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(54) **METHODS AND APPARATUS FOR SLUDGE COLLECTION**

VERFAHREN UND VORRICHTUNG ZUR SCHLAMMABFÜHRUNG

PROCEDES ET APPAREIL DE COLLECTE DES BOUES

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Description

[0001] The present invention is directed to methods and apparatus for removing sludge byproducts that are created by water filtration processes from settling basins and tanks commonly found in water and wastewater treatment plants.

Background of the Invention

[0002] The settling basins in water and wastewater treatment plants are typically circular or rectangular concrete structures that have sloped bottoms that collect and store sludge. The basins are periodically drained and the sludge that has accumulated is flushed out through drains in the basin floor. Removal of the accumulated sludge is an important part of the overall treatment process, particularly since anaerobic bacterial activity may develop in the collected sludge over time. Therefore, in an ideal situation, the sludge is drained or removed without disturbing the material through excavation or manual removal. Moreover, it is further desirable from a cost and efficiency standpoint to be able to effectively remove the sludge from the basin when accumulation requires its removal.

[0003] Methods of removing sludge on a more or less continuous basis have been developed in an effort to reduce the need to completely drain and flush the basin. Techniques such as header and lateral piping systems, scraper mechanisms and vacuum or suction removal systems have been tried, without complete success.

[0004] Sludge removal systems are known where a moving apparatus is directed across the floor of the basin to remove the sludge in its path. The unit can be guided by rails and may use static head or eduction to remove the sludge. In some variations, the sludge collection basin is cone-shaped and the sludge collection apparatus moves along a circular or spiral path over the surface of the cone. Such systems are cumbersome and expensive and require a complex system of moving parts and precision machinery prone to breakdown in the gritty environment of a sludge bed.

[0005] In other systems, the inherent problems of moving equipment are avoided by providing a series of fixed pipes to remove the sludge. The pipes are selected so that a number of perforated pipes of small diameter are connected to larger diameter pipes, which are in turn connected to a lesser number of larger diameter pipes, and so on, until ultimately, the piping "tree" meets at a single header pipe of relatively large diameter that is controlled by a single collection valve. The single valve is opened to flush sludge into drains by means of the static head of water in the basin. In order for fixed grid sludge collection systems to collect evenly, it is critical that the flow capacity of the grid be compatible with the flow capacity of the downstream piping including the header, valve and basin outlet. Therefore, it is necessary to either use a very large valve and basin outlet in combination with a grid covering the entire basin or to use multiple valves and basin outlets in combination with smaller grids.

[0006] Another limitation to fixed sludge collection systems is that sludge is often not efficiently removed because the water in the basin tends to flow around the sludge and into the collection system. Typically, sludge may flow into the collection system when the valve first opens, creating a hole or depression in the sludge. This depression is known as a "rat hole." Once this depression exposes the collection orifice, water enters the collection system rather than sludge. Fixed collection systems that have valves open for extended periods of time usually collect more water than sludge. The tendency toward "rat holing" is dependent upon certain characteristics of the sludge such as its composition, concentration, viscosity, and compressibility. Sludge found in water treatment processes may have different compositions, varying amounts of suspended solids, and therefore different characteristics. For example, alum sludge will have different characteristics than ferric sludge or lime sludge.

[0007] A limitation to systems using single large outlets is that the system must be operated to remove sludge from the entire basin as soon as one area exhibits significant sludge accumulation. This type of operation is inherently inefficient and either wastes water unnecessarily or allows sludge to accumulate more heavily than is optimal for the process. A limitation to systems using the multiple basin outlets is the expense of the outlets and the difficulty in retrofitting the basin.

[0008] Finally, sludge removal is also sometimes attempted by providing systems that float and skim the sludge from the water overlying the bottom of the basin. However, such systems are inefficient, expensive and require complex systems of piping and suction, the latter of which are prone to breakdown since a gritty slurry of sludge and water must be skimmed and pumped.

[0009] Additionally, all of the known systems discussed above are difficult if not impossible to retrofit into existing sludge collection basins.

[0010] Therefore, it would be desirable to provide a sludge collection system that is simple and reliable, while still effectively removing sludge. Additionally, it would be desirable to permit the amount of removal applied to various areas of the bed to be adjusted or varied based upon sludge accumulation patterns. Finally, such a system would ideally be adaptable for both new construction and retrofit applications.

[0011] The document US-A-5143623 describes a sludge collection system comprising a manifold having a plurality of inlets connected to collectors and a collection valve.

Summary of the Invention

[0012] The present invention provides a sludge collection system and method according to claims 1 and 10.

[0013] The specialized piping of the sludge collection system of the present invention provides improved hy-

draulic characteristics. One advantage of the sludge collection system disclosed is that the performance of the system can be regulated and adjusted to meet the requirements of the filtration system. Another advantage of this invention is the ability to effectively remove sludge through smaller or fewer basin outlets than conventional fixed grid designs. The disclosed system is thereby more cost effective for retrofitting into existing basins.

[0014] The present invention uses the static head of the water in the basin to push sludge and water into a sludge collection grid, through a valve, through main drain piping and out of the basin. Each sludge collection basin is divided into a number of collection zones, and each zone may be sized and independently operated to allow the hydraulic characteristics of the system to be optimized. Optimization is preferably obtained by matching the flow rates of each zone to the capacity of the piping system used to remove the sludge from the basin.

[0015] The flow rate from each zone is dependent on the available static head and the diameter and number of the orifices in the zone. The flow rate can be optimized by varying the diameter and/or the number of orifices in the collection grid. In addition, the laterals may be spaced at varying pitches to provide further flexibility. The zones allow the system to provide the required amount of removal capacity in each area of the basin. In most basins, sludge tends to collect more rapidly in one area, and the removal capacity of each zone is thus preferably tailored to the anticipated sludge accumulation rate. The spacing of the orifices and the laterals can also be optimized for the collection of various types of sludge in order to reduce the effect of "rat holing." As a result, the present invention is more cost effective and efficient than previous systems.

[0016] In a preferred embodiment, the sludge collection system of the present invention comprises one or more header and lateral piping systems installed on the bottom of the basin that together create a sludge grid disposed within a zone. The header piping from each zone is connected to a valve and the valve selectively allows water and sludge from one or more selected sections to flow into a main drain pipe, and out of the basin for further processing. For example, the collected sludge can then be transferred to a holding tank or clarifier. The sludge may then be dewatered by one of several available methods and the supernatant returned to the head of the plant or otherwise carried away.

[0017] In various preferred embodiments, the sludge collection system of the present invention can be provided with either automated or manual controls. These controls preferably allow the operator to control the frequency and the duration of the operation of the valves within each zone independent of the other zones. In this manner, sludge can be removed from a particular zone or zones as necessary. The optimal frequency of withdrawal is dependent on site specific factors such as the condition of the raw water, chemical feeds, sludge characteristics, and the plant's capacity to handle concentrated sludge and unfinished water.

Brief Description of the Drawings

[0018]

FIG. 1 is a plan view of an embodiment of a sludge basin and a sludge collection system made in accordance with the present invention;

FIG. 2 is a partial side elevation view of the sludge basin and sludge collection system illustrated in FIG. 1;

FIG. 2A is a side elevation view similar to FIG. 2 illustrating an alternate embodiment of the present invention;

FIG. 3 is an end elevation view of the sludge basin and sludge collection system illustrated in FIG. 2A;

FIG. 4 is a side elevation view of a mud valve;

FIG. 5A is a perspective view of a multiple port valve (not according to the claims); and

FIG. 5B is a perspective view of an alternate embodiment of a multiple port valve (not according to the claims).

Detailed Description of the Preferred Embodiments

[0019] Referring now to FIG. 1, a plan view of a sludge collection system 100 made in accordance with the present invention is illustrated. It will be understood that the embodiment shown in FIG. 1 is a representative installation and that the present invention is by its nature, modular, flexible and adaptable to a variety of sludge collection basins, both existing and those under construction. In FIG. 1, the sludge basin 50 is rectangular and is divided into three equal zones 52,54,56 along its length. In other embodiments, as explained below, the zones need not be equal, or arrayed along a central axis. Each zone includes a multiple inlet manifold 10, from which four main collection conduits 12 extend. In one embodiment of the invention, the multiple inlet manifold 10 is a central collection hub. Thus, each zone, 52,54,56 is in turn, subdivided into four sections. In other embodiments, less than four sections or more than four sections can be provided, and the sections themselves can be of unequal sizes or be asymmetrically arrayed about the multiple inlet manifold 10. Connected to each main collection conduit 12 is a spreader conduit 14, and extending from each spreader conduit 14 are a plurality of collection laterals 16. The main collection conduit 12 and the spreader conduit 14 are preferably of approximately equal diameter, while the collection laterals 16 are of a smaller diameter than the spreader conduit 14. As illustrated in FIG. 1, the pitch of the collection laterals along the length of the spreader conduit 14 can be varied. The left hand zone 52 has a smaller pitch, and thus a higher number of collection laterals 16. The laterals in zone 52 may also have a higher number of orifices and/or larger diameter orifices than in the adjacent zones. In application, this is because

this area 52 of the basin 50 accumulates sludge at a higher rate than the adjacent zones 54,56. In conjunction with the other aspects of varying the sizes and configurations of the zones, it will be readily appreciated how the geometry of the sludge collection system of the present invention can be infinitely varied to suit the conditions of the collection basin 50.

[0020] A side elevation view of two zones 52,54 of the sludge collection system illustrated in FIG. 1 is shown in FIG. 2. In this view it can be seen how the main collection conduits 12 and spreader conduits 14 extend from the multiple inlet manifold 10. This view further illustrates the multiple inlet manifold 10 and the main drain conduit 20 that is selectively opened in conjunction with the operation of the multiple inlet manifold 10. FIG. 2A and FIG. 3 each further illustrate one of the alternate preferred embodiments of the present invention. As shown in FIG. 2A, the manifold 10 has multiple manifold inlets 11 that provide for the flow of sludge from the main collection conduits 12 into the manifold 10. FIG. 3 is an end elevation view of the sludge collection system 100 illustrated in FIG. 2A. The drain 20, shown in FIG. 3, which is in fluid communication with the manifold outlet is a single central drain that is perpendicular to the drains illustrated in FIG. 2. The arrows, shown in FIG. 3, depict the direction of the flow of sludge S through the collection grid by means of the static head of water in the basin. The varying level of water W in the basin is also shown in FIG. 3.

[0021] The piping layout described above, in conjunction with the other aspects of the present invention set forth below, permits sludge to be collected at varying cycles. In the illustrated preferred embodiment, approximately 70% of the sludge collects in the first zone 52, and the four sections of this zone can be flushed as often as necessary, for example, once an hour. The center zone 54 collects about 20% of the sludge and needs to be flushed daily, or at another frequency usually determined empirically. Finally, since the remaining sludge gravitates to the farthest zone 56, it may be necessary to flush these four sections as infrequently as once a week. It should be understood that the cycling can be accomplished in any order, with any frequency, simply by controlling valves using known manual, semi-automatic or automatic controls. In certain embodiments, if the valves are opened and closed in a dynamic sequence, the sludge can be moved or "swept" into a particular zone or area for collection in a more efficient manner.

[0022] Those of skill in the art will realize, however, that the size, shape and location of the zones are dependent on a number of factors. The available static head of water in the basin and the available capacity of the outlet or outlets to handle the flow of sludge and water will to some extent dictate the ability of the system to be flushed, and will thus influence the number and size of the collection zones. For example, if a relatively low static head is available or if the outlets are of relatively small size, the number of zones must be greater, i.e., the area of each zone must be smaller or the number and/or size of collection orifices must be reduced. Sludge tends to settle at a greater rate in certain areas of a basin, depending upon a number of factors, including basin layout, process flow and sludge characteristics. In areas where sludge accumulates rapidly, a greater number of collection zones is preferably provided so that the overall amount of sludge that accumulates per zone is approximately equal. Similarly, the physical dimensions of the settling basin and the presence or absence of sloped floors, trenches, supporting structures and other obstructions in the basin will influence the sludge profile and will thus dictate to some extent the sizing and placement of the piping that defines the collection zones.

[0023] One aspect of the present invention is the provision of a collection valve or valves that selectively interconnect one or more of the collection zones and the drainage system. Preferably, any single zone can be drained at any given time. However, embodiments of the present invention are envisioned where more than one zone is drained at a time, or where zones are partially drained or drained in alternating sequences. For example, FIG. 4 shows one preferred embodiment that uses an actuated disc valve 132 or mud valve enclosed in a canister 114 or vessel. Transfer piping or the main collection conduits 12 from each of the sections is connected to the vessel 114, through the top or its sides, and the bottom zone of the vessel is connected to a drain pipe. With this disc valve 132, the main collection conduits 12 from all the sections of that particular zone are actuated, all at the same time, to collect sludge or not.

[0024] FIG. 5A shows referentially a multiple port valve 110, illustrated as a four-port valve, for collecting sludge at one section of a zone independently from the other sections of that zone. A connecting pipe 116 is moveable between four ports 118. When the valve 110 is actuated, the static head of water pushes sludge S, along with the flushing water, through all of the interconnected sections, through the transfer piping 12, through the valve 110 and into the drain pipe 20 by means of the manifold outlet 15. The illustrated embodiment is connected to four sections and thus has four openings 118. In other embodiments, a greater number or a lesser number of sections could be serviced, with a commensurate number of openings 118 being required. In certain embodiments, the connecting pipe 116 can be actuated to continuously sweep the surface of the top of the canister 114 and thus systematically pass over each of the openings 118. By varying the rate of the sweep and/or building in dwell points, the connecting pipe 116 may reside over one or more openings 118 for a set period of time.

[0025] An alternate referential embodiment of a valve is illustrated in FIG. 5B. This configuration is a multiple port valve 120 and again is preferably used in collecting sludge in one section of a zone independent from the other sections of that zone. Transfer piping from each zone is connected to one of the valve ports 128, and a center port 126 is connected to a drain pipe. A rotating

valve bonnet 122 rotates around the valve body 124 and at each position the bonnet 122 interconnects a different port 128, allowing sludge from each section to flow into the main drain piping (20 in FIG. 2).

[0026] In the preferred valve configuration illustrated and described in Fig. 4, air should be prevented from entering the system through the drain pipe 20. If air were to become trapped in the transfer piping, valve canister or drain piping, it would likely inhibit the flow of sludge and water and also cause excessive vibration. It is further important to slowly open and close the valves and to prevent water hammer, which could also damage the system.

[0027] As noted above, a drawback of many prior art systems is that the sludge collection systems needed to be designed and installed when the sludge collection basin was constructed. This is often difficult, and even if accomplished, over time and changing conditions, the sludge collection characteristics of the basin are likely to change. Sludge collection characteristics may change, for example, when there is a change in the chemical coagulant that is used or when there is a change in the overall flow rate of the plant. Thus, an important advantage of the present invention, in addition to the ability to selectively remove sludge from a zone, is that the piping and valving system described above can be retrofitted into existing sludge collection basins, and even after being installed, can be modified if the sludge collection parameters dictate.

Claims

1. A sludge collection system (100), comprising:

a sludge basin (50) having at least one collection zone (52, 54, 56), the at least one collection zone having a manifold (10) that has a plurality of manifold inlets (11) and a manifold outlet, wherein the manifold is situated in the interior of the at least one collection zone;
a plurality of collection laterals (16) that are in fluid communication with the manifold by way of said plurality of manifold inlets;
a drain (20), in fluid communication with the manifold outlet for removing sludge from the manifold;
at least one collection valve (132) in the manifold that permits flow of sludge from the plurality of collection laterals through the manifold; and
at least first and second main collection conduits (12) connecting the plurality of collection laterals (16) to the manifold inlets (11), the first main collection conduit, ***[deletion(s)]*** the collection valve, and the second main collection conduit being operable such that sludge may simultaneously pass through the first main collection conduit and the second main collection conduit and to the drain (20).

2. A sludge collection system of claim 1, wherein the sludge basin (50) includes first and second zones; and,
a manifold (10) is situated in the interior of each of the first and second zones.

3. A sludge collection system of claim 1 or 2, further comprising a plurality of main collection conduits (12) that connect the plurality of collection laterals to the plurality of manifold inlets (11).

4. A sludge collection system of claim 1, 2 or 3, wherein the sludge basin (50) includes first and second zones each having a plurality of the collection laterals (16), the collection laterals in the first zone are spaced at a first pitch and the collection laterals in the second zone are spaced at a second pitch.

5. A sludge collection system of claim 3, wherein the at least one collection valve is a multiple port valve.

6. A sludge collection system of claim 5, wherein the multiple port collection valve is a four-port valve.

7. A sludge collection system of any preceding claim, further comprising four main collection conduits (12) that connect the collection laterals to the manifold inlets (11), wherein the manifold contains at least four manifold inlets that are each in fluid communication with a separate main collection conduit.

8. A sludge collection system of any preceding claim, wherein the sludge basin (50) is rectangular and the drain comprises a central longitudinal drain line.

9. A sludge collection system of any preceding claim, wherein the sludge basin (50) includes first and second zones each having a plurality of the collection laterals, wherein the collection laterals each have a diameter and a plurality of collection orifices, wherein one or more of the following is different between the first and second zones:

the diameter of the collection laterals;
the number of collection orifices in the collection laterals; and,
the diameter of the collection laterals and the number of the collection orifices in the collection laterals.

10. A method of removing sludge from a sludge basin, comprising the steps of:

providing a sludge collection system (100) comprising:

a sludge basin (50) having at least one collection zone (52, 54, 56), the collection zone having a manifold (10) situated in the interior of the zone and having a plurality of manifold inlets (11) and a manifold outlet;
a plurality of collection laterals (16) that are in fluid communication with the manifold by way of said plurality of manifold inlets;
a drain (20), in fluid communication with the manifold outlet for removing sludge from the manifold;
a collection valve (132) in the manifold that permits flow of sludge from the collection laterals through the manifold;
at least first and second main collection conduits (12) connecting the collection laterals to the manifold inlets; and
collecting sludge from the sludge basin by actuating the collection valve in the manifold to simultaneously draw sludge through the at least first and second main collection conduits and to the drain.

11. A method of Claim 10, wherein the step of collecting sludge is automated.

12. A method of Claim 10 or 11, wherein the sludge collection system (100) further includes first and second zones each having a plurality of collection laterals (16):

the method further comprises the step of:

varying the rate of sludge collection from the first and second zones.

13. A method of Claim 12, wherein the step of varying the rate of sludge collection among the zones is automated.

14. A method of any one of Claims 10 to 13, wherein the sludge collection system (100) further comprises a plurality of main collection conduits (12) that connect the collection laterals (16) to the manifold inlets (11), and a plurality of sections proximate to the plurality of main collection conduits.

15. A method of Claim 14, wherein the manifold (10) receives four main collection conduits thereby defining four sections in one zone.

16. A method of any one of Claims 10 to 15, wherein the sludge collection system (100) further includes first and second zones each having a plurality of collection laterals (16), the collection laterals in the first zone are at a pitch different from the pitch of the collection laterals in the second zone.

17. A method of any one of Claims 10 to 16, wherein the sludge collection system further includes first and second zones each having a plurality of collection laterals (16), wherein at least one of:

the diameter of the collection laterals, and
the number of collection orifices in the collection laterals, is different among the first and second zones.

18. A method of any one of Claims 10 to 18, wherein the sludge collection system further includes first and second zones, a manifold (10) is situated in the interior of each of the first and second zones.

Patentansprüche

1. Eine Schlammsammlungsanlage (100), bestehend aus:

einem Schlammbecken (50), das mindestens eine Sammlungszone hat (52, 54, 56), welche Sammlungszone einen Verteiler (10) hat, der mehrere Verteilereinlässe (11) hat, und einen Verteilerauslass, wobei sich der Verteiler innerhalb von mindestens einer Sammlungszone befindet;
mehrerer Sammlungszweige (16), die in flüssiger Kommunikation mit dem Verteiler durch die genannte Mehrheit der Verteilereinlässe stehen;
einem Abfluss (20), der in flüssiger Kommunikation mit dem Verteilerauslass steht, um Schlamm aus dem Verteiler zu entfernen;
mindestens einem Sammlungsventil (132) im Verteiler, dass den Fluss des Schlamms von der Mehrheit der Sammlungszweige durch den Verteiler gestattet; und
mindestens einen ersten und einen zweiten Hauptsammlungskanal (12), zur Verbindung der mehrfachen Sammlungszweige (16) mit den Verteilerauslässen (11), wobei der erste Hauptsammlungskanal, das Sammlungsventil und der zweite Hauptsammlungskanal bedienungsfähig sind, und der zweite Hauptsammlungskanal so eingerichtet ist, dass der Schlamm gleichzeitig durch den ersten Hauptsammlungskanal und den zweiten Hauptsammlungskanal zum Ausfluss (20) gelangen kann.

2. Eine Schlammsammlungsanlage nach Anspruch 1, wobei das Schlammbecken (50) die erste und die zweite Zonen einschließt; und,
wobei sich ein Verteiler (10) innen in jeweils der ersten und der zweiten Zone befindet.

3. Eine Schlammsammlungsanlage nach Anspruch 1

oder 2, die außerdem eine Mehrheit von Hauptsammlungskanälen (12) aufweist, die die Mehrheit von Sammlungszweigen mit der Mehrheit von Verteilereinlässen (11) verbindet.

4. Eine Schlammsammlungsanlage nach Anspruch 1, 2 oder 3, wobei das Schlammbecken (50) eine erste und eine zweite Zone einschließt, die je mehrere Sammlungszweige (16) haben, und wobei die Sammlungszweige in der ersten Zone einen ersten Abstand haben, und die Sammlungszweige in der zweiten Zone mit einem zweiten Abstand angeordnet sind.

5. Eine Schlammsammlungsanlage nach Anspruch 3, wobei mindestens ein Sammlungsventil ein Mehrwegventil ist.

6. Eine Schlammsammlungsanlage nach Anspruch 5, wobei das Mehrwegsammlungsventil ein Vierwegventil ist.

7. Eine Schlammsammlungsanlage nach einem der vorgenannten Ansprüche, einschließlich vier Hauptsammlungskanäle (12), die die Sammlungszweige mit den Verteilereinlässen (11) verbinden, wobei der Verteiler mindestens vier Verteilereinlässe einschließt, die je in flüssiger Kommunikation mit einem separaten Hauptsammlungskanal stehen.

8. Eine Schlammsammlungsanlage nach einem der vorgenannten Ansprüche, wobei das Schlammbekken (50) rechteckig ist, und der Abfluss eine zentrale Längsabflussleitung einschließt.

9. Eine Schlammsammlungsanlage nach einem der vorgenannten Ansprüche, wobei das Schlammbekken (50) eine erste und eine zweite Zonen einschließt, die jeweils mehrere Sammlungszweige haben, wobei die Sammlungszweige je einen Diameter und eine Mehrheit von Sammlungsöffnungen haben, wobei eines oder mehreres wie folgt zwischen der ersten und der zweiten Zone verschieden sein kann:

der Diameter der Sammlungszweige;
die Anzahl der Sammlungsöffnungen in den Sammlungszweigen; und
der Diameter der Sammlungszweige und die Anzahl von Sammlungsöffnungen in den Sammlungszweigen.

10. Eine Methode zur Entfernung von Schlamm aus einem Schlammbecken einschließlich der folgenden Schritte:

die Bereitstellung einer Schlammsammlungsanlage (100) einschließlich:
eines Schlammbeckens (50), das mindestens eine Sammlungszone (52, 54, 56) hat, wobei die Sammlungszone einen Verteiler (10) hat, der sich im Inneren der Zone befindet, und der mehrere Verteilereinlässe (11) und einen Verteilerauslass hat,
mehrere Sammlungszweige (16), die in flüssiger Kommunikation mit dem Verteiler durch vorgenannte Mehrheit der Verteilereinlässe stehen;
einen Abfluss (20), der m flüssiger Komminkation mit dem Verteilerauslass zur Entfernung von Schlamm vom Verteiler steht;
ein Sammlungsventil (132) im Verteiler, das den Fluss von Schlamm von den Sammlungszweigen durch den Verteiler gestattet;
mindestens einen ersten und einen zweiten Hauptsammlungskanal (12), um die Sammlungszweige mit den Verteilereinlässen zu verbinden; und zur Sammlung von Schlamm vom Schlammbecken, indem das Sammlungsventil im Verteiler aktiviert wird, um gleichzeitig Schlamm durch mindestens den ersten und den zweiten Sammlungskanal zum Ausfluss zu leiten.

11. Eine Methode nach Anspruch 10, wobei der Schritt der Schlammsammlung automatisiert wird.

12. Eine Methode nach Anspruch 10 oder 11, wobei die Schlammsammlungsanlage (100) weiterhin eine erste und eine zweite Zone mit je einer Mehrheit von Sammlungszwiegen (16) einschließt:

die Methode schließt außerdem den folgenden Schritt ein:

verschiedene Raten der Schlammsammlung aus der ersten und der zweiten Zone.

13. Eine Methode nach Ansprach 12, wobei der Schritt der Veränderung der Rate der Schlammsammlung zwischen den Zonen automatisiert ist.

14. Eine Methode nach einem der Ansprüche 10 bis 13, wobei die Schlammsammlungsanlage (100) weiterhin eine Mehrheit von Hauptsammlungskanälen (12) einschließt, die die Sammlungszweige (16) mit den Verteilereinlässen (11) verbinden, und mehrere Abschnitte neben der Mehrheit der Hauptsammlungskanäle.

15. Eine Methode nach Anspruch 14, wobei der Verteiler (10) vier Hauptsammlungskanäle empfängt und dabei vier Abschnitte in einer Zone definiert.

16. Eine Methode nach einem der Ansprüche 10 bis 15, wobei die Schlammsammlungsanlage (100) außer-

dem eine erste und eine zweite Zone einschließt, die je eine Mehrheit von Sammlungszweigen (16) haben, und wobei die Abstande der Sammlungszweige in der ersten Zone einen anderen Abstand haben, als die Sammlungszweige in der zweiten Zone.

17. Eine Methode nach einem der Ansprüche 10 bis 16, wobei die Schlammsammlungsanlage außerdem eine erste und eine zweite Zone einschließt, die je eine Mehrheit von Sammlungszweigen (16) haben, wobei mindestens einer der:

Diameter der Sammlungszweige, und
die Anzahl der Sammlungsöffnungen in den Sammlungszweigen, unter der ersten und der zweiten Zone verschieden ist.

18. Eine Methode nach einem der Ansprüche 10 bis 17, wobei die Schlammsammlungsanlage weiterhin eine erste und eine zweite Zone einschließt, und wo sich ein Verteiler (10) im inneren jeder der ersten und der zweiten Zone befindet.

Revendications

1. Un système de raclage de boues (100), comprenant :

Un bassin (50) ayant au moins une zone de raclage (52, 54, 56), l'au moins une zone de raclage ayant un manifold (10) ayant un nombre d'entrées de manifold (11) et une sortie de manifold, où est situé le manifold à l'intérieur de l'au moins une zone de raclage;
Un nombre de canalisations secondaires de raclage (16) en communication fluide avec le manifold par moyen desdits nombres d'entrées de manifold;
Un tuyau (20) d'évacuation, en communication fluide avec la sortie du manifold pour retirer les boues du manifold;
Au moins une soupape (132) dans le manifold permettant l'écoulement des boues du nombre des canalisations secondaires de raclage traversant le manifold, et
Au moins des canalisations primaires et secondaires (12) raccordant le nombre des canalisations secondaires de raclage (16) aux entrées du manifold (11), la première canalisation de raclage principale, la soupape de raclage et la seconde canalisation principale de collection étant fonctionnelles de telle manière à ce que les boues passent en même temps par la première canalisation de raclage principale et la seconde canalisation de raclage principale et au tuyau d'évacuation (20)

2. Un système de raclage de boues figurant à la revendication 1, où le bassin à boues (50) comprend des zones primaires et secondaires ; et, un manifold (10) est situé à l'intérieur de chacune des zones primaire et secondaire.

3. Un système de raclage de la revendication 1 ou 2, comprenant en plus un nombre de canalisations de raclages principales (12) qui raccordent le nombre des canalisations secondaires de raclage au nombre des entrées du manifold (11).

4. Un système de raclage de boues des revendications 1, 2 ou 3, ou le bassin de boues (50) comprend des zones primaires et secondaires chacune ayant un nombre de canalisations de raclage secondaires (16), les canalisations secondaires de raclage dans la première zone sont espacées à un premier pas et les canalisations secondaires dans la seconde zone sont espacées à un second pas.

5. Un système de raclage de boues de la revendication 3 où au moins une soupape de raclage est une soupape multivoies.

6. Un système de raclage de boues do la revendication 5, où la soupape multivoies de raclage est une soupape à quatre orifices.

7. Un système de raclage de boues de tout revendication précédentes, composé en plus de quatre canalisations principales de raclage (12) qui raccordent les canalisations secondaires de raclage aux entrées du manifold (11), dans lequel le manifold contient au moins quatre entrées de manifold qui chacune est en communication fluide avec une canalisation principale séparée de raclage.

8. Un système de raclage de boues de toute revendication précédente, dans lequel le bassin de boues (50) est rectangulaire et le tuyau d'évacuation comprend une tuyauterie de drainage longitudinale centrale.

9. Un système de raclage de toute revendication précédente où le bassin de boues (50) comprenant des zones primaires et secondaires chacune ayant un nombre de canalisations secondaires de raclage, dans lesquelles les canalisations secondaires de raclage chacune ont un diamètre et un nombre d'orifices de raclage dans lesquelles une ou plusieurs des suivants diffèrent entre les zones primaires et secondaires ;
le diamètre des canalisations secondaires de raclage ;
le nombre d'orifices de raclage dans les canalisations secondaires de raclage et,
le diamètre des canalisations secondaires de racla-

ge et le nombre des orifices de raclage dans les canalisations secondaires.

10. Une méthode pour retirer les boues d'un bassin à boues, comprend les étapes :

fournir un système de raclage de boues (100) comprenant :

un bassin à boues (50) ayant au moins une zone de raclage (52, 54, 56), la zone de raclage ayant un manifold (10) situé à l'intérieur de la zone et ayant un nombre d'entrées de manifold (11) et une sortie de manifold;
un nombre de canalisations secondaires de raclage (16) qui sont en communication fluide avec le manifold par voie dudit nombre d'entrées de manifold;
un tuyau d'évacuation (20), en communication fluide avec la sortie du manifold pour retirer les boues du manifold ;
Une soupape de raclage (132) dans le manifold qui permettant l'écoulement des boues des canalisations de raclage à travers le manifold ;
Au moins des canalisations de raclage primaires et secondaires (12) raccordant les canalisations de raclage aux entrées du manifold ; et raclage des boues du bassin à boues en activant la soupape dans le manifold afin de tirer en même temps les boues par au moins les canalisations secondaires primaires et second et au tuyau d'évacuation.

11. Une méthode de la Revendication 10, où l'étape de raclage de boues est automatisée.

12. Une méthode de la revendication 10 ou 11 où le système de raclage de boues (100) comprend en plus des zones primaires et secondaires chacune
Ayant un nombre de canalisations de raclage (16) :

La méthode comprend en plus l'étape de :

Moduler le taux de raclage do boues des premières et secondes zones

13. Une méthode de la revendication 12 où l'étape de modulation du taux de raclage de boues parmi les zones est automatisé.

14. Une méthode parmi toutes les revendications 10 à 13 où le système de raclage de boues (100) comprend en plus un nombre de canalisations principales de raclage (12) qui raccordent les canalisations secondaires de raclage (16) aux entrées du manifold (11), et un nombre de sections situées proche au nombre des canalisations principales de raclage.

15. Une méthode do la revendication 14, où le manifold (10) reçoit quatre canalisations de raclage principales définissant ainsi quatre sections dans une zone.

16. Une méthode parmi toutes les revendications 10 à 15 où le système de raclage de boues (100) comprend en plus des zones primaires et secondaire chacune ayant un nombre de canalisations secondaires de raclage (16), les canalisations secondaires de raclage dans la première zone sont à un pas différent du pas des canalisations secondaires de raclage dans la zone secondaire.

17. Une méthode parmi toutes les revendications 10 à 16 où le système de raclage de boues comprend en plus des zones primaires et secondaires chacune ayant un nombre de canalisations secondaires de raclage (16) parmi lesquelles au moins une :

le diamètre des canalisations secondaires de raclage et le nombre des orifices de raclage dans les canalisations secondaires de raclage diffèrent entre les zones primaires et secondaires.

18. Une méthode parmi toutes les revendications 10 à 17 où le système de raclage de boues comprend en plus des zones primaires et secondaires, un manifold (10) situées dans l'intérieur de chacune des zones primaires et secondaires.

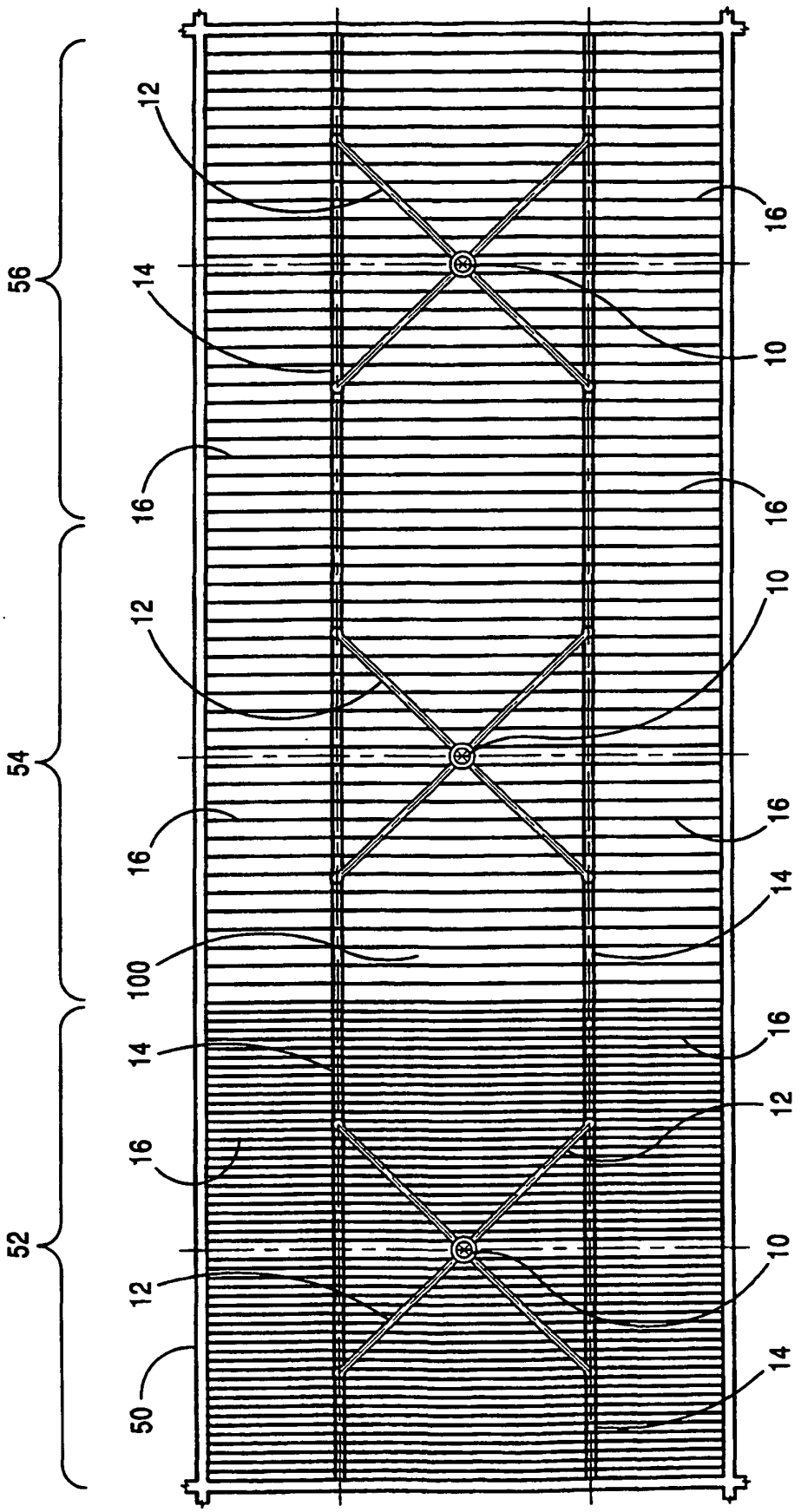

FIG. 1

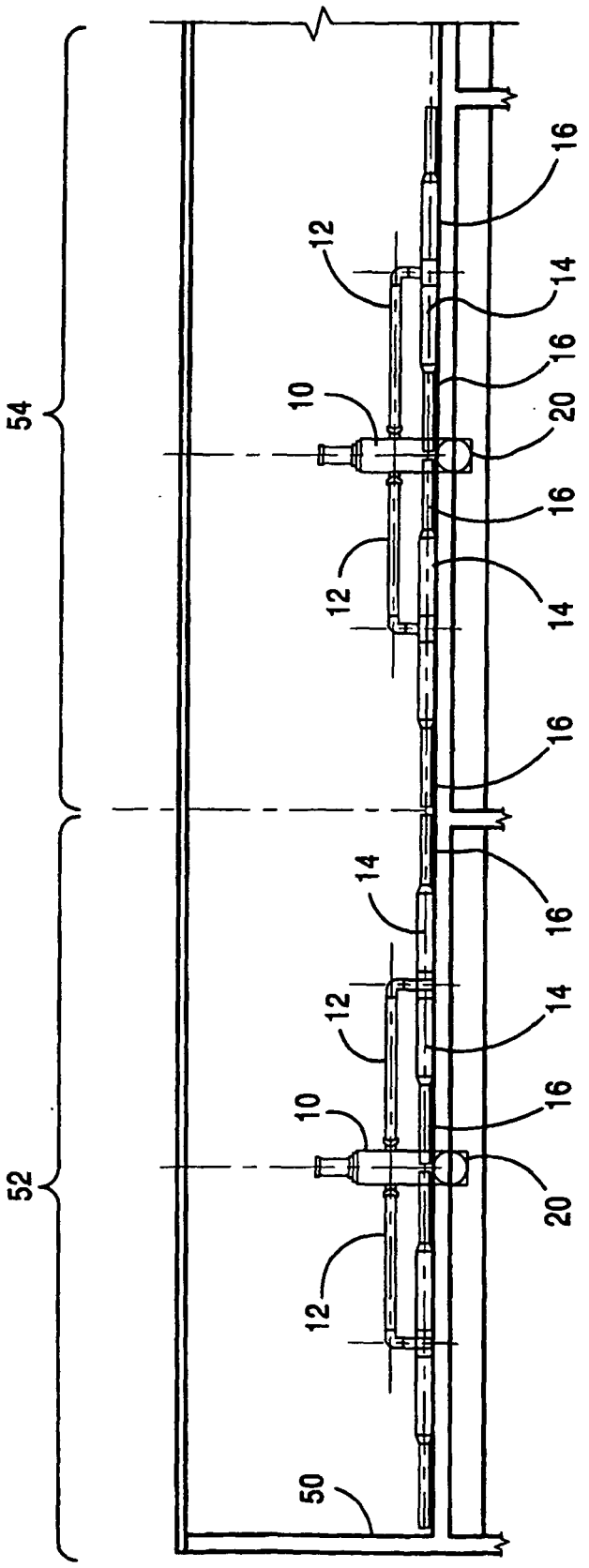

FIG. 2

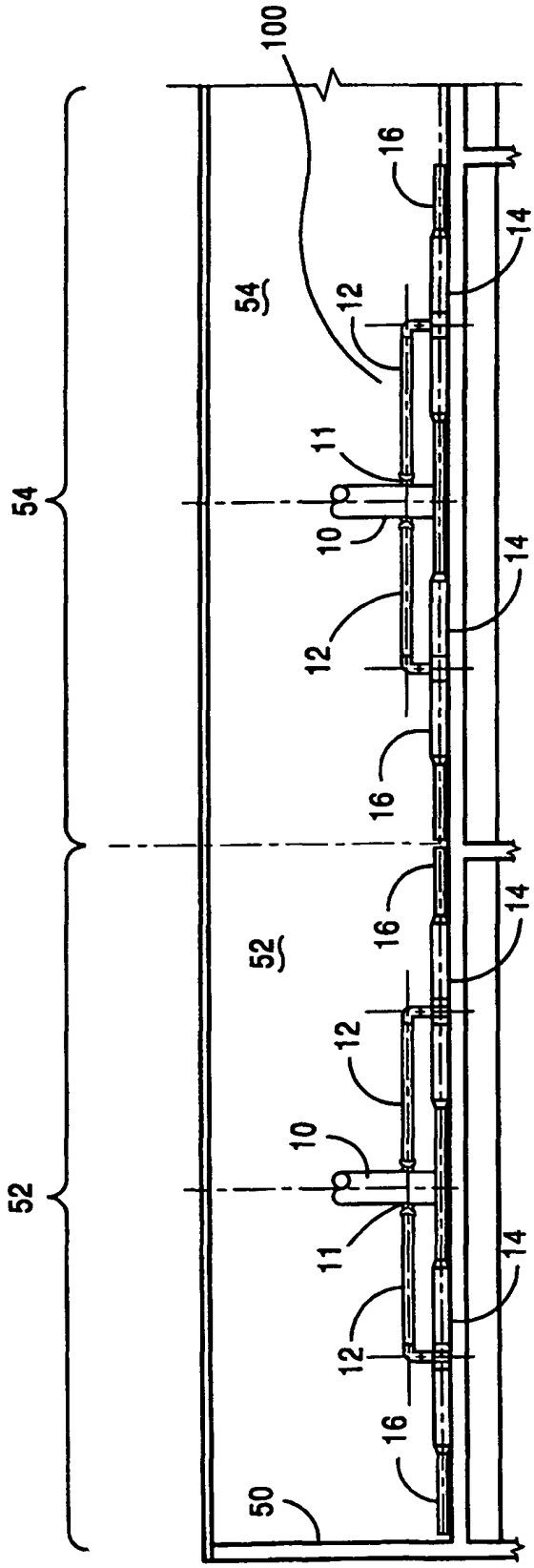
100
16
14
54
12
11
10
14
12
16
16
14
52
12
10
11
14
12
16
50
54
52

FIG. 2A

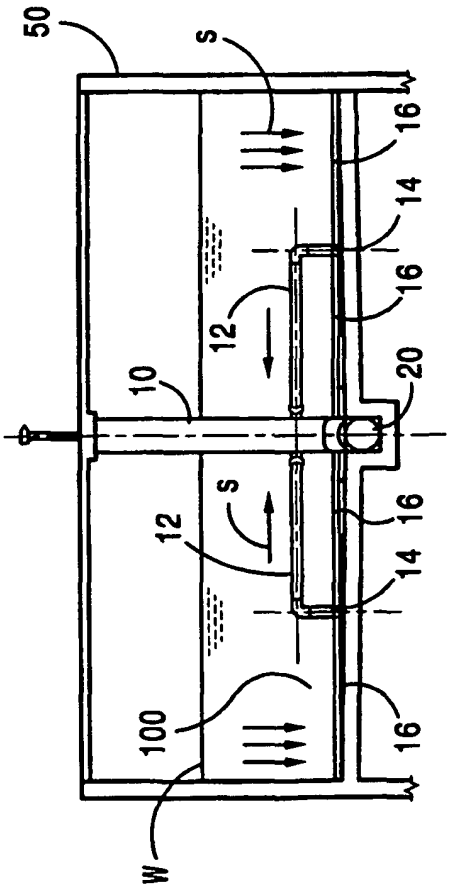
50
S
16
14
16
12
10
20
S
12
14
16
100
16
W

FIG. 3

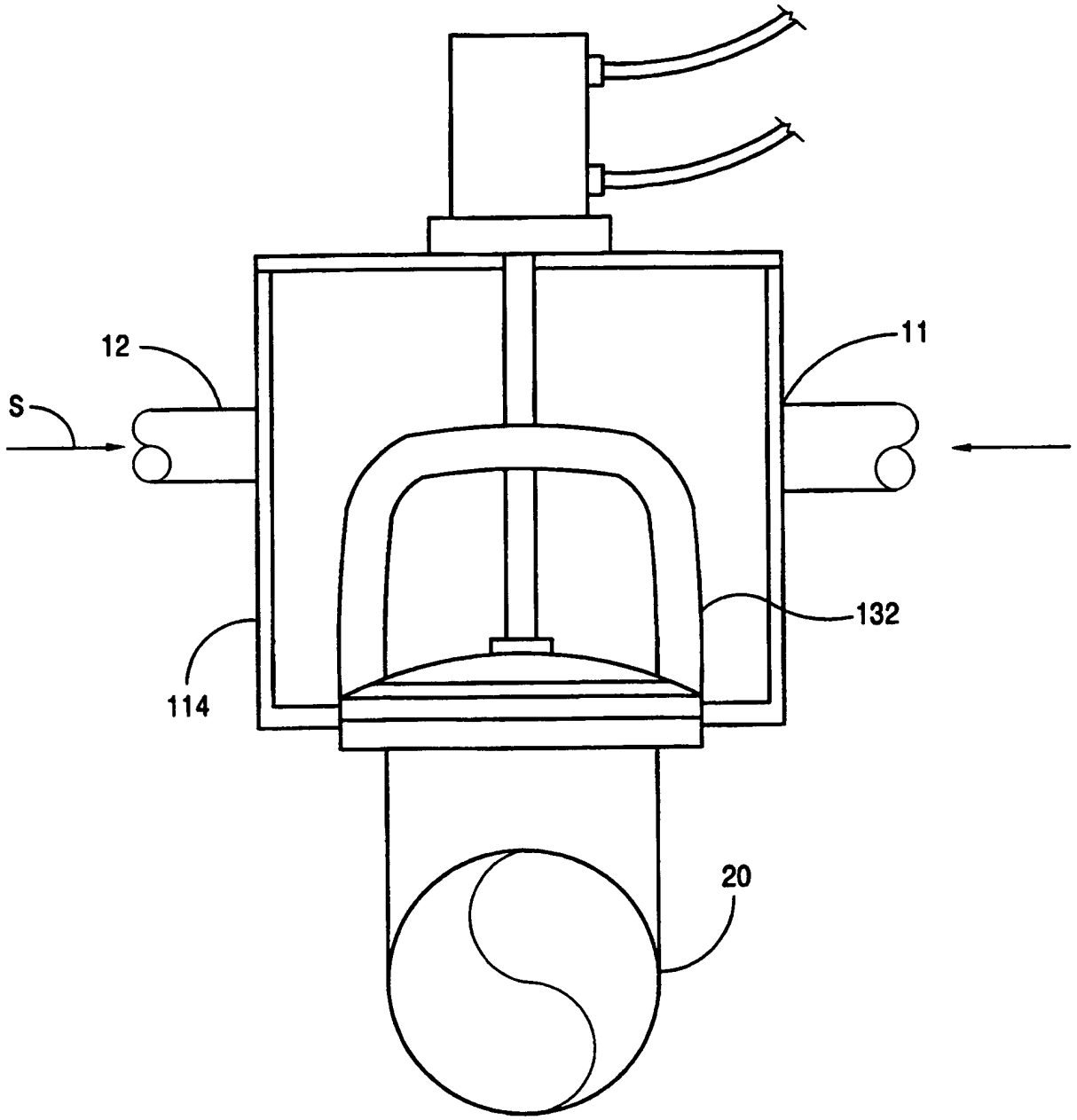

FIG. 4

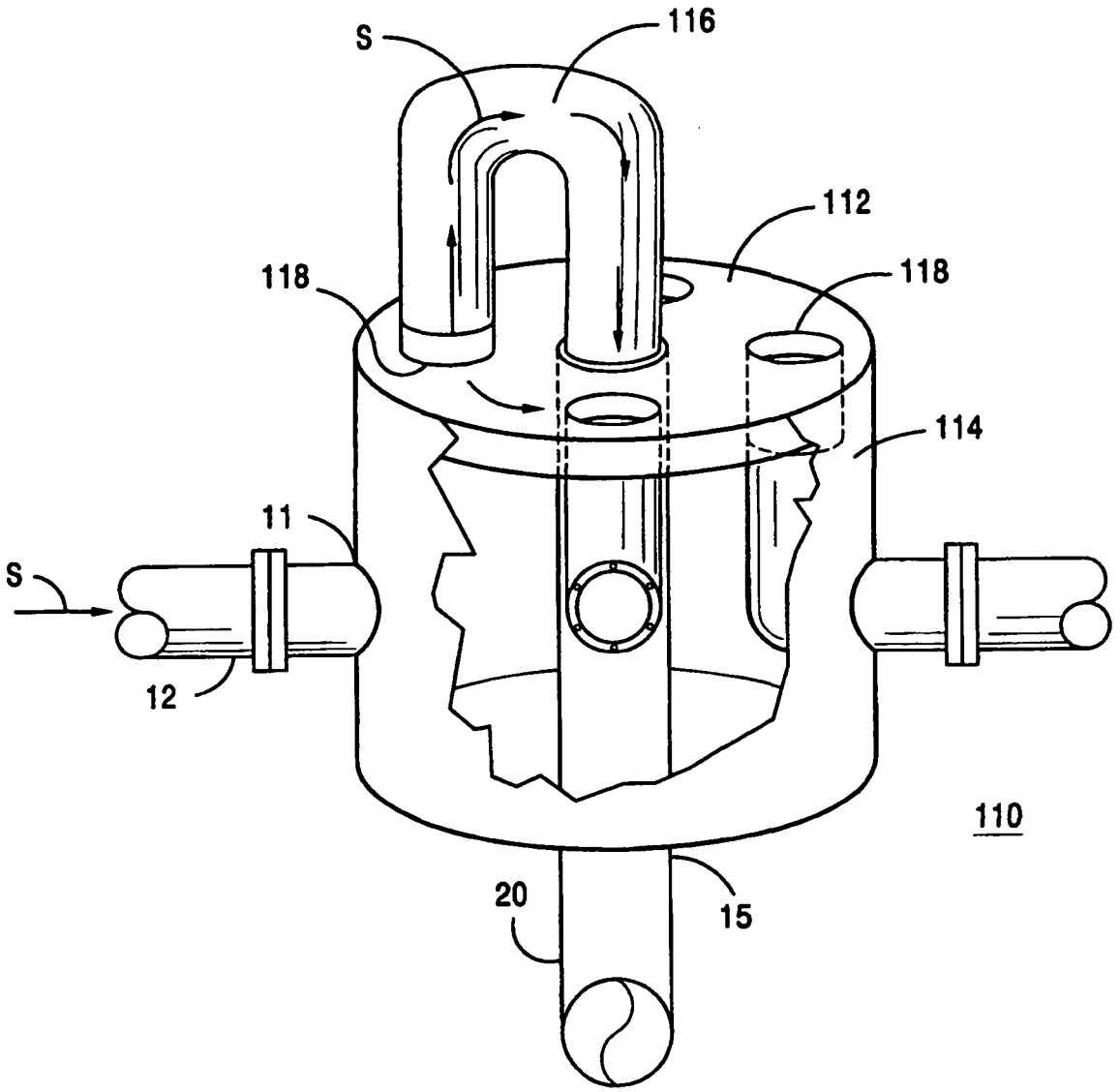

FIG. 5A

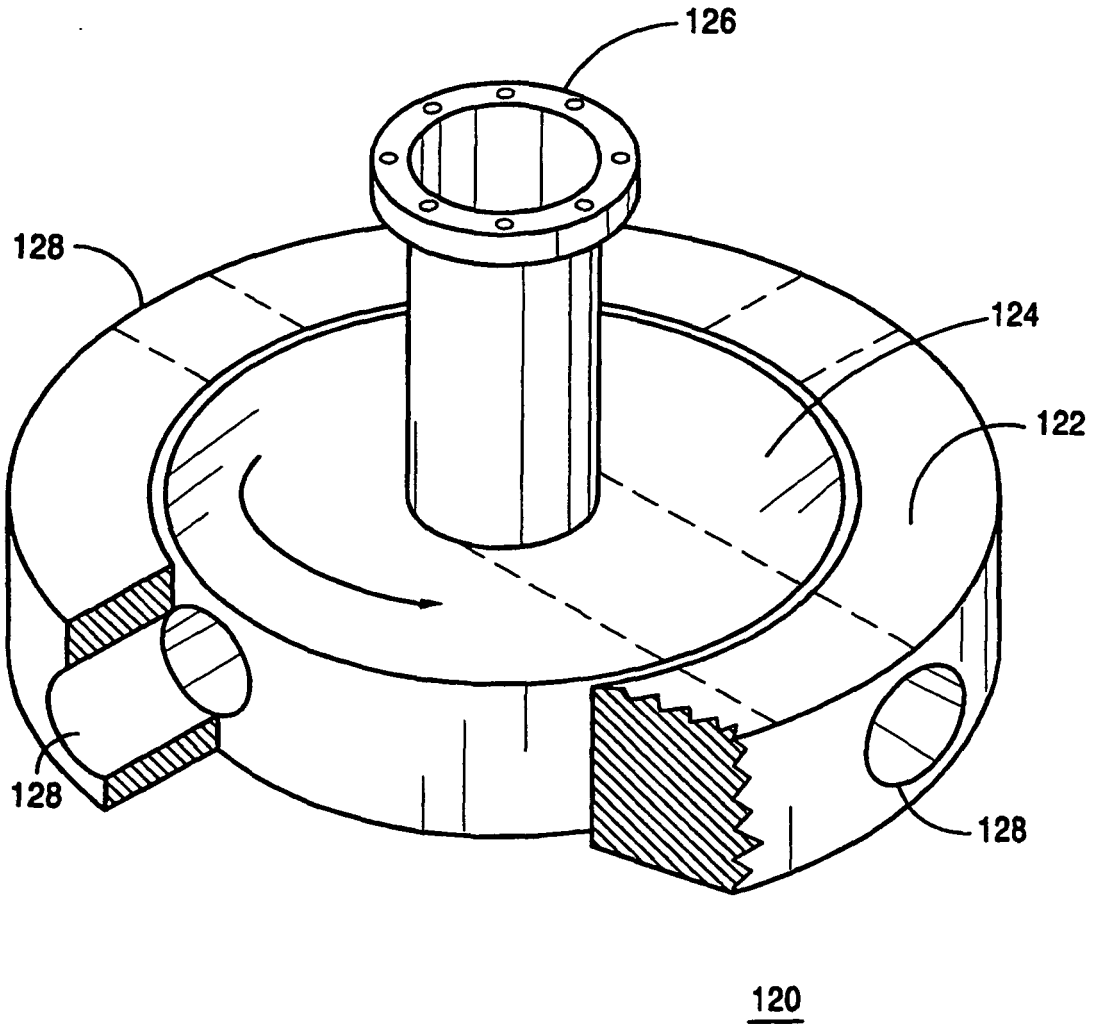

FIG. 5B