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(54) **AN APPARATUS FOR DISCHARGING PULP FROM A VESSEL, METHOD OF DISCHARGING PULP FORM A VESSEL AND METHOD OF UPGRADING A PULP VESSEL**

VORRICHTUNG ZUM AUSTRAGEN VON ZELLSTOFF AUS EINEM GEFÄSS, VERFAHREN ZUM AUSTRAGEN VON ZELLSTOFF AUS EINEM GEFÄSS UND VERFAHREN ZUM AUFRÜSTEN EINES ZELLSTOFFGEFÄSSES

APPAREIL DESTINÉ À ÉVACUER DE LA PÂTE À PARTIR D'UN RÉCIPIENT, PROCÉDÉ D'ÉVACUATION DE PÂTE À PARTIR D'UN RÉCIPIENT ET PROCÉDÉ DE MISE À NIVEAU D'UN RÉCIPIENT À PÂTE

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(56) References cited:
EP-A- 0 269 124
EP-A- 0 323 749
EP-A- 0 475 669
WO-A-2005/061781
US-A- 3 587 637
US-A- 5 087 171
US-A- 5 106 456
US-A- 5 538 597

EP 2 193 233 B1

Description

Technical field

[0001] The invention relates to an apparatus for discharging pulp from a vessel according to preamble of claim 1 comprising a second section for pulp at a first consistency and a first section into which the pulp from the second section is arranged to flow, the first section is provided with means for diluting the consistency of the pulp in the first section to have a second consistency lower than the first consistency, the apparatus further comprising means for discharging pulp having a first discharge conduit arranged to discharge pulp from the first section of the vessel and being provided with a first outlet, and a second discharge conduit arranged to discharge pulp from the second section of the vessel and being provided with a second outlet.

[0002] The invention also relates to method of discharging pulp from a vessel according to preamble of claim 10 and to method of upgrading an existing pulp vessel according to preamble of claim 15.

Background art

[0003] The present invention relates to a method and apparatus for facilitating the discharge of a high consistency pulp tower or the like space containing high consistency pulp and treating pulp in said space. The method and apparatus according to the invention are especially intended to be applied in the pulp and paper industry to facilitate the discharge of vessels containing high consistency pulp by pumping, whereby the apparatuses in use may have a secondary task in treating pulp in said space. The cellulose industry includes many different processes and apparatuses, such as thickening, in which the pulp is discharged at a high consistency, of about 8 - 25 %. It is normal practice to guide the pulp e.g. to a mass tower and wherefrom the pulp is transferred by pumping further in the processing.

[0004] Pulp from a high or medium consistency mass tower has hitherto been discharged from the bottom section of the tower by a conventional centrifugal pump, which has required the dilution of pulp usually to a consistency of about 6% maximum.

[0005] EP1702102 B1 shows a pulp tower originally intended for low consistency pulp having a cylindrical design and large diameter bottom section. The tower is suggested to be provided with a pipe extending through the wall of the tower parallel with the bottom and just above it to the vertical centre line of the tower. The pipe is obliquely cut so that its opening is facing upwards. As mentioned in the publication there will remain large amount of pulp which is not discharged from the tower but form zones of stagnation. It is intended that these stagnations will act as guiding surfaces for the pulp flow. However, that kind of large pulp deposits will be eventually spoiled. It is also possible that at some stage pieces of the pulp deposits will come loose and cause problems in the process.

[0006] In EP 475 669 B1 there is shown an apparatus comprising a mass tower or other pulp vessel and means for the discharge of high or medium consistency pulp when contained therein. It is disclosed that the bottom portion of said pulp vessel is provided with a first pump for removing pulp and a second pump which communicates with the inside of the vessel via a suction conduit having an inlet orifice. The inside wall of the vessel is provided with means permitting continuous pumping of pulp by the second pump, said means comprising either an extension of the duct into the interior of the vessel, or a member arranged adjacent to the suction duct for feeding pulp against the suction duct or against the inner wall of the vessel. These are, however, separate discharge lines and thus this arrangement has only limited possibility of adjusting the discharge consistency of the pulp discharged from the tower.

[0007] In US 5,538,597 A is shown an apparatus for the discharge of a mass tower containing medium to high consistency pulp and operable without the need for further dilution includes a vessel for storing the pulp; a suction duct extending from a zone of moving pulp to a region outside of the tower; and a pump attached to the end of the suction duct for discharging the pulp.

[0008] EP 0 269 124 A2 shows a high-consistency pulp tower comprising a fluidizing discharge device disposed in the outlet for pulp. In order to prevent the pulp from staying in any part of the bottom, the pulp tower is equipped with a rotating means which in turn is provided with transport elements for feeding the pulp towards the outlet.

[0009] An object of the invention is to provide a apparatus for discharging pulp from a vessel, which solves the above mentioned and other problems of the prior art. It is also an object of the invention to provide a method of discharging pulp from a vessel, which solves the above mentioned problem. It is still another object of the invention to provide a method of upgrading an existing pulp vessel with which the pulp tower may be modified to be capable of flexible adjustment of the consistency of the discharged pulp.

[0010] Objects of the invention are met substantially as is disclosed in claims 1, 10 and 15. The other claims present details of different embodiments of the invention.

Disclosure of the invention

[0011] According to an embodiment of the invention an apparatus for discharging pulp from a vessel comprises a first section for pulp at a second consistency and a second section for pulp at a first consistency in which vessel the pulp is arranged to flow from the second section to the first section the first section is provided with means for diluting the consistency of the pulp in the first section to have a second consistency lower than the first consistency, the apparatus further comprising means for

discharging pulp having a first discharge conduit arranged to discharge pulp from the first section of the vessel and being provided with a first outlet, and a second discharge conduit arranged to discharge pulp from the second section of the vessel and being provided with a second outlet. It is characteristic to the invention that the first outlet is in flow connection with the second discharge conduit upstream the second outlet, so that pulp flowing at the second outlet has a third consistency between the first and the second consistency. This has inter alia an effect of facilitating and making flexible the control of the consistency of pulp discharged from the vessel.

[0012] According to an advantageous embodiment the first discharge conduit is provided with a first outlet and the first outlet is in flow connection with the second discharge conduit. Additionally the first discharge conduit is in connection with the second discharge conduit at the suction side of a pump provided in the second discharge conduit. This way the second discharge conduit do not necessarily need a separate mixer but the pump mixes the pulp flows having initially different consistencies. In some cases it is also possible to connect the second discharge conduit to the first discharge conduit at the suction side of a pump provided in the first discharge conduit. The first section of the vessel is preferably provided with an agitator and an inlet for dilution media. This ensures that the consistency of the pulp in the first section is substantially homogenized and the consistency is low enough to be discharged with pumping effect of the pump in the first discharge conduit.

[0013] The vessel is preferably vertically orientated vessel and second discharge conduit is arranged to open into the vessel above the first section of the vessel where the pulp in operation of the vessel is at higher consistency.

[0014] The invention may still be improved with the feature that the second discharge conduit is arranged to the centre longitudinal axis of the vessel. This way in practise the generally descending flow of pulp in the vessel is substantially symmetric in respect of the centre axis which eliminates the risk of formation of so called dead areas where the pulp could be build up and form agglomerates.

[0015] In such an embodiment the second discharge conduit preferably is provided with a vertical suction duct, which is arranged to open upwards into the vessel. Thus, the inlet of the suction duct is opened substantially against the downward flow of pulp.

[0016] A method of discharging pulp from a vessel according to another embodiment of the invention comprises the steps of introducing pulp into a second section of the vessel at a first consistency, arranging pulp to flow from the second section of the vessel to a first section of the vessel, introducing dilution media into the pulp in the first section of the vessel and diluting the pulp in the first section of the vessel to a second consistency lower than the first consistency, discharging a first flow of pulp from the first section at the second consistency, additionally discharging a second flow of pulp from the second section at the first consistency. The invention is characterized by combining the first and the second flows of pulp forming a third flow of pulp having a third consistency between the first and the second consistency.

[0017] Third consistency is controlled by controlling the ratio of the first and/or the second flows of pulp.

[0018] According to a preferred embodiment of the invention the second flow of pulp is discharged at centre longitudinal axis of the vessel in the second section. This way in practise the generally descending flow of pulp in the vessel is substantially symmetric in respect of the centre axis which eliminates the risk of formation of so called dead areas where the pulp could be build up and form agglomerates.

[0019] Preferably, in practise the first consistency is about 8-35% and the second consistency is about 1-6%. Thus, by means of the method of the invention it is possible to discharge a flow of pulp from the vessel, the consistency of which (third consistency) is about 6-15%.

[0020] According to a still another embodiment of the invention a method of upgrading an existing pulp vessel, comprising the steps of arranging means for diluting the consistency of the pulp to a bottom area of the pulp vessel in order to provide a first section of the pulp vessel having pulp at second consistency, lower than the pulp in the first consistency at upper area of the pulp vessel, when the vessel is in use, arranging a first discharge conduit in a manner that it opens into the first section of the pulp vessel, and arranging a second discharge conduit so that it opens into the second section of the pulp vessel, with the second discharge conduit being provided with a second outlet, and arranging the first discharge conduit and the second discharge conduit in connection with each other when the vessel is in use, so that pulp flowing at the second outlet has a third consistency between the first and the second consistency, and arranging a pump into the second discharge conduit at a location down stream the connection of the first and the second discharge conduits.

[0021] This way an existing mass tower may be upgraded to be capable of discharging a flow of pulp from the vessel, the consistency of which may be efficiently and flexibly controlled.

[0022] The pulp vessel may be still improved be practising the further steps of arranging a suction duct of the second discharge conduit into centre area of the cross section of the vessel, and further arranging a suction duct of the second discharge conduit to be opening upwards in the vessel.

Brief Description of Drawings

[0023] In the following the invention will be described with the reference to the accompanying schematic drawings, in which

Fig. 1 illustrates a prior art arrangement for the dis-

charge of a mass tower;

Fig. 2 is an illustration of an apparatus in accordance with a preferred embodiment of the invention;

Fig. 3 is an illustration of an apparatus in accordance with a second embodiment of the invention;

Fig. 4 is an illustration of a further embodiment of the invention;

Fig. 5 is an illustration of a still further embodiment of the invention,

Fig. 6 is an illustration of a still further embodiment of the invention,

Fig. 7 is an illustration of a still further embodiment of the invention, and

Fig. 8 is an illustration of method of upgrading an existing pulp vessel according to the invention.

Detailed Description of Drawings

[0024] Fig. 1 illustrates a modern discharge arrangement of a high consistency mass tower in accordance with the prior art. A high consistency mass tower 10 in the embodiment according to the drawing comprises two portions: a second section which is here an upper section 12, and a first section which is a bottom section 14. Pulp is introduced into the upper section i.e. the second section of the vessel (introduction not shown) at a first consistency. Pulp may be subjected to an additional treatment in the vessel but in may also be merely stored therein.

[0025] There is a feed conduit 22 for introducing dilution liquid into the pulp provided at the lower section. The tower also includes an agitator 24 arranged in the bottom section for mixing the fed dilution liquid with the pulp and keeping the pulp in substantially homogenized state. The lower section may also be called as mixing zone. This way the consistency of the pulp in the bottom section 14 is maintained typically at a level of 6% at maximum, while the consistency in the upper section is typically about 8 - 35%. A conventional centrifugal pump 20 designed for pumping low consistency pulp is attached to the wall of the cylindrical bottom section 14 of the tower for enabling the emptying of the tower. This configuration is typically limited to discharge consistency of maximum 6% because of the capacity of the agitator to maintain pulp in homogenized state at higher consistency is limited.

[0026] In Fig. 2 there is shown an embodiment of the invention in which pulp tower generally as shown in Fig. 1 is provided with pulp discharging means according to the invention. The word "tower" is used herein to describe a commonly used pulp vessel which is constructed to have circular cross section and to stand in upright position. Pulp is introduced into the vessel 10 through an inlet 10.2 arranged to the upper section of the vessel. In the following the upper section is also called as second section. There is an agitator 24 arranged in the bottom section of the vessel 10. There is also a feed conduit 22 arranged in the bottom section for feeding dilution liquid into the pulp. In operation of the vessel the agitator maintains the pulp in the bottom section 14 of the vessel 10 in homogenized state to sufficient extent for pumping. With the dilution water added by means of the feed conduit 22 the consistency of the pulp at a level of about 1-6%. In the following the bottom section is also called as first section.

[0027] The embodiment shown in Fig.2 is provided with a first discharge conduit 26 and a first pump 20 connected thereto. The first discharge conduit 26 opens into the first section 14 of the vessel by means of a suction duct 28. The suction duct is connected to the inlet of the pump 20. This way the pulp may be discharged with the pump 20 from the first section 14 of the vessel 10. While the pulp is discharged from the bottom section of the tower the pulp is gradually flowing downwards from the upper section to the lower section of the tower. The pump 20 is connected to a feed pipe 30 of the first discharge conduit 26, which feed pipe is provided with a first outlet 32.

[0028] The embodiment shown in Fig.2 is also provided with a second discharge conduit 34 and a second pump 36, which is connected to the second discharge conduit. The second discharge conduit 34 opens into the second section 12 of the vessel through a suction duct 38. The suction duct is connected to the inlet of the second pump 36. This way the pulp may be discharged with the second pump 36 from the second section of the vessel 10, that is, from the upper section. The second discharge conduit 34 is provided with an outlet 40 down stream the pump 36. The outlet 40 may be connected to any desired further processing device for the pulp.

[0029] The first outlet 32 of the feed pipe 30 is connected to the second discharge conduit 34. Thus, in operation of the vessel pulp from the first section 14 of the vessel 10 is pumped with the pump 20 to the second discharge conduit 34. Since the second discharge conduit 34 is in connection with the second section 12 of the vessel through the suction duct 38, above the area of diluted pulp in the bottom section of the vessel, the consistency of the pulp entering the suction duct 38 is considerably high, typically of 8-35%. Subsequently, the pulp from the first outlet 32 being in the consistency of the first section 14 of tower 10 (about 1-6%) is introduced into the stream of pulp in the second discharge conduit 34. These streams are mixed in a predetermined ratio which produces a mixture having consistency between the consistency of the pulp in the lower section and the consistency of the pulp in the upper section of the tower. In practise a generally applicable range is between 6 -15%.

[0030] The ratio may be regulated e.g. based on a flow rate indicator 42 and a consistency indicator 44 provided in the discharge conduit after the mixing location of the streams. The actual value provided by the flow rate indicator 42 is used for regulating the flow rate provided by the pump 36. The actual value obtained from the consistency indicator 44 is used for regulating the flow rate provided by the pump 20. The operation of the pumps is controlled by a control unit 46. In this case the pumps are powered by inverter controlled motors. It is clear that

the flow rates may also be controlled be other means, such as control valves arranged into the ducts.

[0031] In this embodiment the first outlet 32 is connected to the suction side i.e. up stream of the pump 36. This way the mixing of the pulp streams of different consistencies are efficiently and reliably mixed and the consistency of the discharged pulp at the outlet 40 is homogenous.

[0032] The suction duct 38 is preferably arranged in such a manner that its inlet opening 38.1 opens towards the flow direction of the pulp from the second section to the first section above the region where the dilution has the effect of lowering the consistency of the pulp. The preferred embodiment of the suction duct is a pipe provided in upright position in the first section so that it extends upwardly through the first section to the second section.

[0033] Further, it is preferred that the suction duct 38 is arranged on a longitudinal centre axis 48 of the vessel 10. This way the flow pattern of pulp descending in the vessel is symmetrical and the risk of "dead" areas of stationary pulp layers are avoided. The tower is preferably supported on a foundation 50 by its bottom section.

[0034] Fig. 3 shows an embodiment of the invention where the vessel has equal cross sectional area at both the upper section and the lower section. The vessel 10 is also supported directly on a foundation 50 by its bottom section 14. In this embodiment the first discharge conduit 26 opens into the upper region of the first section14, but still the basic idea and operation is similar to that described in Fig. 2. The suction duct 38 is also arranged on the longitudinal centre axis of the vessel 10. In Fig. 3 there is also shown with dotted line 30' that the feed pipe 30 may be arranged to lead from the pump 20 to the inlet side of pump 36 outside the vessel 10.

[0035] Fig. 4 shows an embodiment of the invention which has very simple construction. The apparatus is provided with a second discharge conduit 34 and a pump 36 connected to the second discharge conduit. The second discharge conduit 34 opens into the second section 12 of the vessel through a substantially vertical suction duct 38. The suction duct is connected to the inlet of the pump 36. This way the pulp may be discharged with the pump 36 from the second section of the vessel 10, that is, from the upper section. The second discharge conduit 34 is provided with an outlet 40 down stream the pump 36. The outlet 40 may be connected to any desired further processing device for the pulp.

[0036] In this embodiment the first discharge conduit 26 mainly consists of at least one opening 54 in the wall of the second discharge conduit 26, in this case in the vertical suction duct 38. The opening is provided with a flow control device such as a valve 55. Simultaneously it operates as the first outlet 32. Naturally the location of the opening in the wall of the second discharge conduit 26 may be selected appropriately for each case. In addition to being a mere opening the second discharge conduit may comprise also a short pipe if needed.

[0037] Thus, in operation of the vessel pulp from the first section 14 of the vessel 10 is sucked by the pump 36 to the second discharge conduit 34. Since the second discharge conduit 34 is in connection with the second section 12 of the vessel through the suction duct 38, above the area of diluted pulp in the bottom section of the vessel, the consistency of the pulp entering the suction duct 38 is considerably high, typically of 8-35%. Subsequently, the pulp flowing through opening 54 and the valve 55 being in the consistency of the first section 14 of tower 10 (about 1-6%) is introduced into the stream of pulp in the second discharge conduit 34. These streams are mixed in a predetermined ratio which produces a mixture having consistency between the consistency of the pulp in the lower section and the consistency of the pulp in the upper section of the tower.

[0038] Fig. 5 shows a still another embodiment of the invention. Like the embodiment of the figure 4, the apparatus is provided with a second discharge conduit 34 and a pump 36 connected to the second discharge conduit. In the embodiment of figure 5 the first discharge conduit 26 comprises an external duct 56 which extend from the side wall of the lower section of the vessel 10 to the second discharge conduit 34. The duct 56 is connected to the suction side of the pump 36 via the first outlet 32. The duct 56 is also provided with a valve 55 which allows a desired ratio of the pulp flows from the first and the second section to be mixed.

[0039] Additionally the embodiment of figure 5 has its suction duct 38 formed and functioning also as a bottom pillar having its cross-sectional area between suction duct and wall of tower 10 smaller at the upper end of the suction duct than at its lower end. The inlet opening 38.1 of the suction duct 38 is arranged to open upwards on the top of the converging part 58 of the suction duct 38.

[0040] Fig. 6 shows a still another embodiment of the invention. Like the embodiment of the figure 4, the apparatus is provided with a second discharge conduit 34 and a pump 36 connected to suction duct 38 of the second discharge conduit. In the embodiment of figure 6 the first discharge conduit 26 mainly consists of at least one opening 54 in the wall of the second discharge conduit 26 having also a valve 55 for controlling the flow rate of the pulp from the first section 14 to the second discharge conduit 34. Simultaneously the opening operates also as the first outlet 32. The second discharge conduit 16 is formed as integrated channel to a division member 60 provided in the bottom section of the tower 10. The division member may be provided for example for deflecting the agitated pulp flow in the bottom section of the tower.

[0041] Fig. 7 shows a still further embodiment of the invention. It is corresponding to the one in figure 2, having a second discharge conduit 34 with a second pump 36 and a suction duct 38. It also comprises a first discharge conduit 26 having a feed pipe 30. In this embodiment the first outlet 32 of the feed pipe 30 is in flow connection with, that is, the vicinity of the inlet opening 38.1 of the suction duct 38. So, in some application it may be ade-

quate to feed the pulp from the first section 14 to the effective area of the inlet opening 38.1 in order to facilitate the desired mixing of the two pulp streams.

[0042] Fig. 8 illustrates the method of upgrading an existing pulp vessel 10 according to the invention. This method is particularly advantageous to be used in connection with vessels having a foundation 50 directly on which the tower is supported. In Fig. 4 the features or parts on the existing tower are shown with solid lines and the features relating to the method of upgrading are shown with dotted lines. In this exemplary case the existing pulp vessel comprises originally an upper section 12 and a bottom section 14 i.e. lower section. The pulp is stored in the tower so that the consistency of the pulp in the upper section, referred to as the first consistency, is considerably higher than in the bottom section, the consistency in the bottom section being referred to as the second consistency. The bottom section being the area from which the pulp is mainly discharged at lower consistency. The bottom section is typically provided with means for diluting the consistency of the pulp 22, 24. The tower is also provided with a suction duct 28 and a pump 20 to which the duct 28 is connected. The method of upgrading an existing pulp vessel may be used in various kinds of vessels regardless of their former way of use. For example, a vessel for low consistency pulp may be upgraded according to the present invention.

[0043] Now, in order to be able to discharge the pulp at higher consistency than that of diluted pulp in the bottom section, and in lower consistency than that of the pulp in the upper section, the method according to the invention comprises the installation of following components. One of the steps of the method is arranging a second discharge conduit 34 to open into an area containing the pulp at the first consistency, when the vessel is in use and sufficiently filled with pulp. This provides the effect of being able to take the pulp at the first consistency out of the tower. Additionally, the already existing discharge conduit 26, i.e. the suction duct 28 and a pump 20, is connected to the second discharge conduit 34 and the second discharge conduit 34 is provided with means capable of mixing effect at a location downstream the connection point of the existing discharge conduit 26. This way the final consistency of the discharged pulp at the outlet 40 of the second discharge conduit 34 may be adjusted to be more that the consistency at the bottom section 14 of the tower 10. In practise the means capable of mixing effect may be simply the pump 36 or there may be a separate mixer arranged in the duct 34 (not shown).

[0044] The method of upgrading an existing pulp vessel 10 according to the invention is very beneficial because among other things it allows an easy upgrading of a mass tower which has been supported by its bottom directly on a foundation. This is because all the ducts may be lead through the side walls of the vessel.

[0045] The second discharge conduit 34 is arranged to have a suction duct 38, which is according to the method arranged into the centre area of the cross section of the vessel 10, preferably to the centre axis of the vessel and opening to upward direction against the flow direction of the pulp. This way the cross section of the vessel is symmetrical in respect of the flow of the pulp in the vessel 10 minimizing the risk of formation of so called dead zones.

[0046] The pipe connections or lead-through locations are arranged on the side walls 10.1 of the vessel so that the support of the vessel on the foundation 50 need not be altered in any way.

[0047] The method may additionally comprise the steps of installing measurement instruments, such as consistency indicator 44 and flow rate indicator 42 into the discharge conduit after the mixing location, which facilitates the controlling of the discharge process of the pulp.

[0048] It is clear that the invention is not limited to the examples mentioned above but it can be implemented in many other different embodiments within the scope of the claims. It is also clear that the features of any particular embodiment described above may be used in connection with another embodiment as far as technically feasible.

Claims

1. An apparatus for discharging pulp from a vessel (10) comprising a first section (14) for pulp at a second consistency and a second section (12) for pulp at a first consistency, in which vessel the pulp is arranged to flow from the second section (12) to the first section (14), the first section is provided with means for diluting (22, 24) the consistency of the pulp in the first section to have a second consistency lower than the first consistency, the apparatus further comprising means for discharging pulp having a first discharge conduit (26) arranged to discharge pulp from the first section (14) of the vessel and being provided with a first outlet (32), and a second discharge conduit(34) arranged to discharge pulp from the second section (12) of the vessel (10) and being provided with a second outlet (40), **characterised in that** the first outlet (32) is in flow connection with the second discharge conduit (34) upstream the second outlet (40). so that pulp flowing at the second outlet has a third consistency between the first and the second consistency.

2. An apparatus for discharging pulp from a vessel according to claim 1. **characterised in that** both the first and the second discharge conduit are provided with a pump (20, 36).

3. An apparatus for discharging pulp from a vessel according to claim 1, **characterised in that** the first discharge conduit (26) is in connection with the second discharge conduit (34) at the suction side of the

pump (36) provided in the second discharge conduit or **in that** the second discharge conduit (34) is in connection with the first discharge conduit (26) at the suction side of the pump (20) provided in the first discharge conduit.

4. An apparatus for discharging pulp from a vessel according to claim 1, **characterised in that** the first section (14) of the vessel is provided with an agitator (24) and an inlet (22) for dilution media.

5. An apparatus for discharging pulp from a vessel according to claim 1, **characterised in that** the vessel (10) is vertically orientated vessel and second discharge conduit (34) is arranged to open into the vessel above the first section (14) of the vessel.

6. An apparatus for discharging pulp from a vessel according to claim 4, **characterised in that** the second discharge conduit (34) is arranged to the centre longitudinal axis (48) of the vessel.

7. An apparatus for discharging pulp from a vessel according to claim 5, **characterised in that** the second discharge conduit (34) is provided with a vertical suction duct (38) arranged to open upwards into the vessel.

8. An apparatus for discharging pulp from a vessel according to claim 1, **characterised in that** the vessel (10) is vertically orientated vessel and the second section is an upper section of the vessel and the first section is the bottom section of the vessel.

9. An apparatus for discharging pulp from a vessel according to claim 7, **characterised in that** cross section area of the lower section of the vessel is smaller than the upper section of the vessel.

10. Method of discharging pulp from a vessel (10) comprising the steps of

- introducing pulp (10.2) into a second section (12) of the vessel at a first consistency,
- arranging pulp to flow from the second section (12) of the vessel to a first section (14) of the vessel.
- introducing dilution media (22) into the pulp in the first section of the vessel (10) and diluting the pulp in the first section of the vessel to a second consistency lower than the first consistency,
- discharging a first flow of pulp (26) from the first section (14) at the second consistency,
- additionally discharging a second flow of pulp (34) from the second section (12) at the first consistency,

characterized by

- combining the first and the second flow of pulp forming a third flow of pulp having a third consistency between the first and the second consistency.

11. Method according to claim 10, **characterised in that** third consistency is controlled (46, 42, 447) by controlling the ratio of the first and/or the second flows of pulp.

12. Method according to claim 10, **characterised in that** the second flow of pulp is discharged at centre longitudinal axis (48) of the vessel (10) in the second section (12).

13. Method according to claim 10, **characterised in that** the first flow of pulp is discharged at bottom section of the vessel (10).

14. Method according to claim 10, **characterised in that** the first consistency is about 8-35% and/or **in that** the second consistency is about 1-6% and/or **in that** the third consistency is about 6-15%.

15. Method of upgrading an existing pulp vessel discharge conduit comprising the steps of:

- arranging means for diluting the consistency of the pulp to a bottom area of the pulp vessel in order to provide a first section (14) of the pulp vessel having pulp at second consistency, lower than the pulp in the first consistency at upper area of the pulp vessel, when the vessel is in use,
- arranging a first discharge conduit (26) so that it opens into the first section (14) of the pulp vessel, and
- arranging a second discharge conduit (34) in a manner that it opens into the second section (12) of the pulp vessel, with the second discharge conduit being provided with a second outlet (40), and
- arranging the first discharge conduit and the second discharge conduit in connection with each other when the vessel is in use, so that pulp flowing at the second outlet has a third consistency between the first and the second consistency,
- arranging a pump (36) into the second discharge conduit at a location downstream the connection of the first and the second discharge conduits.

16. Method of upgrading a pulp vessel according to claim 15, **characterised by** arranging a suction conduit (38) of the second discharge conduit (34) into centre area of the cross section of the vessel or by arranging

a suction conduit (38) of the second discharge conduit (34) to be opening upwards in the vessel (10).

Patentansprüche

1. Vorrichtung zum Austrag von Pulpe von einem Gefäß (10), das einen ersten Abschnitt (14) für Pulpe bei einer zweiten Konsistenz und einen zweiten Abschnitt (12) für Pulpe bei einer ersten Konsistenz umfasst, wobei in diesem Gefäß die Pulpe angeordnet ist, um von dem zweiten Abschnitt (12) zu dem ersten Abschnitt (14) zu strömen, wobei der erste Abschnitt mit einem Mittel zum Verdünnen (22, 24) der Konsistenz der Pulpe in dem ersten Abschnitt versehen ist, um eine zweite Konsistenz zu erhalten, die geringer als die erste Konsistenz ist, wobei die Vorrichtung ferner ein Mittel zum Austrag von Pulpe umfasst, das eine erste Austragsleitung (26), die so angeordnet ist, Pulpe von dem ersten Abschnitt (14) des Gefäßes auszutragen, und mit einem ersten Auslass (32) versehen ist, und eine zweite Austragsleitung (34) aufweist, die derart angeordnet ist, Pulpe von dem zweiten Abschnitt (12) des Gefäßes (10) auszutragen, und mit einem zweiten Auslass (40) versehen ist, **dadurch gekennzeichnet, dass** der erste Auslass (32) in Strömungsverbindung mit der zweiten Austragsleitung (34) stromaufwärts des zweiten Auslasses (40) steht, so dass Pulpe, die an dem zweiten Auslass strömt, eine dritte Konsistenz zwischen der ersten und der zweiten Konsistenz besitzt.

2. Vorrichtung zum Austrag von Pulpe von einem Gefäß nach Anspruch 1, **dadurch gekennzeichnet, dass** sowohl die erste als auch die zweite Austragsleitung mit einer Pumpe (20, 36) versehen sind.

3. Vorrichtung zum Austrag von Pulpe von einem Gefäß nach Anspruch 1, **dadurch gekennzeichnet, dass** die erste Austragsleitung (26) in Verbindung mit der zweiten Austragsleitung (34) an der Saugseite der Pumpe (36) steht, die in der zweiten Austragsleitung vorgesehen ist, oder dass die zweite Austragsleitung (34) in Verbindung mit der ersten Austragsleitung (26) an der Saugseite der Pumpe (20) steht, die in der ersten Austragsleitung vorgesehen ist.

4. Vorrichtung zum Austrag von Pulpe von einem Gefäß nach Anspruch 1, **dadurch gekennzeichnet, dass** der erste Abschnitt (14) des Gefäßes mit einer Rühreinrichtung (24) und einem Einlass (22) für Verdünnungsmedium versehen ist.

5. Vorrichtung zum Austrag von Pulpe von einem Gefäß nach Anspruch 1, **dadurch gekennzeichnet, dass** das Gefäß (10) ein vertikal orientiertes Gefäß ist, und die zweite Austragsleitung (34) so angeordnet ist, dass sie sich in das Gefäß über dem ersten Abschnitt (14) des Gefäßes öffnet.

6. Vorrichtung zum Austrag von Pulpe von einem Gefäß nach Anspruch 4, **dadurch gekennzeichnet, dass** die zweite Austragsleitung (34) an der zentralen Längsachse (48) des Gefäßes angeordnet ist.

7. Vorrichtung zum Austrag von Pulpe von einem Gefäß nach Anspruch 5, **dadurch gekennzeichnet, dass** die zweite Austragsleitung (34) mit einer vertikalen Saugleitung (38) versehen ist, die derart angeordnet ist, dass sie sich aufwärts in das Gefäß öffnet.

8. Vorrichtung zum Austrag von Pulpe von einem Gefäß nach Anspruch 1, **dadurch gekennzeichnet, dass** das Gefäß (10) ein vertikalorientiertes Gefäß ist, und der zweite Abschnitt ein oberer Abschnitt des Gefäßes ist und der erste Abschnitt ein unterer Abschnitt des Gefäßes ist.

9. Vorrichtung zum Austrag von Pulpe von einem Gefäß nach Anspruch 7, **dadurch gekennzeichnet, dass** die Querschnittsfläche des unteren Abschnitts des Gefäßes kleiner als die des oberen Abschnitts des Gefäßes ist.

10. Verfahren zum Austrag von Pulpe von einem Gefäß (10), mit den Schritten, dass:

    - Pulpe (10.2) in einen zweiten Abschnitt (12) des Gefäßes mit einer ersten Konsistenz eingeführt wird,
    - Pulpe zur Strömung von dem zweiten Abschnitt (12) des Gefäßes zu einem ersten Abschnitt (14) des Gefäßes angeordnet wird,
    - Verdünnungsmedium (22) in die Pulpe in dem ersten Abschnitt des Gefäßes (10) eingeführt wird und die Pulpe in dem ersten Abschnitt des Gefäßes zu einer zweiten Konsistenz verdünnt wird, die geringer als die erste Konsistenz ist,
    - eine erste Strömung von Pulpe (26) von dem ersten Abschnitt (14) mit der zweiten Konsistenz ausgetragen wird,
    - zusätzlich eine zweite Strömung von Pulpe (34) von dem zweiten Abschnitt (12) mit der ersten Konsistenz ausgetragen wird,
    dadurch gekennzeichnet, dass
    - die erste und die zweite Strömung von Pulpe kombiniert werden, wobei eine dritte Strömung von Pulpe gebildet wird, die eine dritte Konsistenz zwischen der ersten und der zweiten Konsistenz aufweist.

11. Verfahren nach Anspruch 10, **dadurch gekennzeichnet, dass** die dritte Konsistenz durch Steue-

rung des Verhältnisses der ersten und/oder der zweiten Strömungen von Pulpe gesteuert (46, 42, 447) wird.

12. Verfahren nach Anspruch 10, **dadurch gekennzeichnet, dass** die zweite Strömung von Pulpe an einer zentralen Längsachse (48) des Gefäßes (10) in dem zweiten Abschnitt (12) ausgetragen wird.

13. Verfahren nach Anspruch 10, **dadurch gekennzeichnet, dass** die erste Strömung von Pulpe an einem unteren Abschnitt des Gefäßes (10) ausgetragen wird.

14. Verfahren nach Anspruch 10, **dadurch gekennzeichnet, dass** die erste Konsistenz etwa 8 - 35 % beträgt und/oder dass die zweite Konsistenz etwa 1 - 6 % beträgt und/oder dass die dritte Konsistenz etwa 6 - 15 % beträgt.

15. Verfahren zum Aufrüsten einer existierenden Austragsleitung eines Pulpengefäßes, mit den Schritten, dass:

- ein Mittel zum Verdünnen der Konsistenz der Pulpe an einem unteren Bereich des Pulpengefäßes angeordnet wird, um einen ersten Abschnitt (14) des Pulpengefäßes bereitzustellen, der eine Pulpe bei einer zweiten Konsistenz besitzt, die geringer als die Pulpe mit der ersten Konsistenz an dem oberen Bereich des Pulpengefäßes ist, wenn das Gefäß in Gebrauch steht,
- eine erste Austragsleitung (26) so angeordnet wird, dass sie sich in den ersten Abschnitt (14) des Pulpengefäßes öffnet, und
- eine zweite Austragsleitung (34) auf eine Weise angeordnet wird, dass sie sich in den zweiten Abschnitt (12) des Pulpengefäßes öffnet, wobei die zweite Austragsleitung mit einem zweiten Auslass (40) versehen ist, und
- die erste Austragsleitung und die zweite Austragsleitung in Verbindung miteinander angeordnet werden, wenn das Gefäß in Gebrauch steht, so dass Pulpe, die an dem zweiten Auslass strömt, eine dritte Konsistenz zwischen der ersten und der zweiten Konsistenz aufweist,
- eine Pumpe (36) in der zweiten Austragsleitung an einer Stelle stromabwärts der Verbindung der ersten und der zweiten Austragsleitung angeordnet wird.

16. Verfahren zum Aufrüsten eines Pulpengefäßes nach Anspruch 15, **dadurch gekennzeichnet, dass** eine Saugleitung (38) der zweiten Austragsleitung (34) in dem Zentralbereich des Querschnitts des Gefäßes angeordnet wird oder eine Saugleitung (38) der zweiten Austragsleitung (34) so angeordnet wird, dass sie sich aufwärts in dem Gefäß (10) öffnet.

Revendications

1. Appareil pour décharger de la pâte d'un récipient (10) comprenant une première section (14) pour la pâte à une deuxième consistance et une seconde section (12) pour la pâte à une première consistance, dans lequel récipient, la pâte est agencée pour s'écouler de la seconde section (12) à la première section (14), la première section est prévue avec des moyens pour diluer (22, 24) la consistance de la pâte dans la première section afin d'avoir une deuxième consistance inférieure à la première consistance, l'appareil comprenant en outre des moyens pour décharger la pâte ayant un premier conduit de décharge (26) agencé pour décharger la pâte de la première section (14) du récipient et étant prévu avec une première sortie (32), et un second conduit de décharge (34) agencé pour décharger la pâte de la seconde section (12) du récipient (10) et étant prévu avec une seconde sortie (40), **caractérisé en ce que** la première sortie (32) est en raccordement d'écoulement avec le second conduit de décharge (34) en amont de la seconde sortie (40), de sorte que la pâte s'écoulant au niveau de la seconde sortie a une troisième consistance entre la première et la deuxième consistance.

2. Appareil pour décharger de la pâte d'un récipient selon la revendication 1, **caractérisé en ce que**, à la fois le premier et le second conduit de décharge sont prévus avec une pompe (20, 36).

3. Appareil pour décharger de la pâte d'un récipient selon la revendication 1, **caractérisé en ce que** le premier conduit de décharge (26) est en raccordement avec le second conduit de décharge (34) du côté de l'aspiration de la pompe (36) prévue dans le second conduit de décharge ou **en ce que** le second conduit de décharge (34) est en raccordement avec le premier conduit de décharge (26) du côté de l'aspiration de la pompe (20) prévue dans le premier conduit de décharge.

4. Appareil pour décharger de la pâte d'un récipient selon la revendication 1, **caractérisé en ce que** la première section (14) du récipient est prévue avec un agitateur (24) et une entrée (22) pour le milieu de dilution.

5. Appareil pour décharger de la pâte d'un récipient selon la revendication 1, **caractérisé en ce que** le récipient (10) est un récipient orienté verticalement et un second conduit de décharge (34) est agencé pour s'ouvrir dans le récipient au-dessus de la première section (14) du récipient.

6. Appareil pour décharger de la pâte d'un récipient selon la revendication 4, **caractérisé en ce que** le

second conduit de décharge (34) est agencé sur l'axe longitudinal central (48) du récipient.

7. Appareil pour décharger de la pâte d'un récipient selon la revendication 5, **caractérisé en ce que** le second conduit de décharge (34) est prévu avec un conduit d'aspiration vertical (38) agencé pour s'ouvrir vers le haut dans le récipient.

8. Appareil pour décharger de la pâte d'un récipient selon la revendication 1, **caractérisé en ce que** le récipient (10) est un récipient orienté verticalement et la seconde section est une section supérieure du récipient et la première section est la section inférieure du récipient.

9. Appareil pour décharger de la pâte d'un récipient selon la revendication 7, **caractérisé en ce que** la surface transversale de la section inférieure du récipient est plus petite que la section supérieure du récipient.

10. Procédé pour décharger de la pâte d'un récipient (10) comprenant les étapes consistant à :

introduire la pâte (10.2) dans une seconde section (12) du récipient à une première consistance,
agencer la pâte pour s'écouler de la seconde section (12) du récipient vers la première section (14) du récipient,
introduire le milieu de dilution (22) dans la pâte dans la première section du récipient (10) et diluer la pâte dans la première section du récipient jusqu'à une deuxième consistance inférieure à la première consistance,
décharger un premier écoulement de pâte (26) de la première section (14) à la deuxième consistance,
décharger de plus, un deuxième écoulement de pâte (34) de la seconde section (12) à la première consistance,
caractérisé par l'étape consistant à :

combiner le premier et le deuxième écoulement de pâte formant un troisième écoulement de pâte ayant une troisième consistance entre la première et la deuxième consistance.

11. Procédé selon la revendication 10, **caractérisé en ce que** la troisième consistance est contrôlée (46, 42, 447) en contrôlant le rapport du premier et/ou du deuxième écoulement de pâte.

12. Procédé selon la revendication 10, **caractérisé en ce que** le deuxième écoulement de pâte est déchargé au niveau de l'axe longitudinal central (48) du récipient (10) dans la seconde section (12).

13. Procédé selon la revendication 10, **caractérisé en ce que** le premier écoulement de pâte est déchargé au niveau de la section inférieure du récipient (10).

14. Procédé selon la revendication 10, **caractérisé en ce que** la première consistance est d'environ 8-35% et/ou **en ce que** la deuxième consistance est d'environ 1-6% et/ou **en ce que** la troisième consistance est d'environ 6-15%.

15. Procédé pour améliorer un conduit de décharge de récipient de pâte existant comprenant les étapes consistant à :

agencer des moyens pour diluer la consistance de la pâte sur une surface inférieure du récipient de pâte afin de fournir une première section (14) du récipient de pâte ayant la pâte à la deuxième consistance, inférieure à la pâte dans la première consistance au niveau de la surface supérieure du récipient de pâte, lorsque le récipient est utilisé,
agencer un premier conduit de décharge (26) de sorte qu'il s'ouvre dans la première section (14) du récipient de pâte, et
agencer un second conduit de décharge (34) de sorte qu'il s'ouvre dans la seconde section (12) du récipient de pâte, avec le second conduit de décharge qui est prévu avec une seconde sortie (40), et
agencer le premier conduit de décharge et le second conduit de décharge en raccordement entre eux lorsque le récipient est utilisé, de sorte que la pâte s'écoulant au niveau de la seconde sortie a une troisième consistance entre la première et la deuxième consistance,
agencer une pompe (36) dans le second conduit de décharge à un emplacement en aval du raccordement du premier et du second conduit de décharge.

16. Procédé pour améliorer un récipient de pâte selon la revendication 15, **caractérisé par** l'étape consistant à agencer un conduit d'aspiration (38) du second conduit de décharge (34) dans la surface centrale de la section transversale du récipient ou par l'étape consistant à agencer un conduit d'aspiration (38) du second conduit de décharge (34) pour qu'il s'ouvre vers le haut dans le récipient (10).

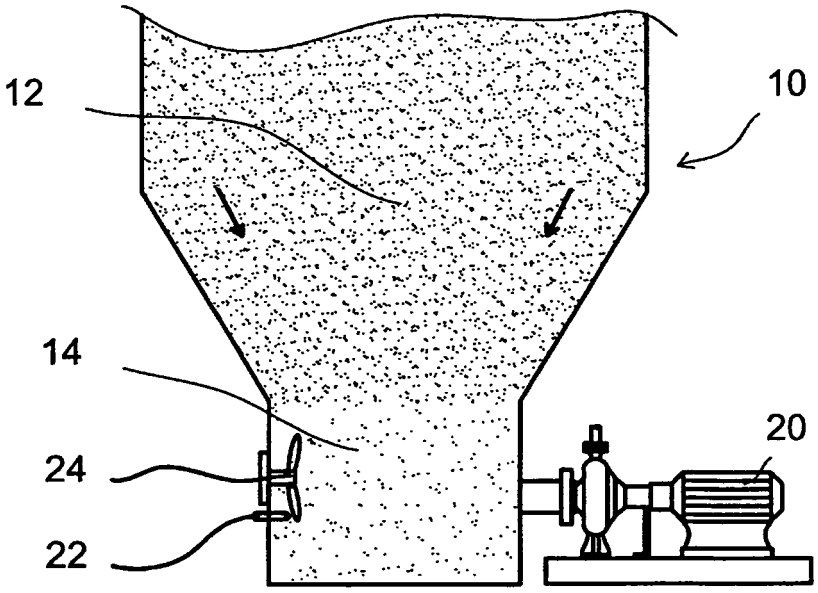

Fig. 1 Prior Art

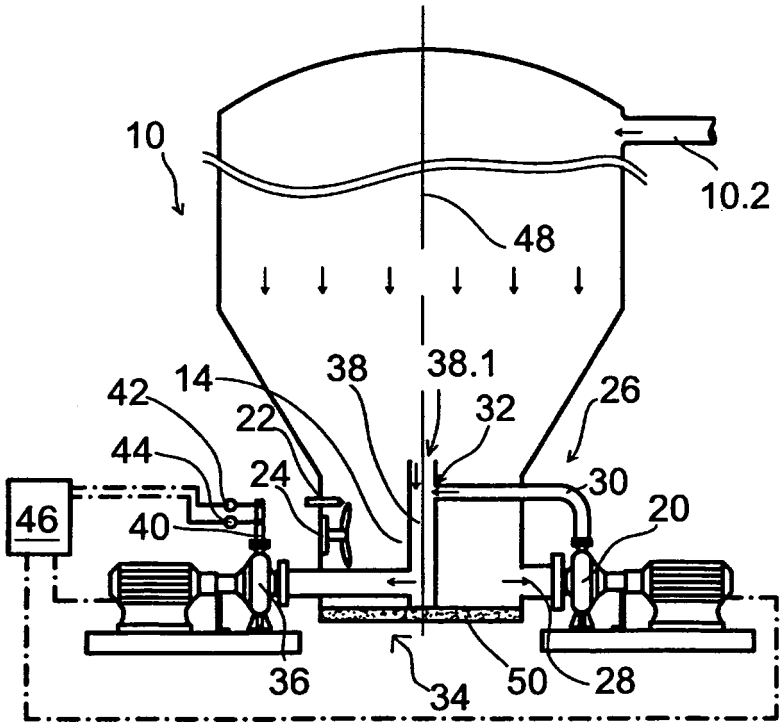

Fig. 2

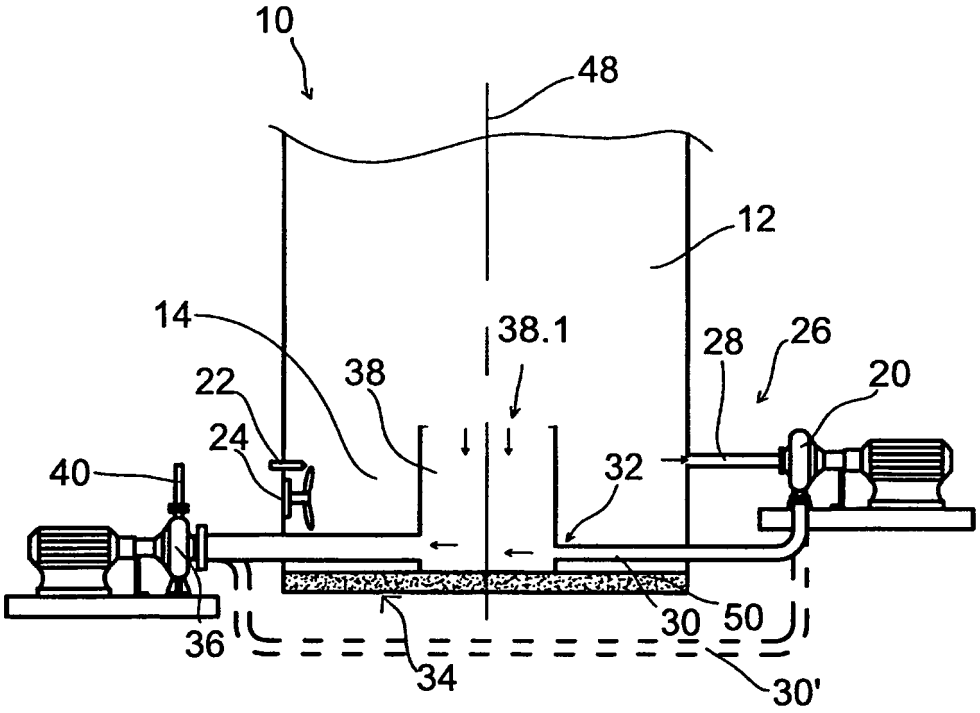
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Fig. 3

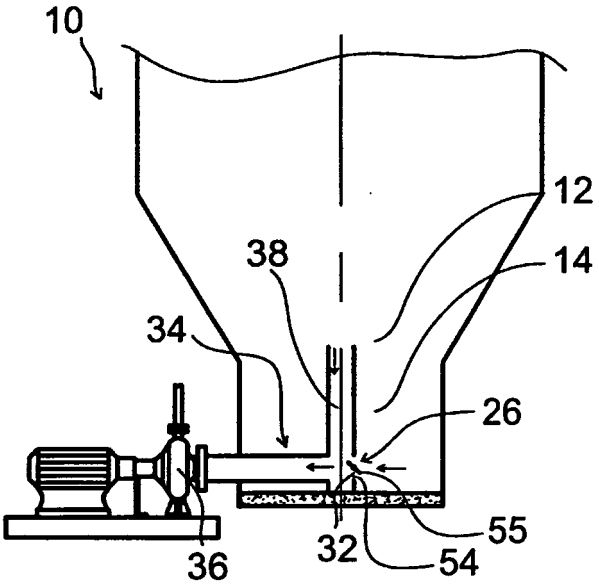
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Fig. 4

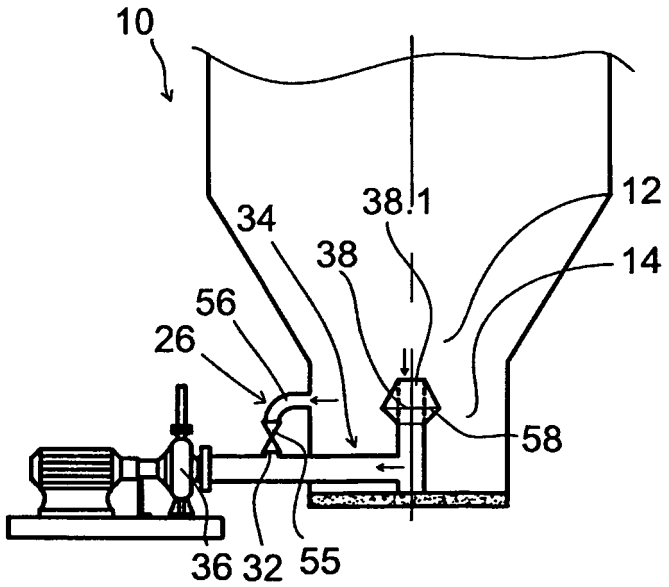

Fig. 5

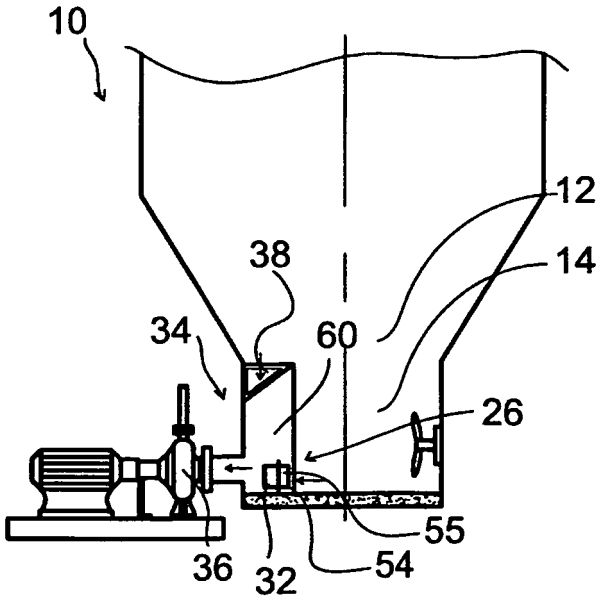

Fig. 6

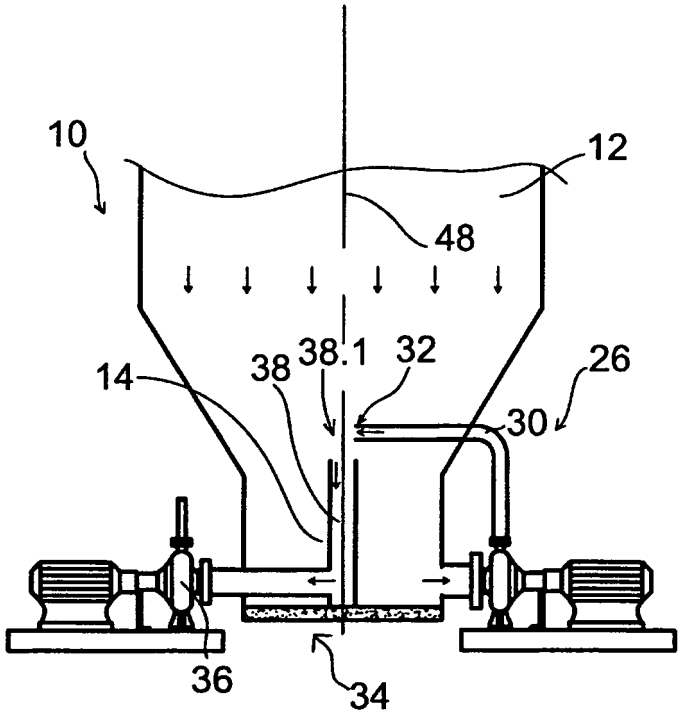
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Fig. 7

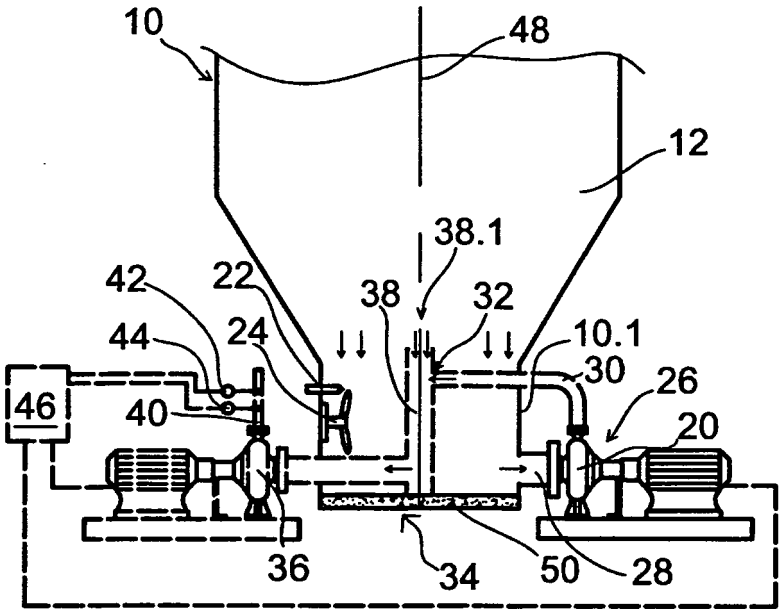
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Fig. 8

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 1702102 B1 **[0005]**
- EP 475669 B1 **[0006]**
- US 5538597 A **[0007]**
- EP 0269124 A2 **[0008]**