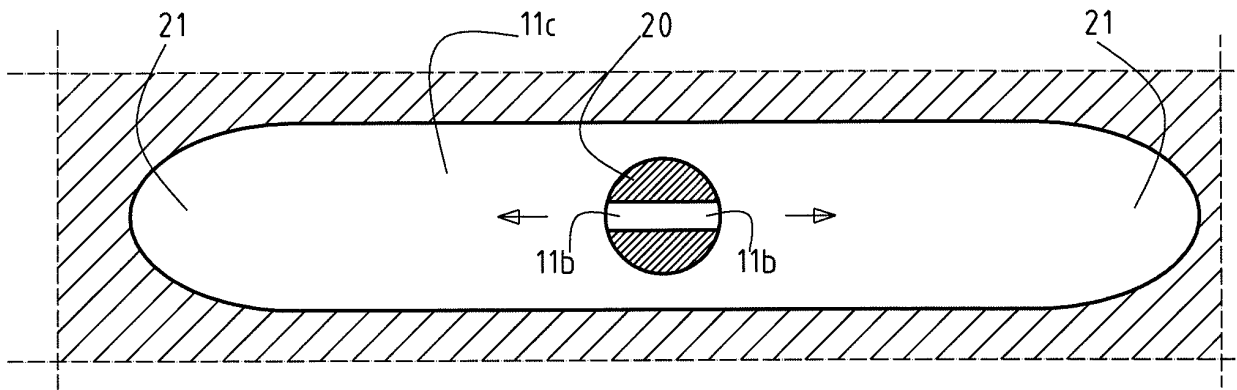


Fig. 7

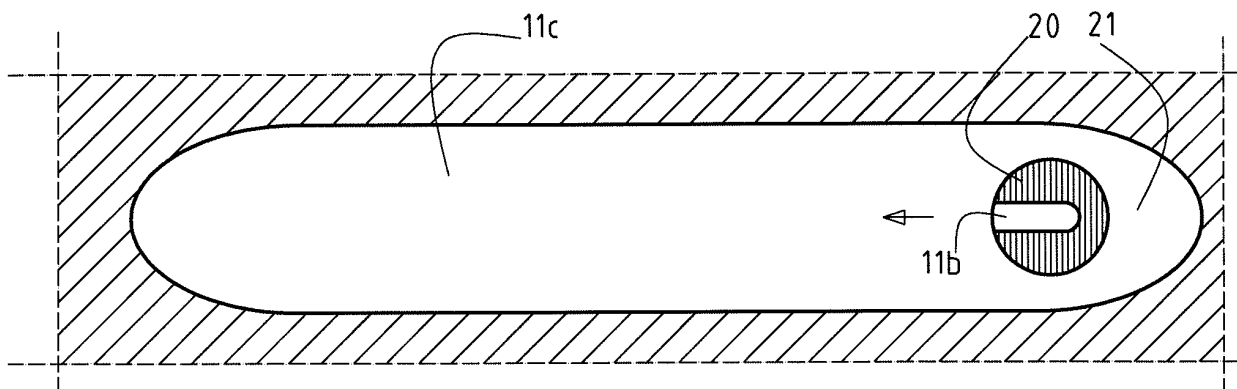


Fig. 8

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 3980518 A [0003]
- US 5046338 A [0004]
- SE 502815 [0004]
- SE 448524 [0006]