United States Patent

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[54] **DECANTATION APPARATUS**
32 Claims, 8 Drawing Figs.

[52] U.S. Cl. **210/519,** 210/523
[51] **Int. Cl.** **B01d 21/12**
[50] **Field of Search** 210/519, 534, 523

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ABSTRACT: A decantation apparatus comprises a horizontally elongated vessel having a top section and a bottom section and being arranged to be filled to a predetermined level of the top section. Feed means feeds the suspension into the vessel. A distributor chamber extends lengthwise of the vessel substantially coextensive within the top section and receives the suspension from the feed means. An elongated loading well extends lengthwise of the distributor chamber below the same and substantially coextensive therewith. It communicates with the distributor chamber and projects downwardly into the bottom section. A pair of outlet channels extends lengthwise of the loading well at opposite lateral sides thereof at the level of the suspension. Discharge means is provided in the bottom section extending lengthwise of the vessel at least substantially coextensive therewith for discharging the solid component of the suspension which has settled in the bottom section.

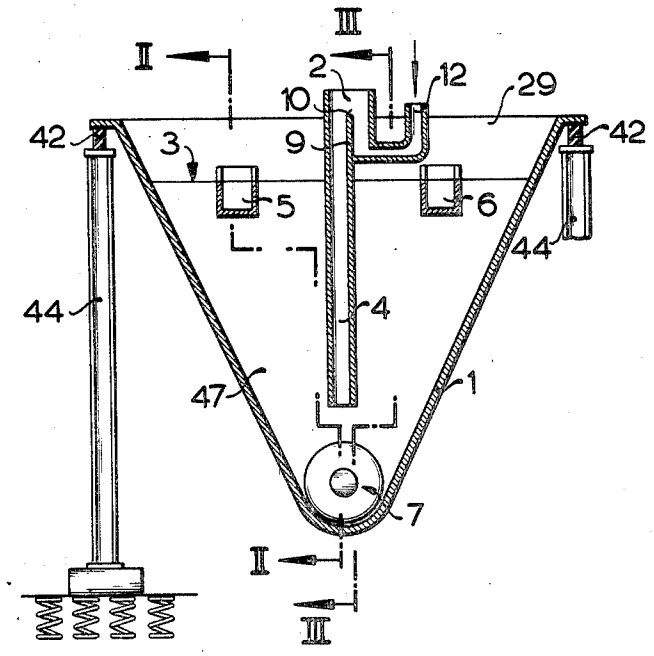


FIG. 1

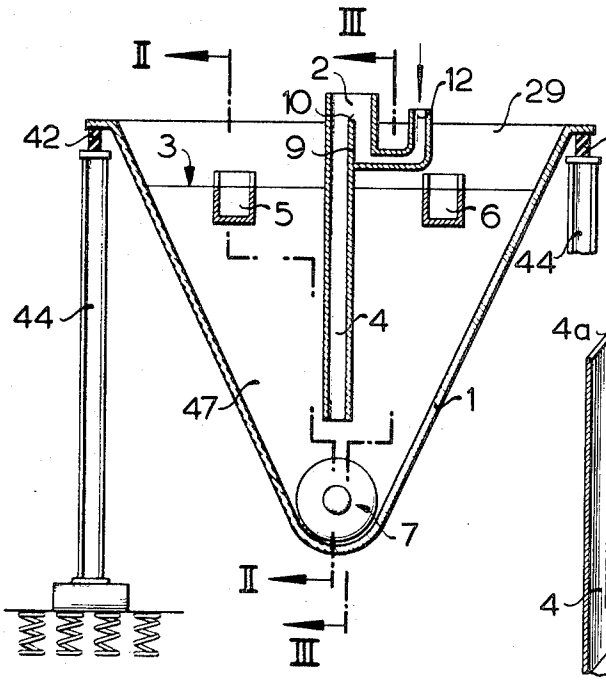


FIG. 4

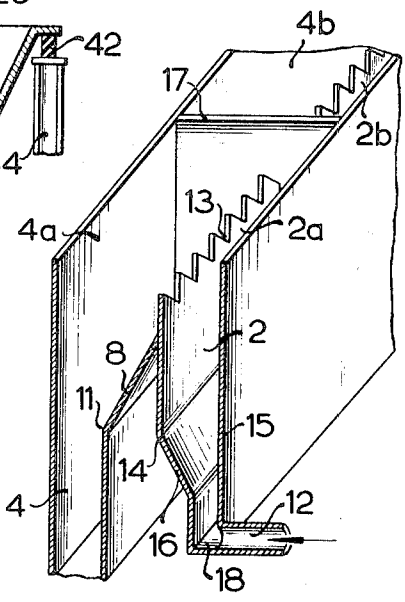


FIG. 2

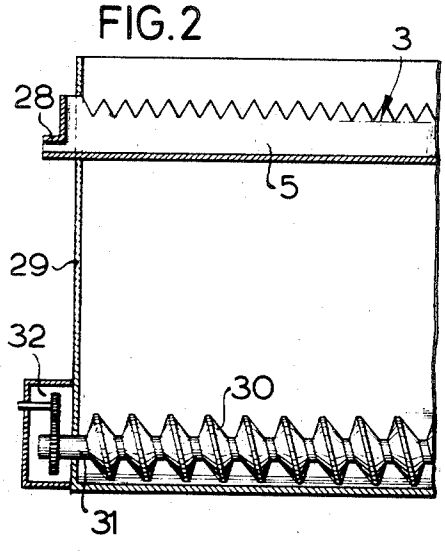
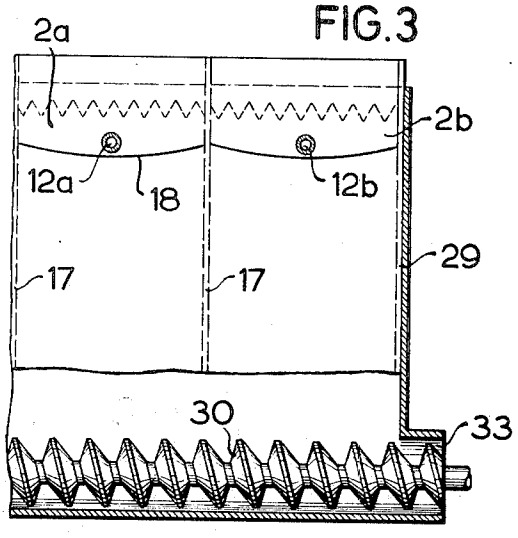


FIG. 3



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FIG.5

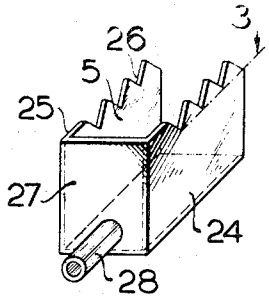


FIG.6

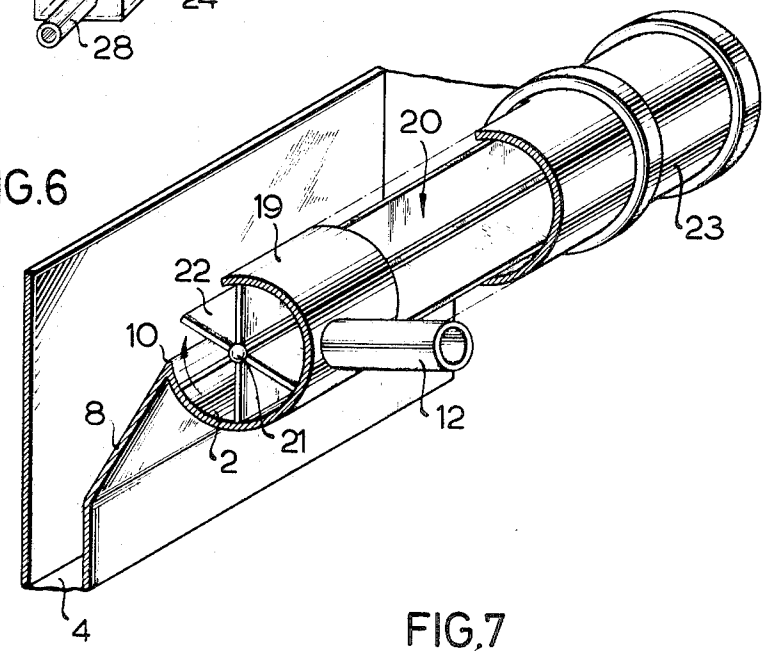
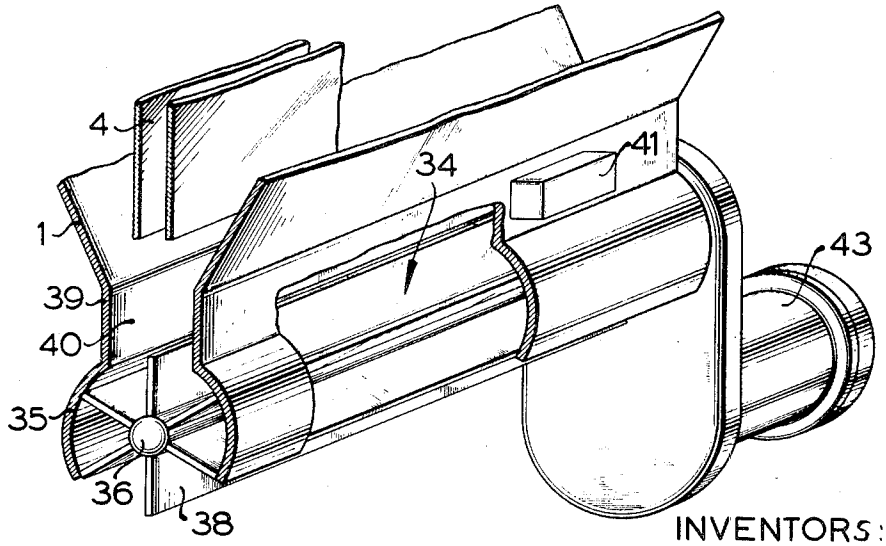
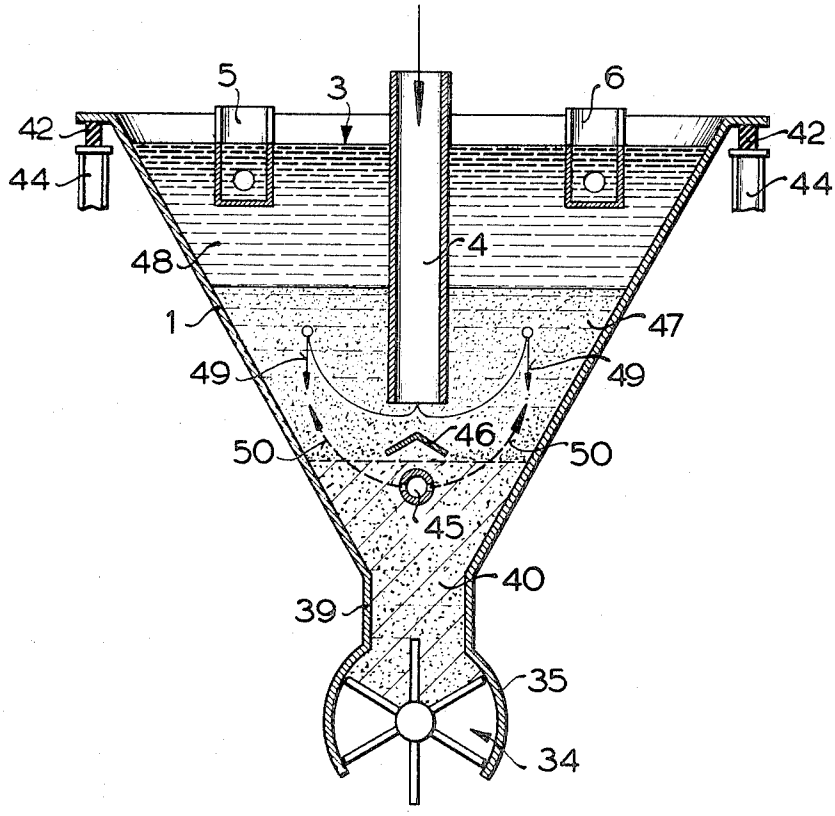


FIG.7



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FIG. 8



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DECANTATION APPARATUS

BACKGROUND OF THE INVENTION

The present invention relates generally to the decantation of suspensions, and more particularly to a decantation apparatus. Still more particularly the invention relates to a static decantation apparatus for thickening a suspension by free settling of the solid component of the suspension in laminar flow.

Decantation apparatus of the general type here under discussion, also known as continuous thickeners, are already known. They are widely used, for instance in the sugar industry primarily for thickening the colloid-containing sludge of the first saturation, and in some juice-cleaning processes also for thickening the colloid-free sludge of other processing stages, for instance that obtained during the second saturation. The purpose of such apparatus is to obtain sedimentation, that is gravitational settling of solid particles suspended in a liquid. The settled solid particles are withdrawn at the bottom of the apparatus and the clarified liquid freed from the solid particles as withdrawn from the top of the apparatus.

Apparatuses known for this purpose are by no means inoperative. However, they do all have certain disadvantages, primarily the fact that with none of them it is possible to achieve perfection in the primary goal, namely obtaining liquid which has been clarified to the maximum possible extent and high concentration of solids in the thickened sludge with short dwell-time of the liquid in the decanter. The problem is, primarily, the structural configuration of the decanting apparatus known from the art, and further the arrangement in which the suspension is supplied and the manner in which the thickened sludge is removed. It has been found that the suspension which is supplied to the apparatus is not distributed evenly over the entire cross section of the decantation vessel and that in addition it becomes admixed with the already partially clarified liquid which rises in the decanter towards the top.

Furthermore, the withdrawal of the clarified liquid, that is for instance the juice, takes place at the lateral sides of the decantation vessel so that the liquid not only must move upwardly during clarification but also receives a component of movement in longitudinal or axial direction of the decantation vessel. Evidently, not all particles of the clarified liquid are identically distant from the outlet, and all of these problems taken together result in an uneven loading of the decantation surface and thereby in an uneven and inadequate use of the decanter vessel volume which is the final analysis results in an increase of the sedimentation time required.

SUMMARY OF THE INVENTION

The present invention has, therefore, as its general object to overcome the aforementioned disadvantages.

More particularly it is an object of the present invention to provide a decantation apparatus which is not possessed of these disadvantages.

In addition it is an object of the invention to provide such a decantation apparatus wherein the decantation surface is more evenly loaded and a sedimentation of the suspension is provided while the suspension enters into the sedimentation space of the apparatus.

A further object of the invention is to provide such an apparatus wherein a movement of the suspension in the longitudinal or axial direction of the decanter vessel is avoided.

In pursuance of the above objects, and others which will become apparent hereafter, one feature of our invention resides, briefly stated, in a decantation apparatus which comprises a horizontally elongated vessel having a top section and a bottom section and which is arranged to be filled to a predetermined level of the top section. The feed means which is provided serves to feed a suspension whose solid component is to be withdrawn from the vessel at the bottom section and whose liquid component is to be withdrawn at the top section. A distributor chamber communicates with the feed means for receiving the suspension therefrom. It extends lengthwise of the vessel substantially coextensive therewith in the top section. An elongated loading well extends lengthwise of the distributor chamber below the same and is substantially coextensive therewith. It communicates with the distributor chamber and projects downwardly therefrom into the bottom section. A pair of outlet-channel members are provided and extend lengthwise of the loading well at opposite lateral sides thereof at the predetermined level which the vessel is filled with suspension. Finally, discharge means is provided in the bottom section extending lengthwise of the vessel at least substantially coextensive therewith for discharging the solid component of the suspension from the vessel.

It is evident that with the apparatus according to the present invention both the supply of the suspension and the removal of the clarified liquid thereof takes place evenly over the entire length of the decanting vessel, resulting in an even loading of the decanting apparatus over its entire decanting surface and in a significant reduction of the sedimentation time and therefore of the dwell time of the liquid in the decanting vessel.

It will be appreciated that a reduction in the sedimentation time has certain advantages. Not only are there advantages from the point of view of the investments required because the invention makes it possible to construct less expensive installations having the same operational capacity as more expensive installations heretofore required. In addition, there are technological advantages because tests have shown that the reduction of the sedimentation time to approximately half of what heretofore was necessary—which is to be achieved with the apparatus according to the present invention—results in a marked improvement of the juice quality produced with the novel apparatus. The color of the juice was improved by approximately 20 percent and a reduction of the ash contents, that is of the molasses-forming matter, was achieved to the extent of between 15 and 18 percent. At the same time an increase of the purity quotient of the juice was observed.

In accordance with the invention the distributor chamber and loading well may be subdivided into individual compartments, depending upon the quantity of suspension being fed and the elongation of the decanting vessel. The distributor chamber is arranged above the level of liquid in the vessel whereas the loading well extends downwardly from below the distributor chamber and has its outlet above the discharge means for the thickened sludge. Both the distributor chamber and the loading well, however, extend over the entire or at least substantially the entire length of the decanter vessel. The distributor chamber has an overflow edge over which the incoming suspension overflows into the loading well; the distributor chamber is so constructed according to the present invention that already here a stabilization of the liquid level over the entire length of the overflow edge occurs without permitting any possibility of sedimentation of the incoming suspension. A particularly advantageous construction according to the present invention provides for the overflow edge to have sawtooth-shaped serrations and to be followed immediately in the direction of flow of the suspension by an inclined surface over which the suspension flows. This provides a further disposal of the flow of incoming suspension which has already been separated by the serrations of the overflow edge.

The basic inventive concept resides in the fact that the suspension is distributed in a distributor chamber and a loading well evenly over the entire length of the decanter vessel.

In accordance with a further embodiment of the invention the distributor arrangement for the suspension may be provided with a rotary suspension distributor, with the distributor chamber being of substantially hollow-cylindrical configuration and having a slot extending along the overflow edge. In this embodiment the suspension is supplied to the rotary suspension distributor which may consist of a plurality of baffles of sheet steel or the like which are mounted—as by welding—on a rotary shaft in axial parallelism or helically convoluted thereabout. The shaft is associated with a drive whose rotations correspond to the desired capacity of the device.

The baffles may be provided with cutouts or interruptions as desired, so that they constitute a plurality of agitator shovels. Independently of the hydrodynamic conditions in the distributor device, and the chemical-physical characteristics of the suspension, this embodiment also assures that the suspension is evenly distributed over the entire length of the decanting vessel. Furthermore, there is no danger that sedimentation might occur already in the distributor device, particularly when the apparatus is deactivated. When the spaces between the respective baffles are completely filled, the supply of suspension can be regulated by regulating the number of rotations of the device independently of the other technological processes of the apparatus. Also, the inflow from the liquid level of the clarified liquid may be automatically regulated.

The even outflow or removal of the clarified liquid is guaranteed by provision of the outflow channel members located at the height of the liquid level in the vessel at opposite lateral sides of the loading well, preferably symmetrically with reference to the center of the loading well. They extend over the entire length of the decanter vessel, or at least over substantially the entire length, and their opposite sidewalls are preferably provided at their upper free edges with sawtooth-shaped serrations or a differently configurated overflow edge. The outlet channel members are so constructed that the clarified liquid can be withdrawn from them either over the upper edges of one or both of their end walls, which must of course then be located outside the vessel and must be at a level lower than the overflow edges, via conduits communicating with the interior of the respective outlet channel members through the end walls, or via outlet openings provided in the bottom walls of the outlet channel members and communicating with suitable conduits.

As mentioned before, discharge means is provided in the bottom section for removing the thickened sludge from the vessel. This discharge means may be in form of a feed screw which axially feeds the sludge, or it may be in form of a cell-type compartmented rotatable member. The latter may be constructed by providing a driven shaft to which several baffles for instance in form of steel strips are welded or otherwise secured, extending in axial parallelism with the shaft or being helically convoluted thereabout. The walls bounding the bottom portion of the bottom section, that is the portion which constitutes the sludge-collecting chamber, may be so configurated that they surround the discharge means and provide a casing for the same which communicates with the sludge-collecting chamber. However, a casing for the discharge means may be separately provided and may then be so arranged as to communicate with the sludge-collecting chamber, for instance by communicating slots or the like.

The removal of the sludge can be facilitated by providing one or more vibrators connected to the exterior wall of the sludge collecting chamber, and further the decanter vessel may be elastically mounted to facilitate the effect upon it by the vibrator. The baffles of the device may be provided with cutouts or may be interrupted and this is a most simple and at the same time reliable manner of improving the operation of the device.

The use of a rotating discharge device of the type just mentioned has the considerable advantage that it closes the sludge-collecting chamber without any danger of the sediment being agitated and blown upwardly into the suspension above it as a result of rotation of the discharge device. Furthermore, this type of discharge device prevents the sediment from settling only at one side of the sedimentation chamber and thus creating nonuniform conditions in the latter. It follows from this that the thickening of the sludge is not adversely influenced by the presence of the discharge device and that it is therefore possible to obtain a sludge of very high dry-substance content. In fact, the quantity of this content may be regulated within certain limits. The speed of rotation of the device may be selected in accordance with the height of the collected sludge layer, in accordance with the weight of the sludge or in accordance with the concentration of the sludge, for instance by obtaining the latter figure through weighing of the entire decanting vessel.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims.

The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a diagrammatic cross section through an apparatus according to the present invention;

FIG. 2 is a fragmentary section taken on the line A–B of FIG. 1;

FIG. 3 is a fragmentary section taken on the line C–D of FIG. 1;

FIG. 4 illustrates a fragmentary perspective view of a further possible embodiment of the distributor chamber and loading well;

FIG. 5 is a perspective fragmentary detail view of an embodiment of an outlet channel member;

FIG. 6 is a somewhat diagrammatic fragmentary view illustrating an embodiment of a distributor device for use in a distributor chamber in an apparatus according to the present invention;

FIG. 7 is a view somewhat similar to FIG. 6 but illustrating a possible embodiment of a discharge device in an apparatus according to the present invention; and

FIG. 8 is a fragmentary diagrammatic cross section through an apparatus according to the present invention in yet a further embodiment.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Discussing firstly the embodiment in FIGS. 1–3, it will be seen that the apparatus according to the present invention comprises a decantation vessel 1 of downwardly funnel-shaped cross section. It should be understood that this vessel 1 is elongated in the direction normal to the plane of FIG. 1. The vessel is open at the top, as shown. Its bottom may be closed as illustrated in FIG. 1 or it may be open as illustrated in FIG. 7, which latter Figure is still to be discussed in more detail later.

A feed conduit 12 is provided through which a suspension is supplied, the source of the suspension not being illustrated as not forming a part of the present invention. In FIG. 1 the feed conduit 12 will be seen to communicate with a distributor chamber 2 which in turn communicates with a loading well 4. Both the distributor chamber 2 and the loading well 4 are so constructed as to extend over the entire or at least over substantially the entire length of the vessel 1, that is the length as seen in FIG. 1 in direction normal to the plane of the drawing.

The suspension supplied into the interior of the vessel 1 undergoes sedimentation, that is its solid component settles at the bottom region of the vessel 1 in form of a thick sludge, whereas the clarified liquid rises to the top, the upper liquid level in the vessel 1 being identified by the line and arrow 3. The clarified liquid is withdrawn via the outlet channel members 5 and 6 which are located at the level 3, and the sludge is withdrawn by the discharge means 7. Both the outlet channel members 5 and 6 and the discharge means 7 extend over the entire or at least substantially entire length of the vessel 1 as seen in the direction normal to the plane of FIG. 1. FIG. 1 also shows that the outlet channel members 5 and 6 are located symmetrically at opposite lateral sides of the loading well 4, which latter again is located centrally of the vessel 1 in the longitudinal axis thereof.

While it has been pointed out that the chamber 2 and the loading well 4 should extend over the entire length of the vessel 1, it is emphasized that the effectiveness of the apparatus is not adversely influenced if they extend only over substantially the entire length.

FIG. 1 shows that the distributor chamber 2 and the loading well 4 may be of unitary construction with a straight wall 9 separating them. The wall 9 has an upper overflow edge 10 over which liquid overflows from the chamber 2 into the loading well 4. The overflow edge 10 in FIG. 1 is straight, but as shown in FIG. 4 a further embodiment provides for the overflow edge 10 to be formed with sawtooth-shaped serrations 13. This is a highly advantageous embodiment, particularly because downstream of the edge 10 there is arranged a downwardly inclined baffle surface 8. The advantage of the sawtooth-shaped serrations 13 is the fact that they subdivide the stream of suspension flowing over the edge 10 onto the inclined surface 8, and thereby provide for a further particularly good dispersion of the suspension over the entire length of the edge 10 and therefore the surface 8.

As further shown in FIG. 4, it is advantageous if the internal cross section of the chamber 2 diverges in direction from the inlet conduit 12 towards the edge 10. Of course, instead of the wall 14 it could be the wall 15 which is so configurated. The advantage of this increase in the cross section of the chamber 2 in the direction towards the edge 10 is that the flow speed of the incoming suspension decreases toward the edge 10 so that the suspension enters the sedimentation space 47 in the vessel 1—via the loading well 4—with a speed which is so low that a significant turbulence in this space and disturbance of the settling solids in the space are avoided.

As shown in FIGS. 3 and 4, either the distributor chamber 2 or the loading well 4, or else both of them, may be separated by individual partition walls 17—or by partition walls which are common to both chambers—into compartments 2*a*, 2*b* or 4*a*, 4*b*. The number of such partition walls 17 may be selected at will, in dependence upon the length of the vessel 1. The bottom wall 18 may be horizontal, as illustrated in FIG. 4, or it may be inclined in which latter case the inclination will be upwardly away from the inlet conduit 12, or the inlet conduits 12*a*, 12*b* each of which is associated with respective compartments 2*a*, 2*b*. In any case, no sedimentation takes place on entry of the suspension into the vessel 1. The flow speed of the incoming suspension during the rise of the same upwardly towards the level 3 is so small that the level 3 will always be quiet and even, and not turbulent.

As shown in the embodiment of FIG. 6, the distributor chamber 2 may be configurated with a part-circular wall 19 forming a jacket within which there is arranged a rotary suspension distributing device 20. The wall 19 has an opening extending along the overflow edge 10 as shown so that suspension entering through the inlet conduit 12 can overflow over the edge 10 in the same manner as described before. The distributor device 20 comprises a shaft 21 which may rotate in the direction of the arcuate arrow and is driven in suitable manner by a drive 23 whose particular type and construction are of no importance for purposes of the present invention. A plurality of strip-shaped baffles 22 are secured as by welding or in other suitable manner on the shaft 21, extending either in axial parallelism with the same lengthwise of the shaft 21, or being helically convoluted thereabout, the latter possibility not being illustrated. Of course, if the chamber 2 is subdivided into a plurality of compartments, then the baffles 22 must be interrupted so as to have a length corresponding only to the length of each compartment as seen in the direction of elongation of the vessel 1, and the opening of the wall 19 must of course extend over the entire length of each of the compartments. The baffles 22 move the suspension upwardly to the overflow edge 10 over which they flow onto the inclined surface 8, evenly distributed over the entire length of the surface 8. The suspension will then flow in a thin evenly distributed continuous layer over the surface 8 and will enter almost without noticeable flow speed into the sedimentation space 47.

The clarified liquid which extends to the level 3, overflows over the upper edges of the sidewalls 24 (see FIG. 5) of the outlet channel members 5 and 6. From these channel members 5 and 6 it is withdrawn, for instance via the conduit 28 extending through the end wall or end walls 27 of the channel members, through similar conduits extending through apertures in the bottom walls of the channel members, or—if the channel members extend outwardly through the opposite end walls of the vessel 1—the end walls 27 of the channel embers 5 and 6 may have upper edges which are lower than the upper edges 25 of the sidewalls 24, so that the liquid may overflow over these upper edges of the end walls 27. This possibility is suggested in FIG. 2 where, however, instead of the end walls 27 of reduced height the conduit 28 is provided communicating with the interior of the channel members 5 and 6 (only 5 shown in FIG. 2). It is preferred that the upper edges 25 of the sidewalls 24 be provided with sawtooth-shaped serrations 26, as shown in FIG. 5. This provides for a more even distribution of the incoming liquid over the entire length of the channel members 5 and 6.

The thickened sludge settling at the bottom of the vessel 1 is removed by the discharge means 7 diagrammatically shown in FIG. 1. In FIGS. 1–3 this discharge means 7 is in form of an axially feeding feed screw 30 mounted on a shaft 31 which is driven by a suitable drive 32. An outlet opening 33 is provided in one of the end walls 29 of the vessel 1 so that the sludge may pass from the interior of the vessel 1.

A further embodiment of the discharge means is shown in FIG. 7. According to this embodiment the discharge means may be somewhat analogous to the distributor device for the incoming suspension which is shown in FIG. 6. Here, the discharge means is identified with reference numeral 34 and surrounded by wall means 35 forming a jacket and having a downwardly slot-shaped opening 37. The discharge means 34 comprises a rotatable shaft 36 driven in a suitable manner by a drive 43 whose particular construction forms no part of the present invention. Mounted on the shaft 36 is a plurality of baffle members 38 analogous to the members 22 of FIG. 6, which may extend in axial parallelism with the shaft 36 lengthwise thereof, or which may be helically convoluted about the shaft 36. Reference numeral 40 identifies the sludge-collecting chamber at the bottom of the vessel 1, which is bounded by upright sidewall portions 39 and which communicates with the jacket 35. However, the discharge means 34 may also be located in the sludge-collecting chamber 40 itself although this is not specifically illustrated.

In order to assure that the sludge which collects in the chamber 40 is removed evenly over the entire length of the vessel 1, with which the discharge device 34 is coextensive or at least substantially coextensive, a vibrating device 41 of any known construction may be provided at the outside of one or both of the wall portions 39 so as to impart slight vibrations to the vessel 1. For this purpose the latter is advantageously mounted on elastic means 42, for instance elastomeric supports, which are interposed between the supporting portions of the vessel 1 and the upright supports 44 for the latter. The vibrator or vibrators 41 vibrate the entire apparatus including associated components, that is also the discharge means 34, and this in turn results in the imparting of such vibrating motion to the sludge and in improved movement of the sludge into the operative region of the discharge means 34.

Coming, finally, to the embodiment illustrated in FIG. 8 it will be seen that here a tubular conduit 45 is arranged downwardly of the outlet opening of the loading well 4, extending lengthwise thereof over the entire length of the vessel 1. Wash water or another washing fluid is supplied through this conduit 45 which may be provided over its entire length and if desired over its circumference with outlet nozzles of suitable type which are not shown. Arranged between the conduit 45 and the outlet of the loading well 4 is a substantially roof-shaped baffle 46 which also extends over the entire length of the vessel 1.

The water issuing from the conduit 45 moves in the direction of the broken-line double-headed arrow 50, the baffle 46 being provided to prevent it from interferring with the suspension issuing from the outlet end of the loading well 4. The particles 49 which settle out of the incoming suspension

perform initially the movement illustrated by the solid-line curved arrow, and thereupon fall out downwardly as illustrated by the downwardly pointing end portions of the solid-line arrow 49. During this latter movement they flow in countercurrent to the movement of the washwater 50, so that the latter becomes saturated with the washed-out particles 49, for instance with sugar.

In accordance with the invention it is also possible to mount the chamber 2, the loading roll 4, the channel 5 and the channel 6—all of them or any one of them—so that they can be raised and lowered in the vessel 1 with reference to the level 3. The same may be done for the members 45 and 46. Means for effecting such raising and lowering is not illustrated in the drawing because it may be entirely conventional and will be evident to those having ordinary skill in the art.

Evidently, various modifications of the illustrated embodiments will offer themselves readily to those skilled in the art and may be effected without departing from the scope of the invention. Thus, it is for instance possible to provide the apparatus with the inlet arrangement as illustrated in FIG. 1 and with the discharge means as illustrated in FIG. 2. Similarly, the inlet arrangement of FIG. 6 may be combined with the discharge means of FIGS. 2 and 3. Also, the members 45 and 46 of FIG. 8 may be combined with any of the other embodiments. The essential point is that the suspension is introduced into the decanting vessel evenly and almost without noticeable flow speed over the entire length of the decanting vessel, and that it similarly is removed evenly over the entire length of the decanting vessel, that is, that its clarified liquid and its thickened sludge components are removed in this manner.

It will be evident that in addition to the advantages recited earlier which are obtained with the apparatus according to the present invention, there are further advantages. One of these is the fact that the sedimentation separating zones may be regulated. The upper zone or section in the vessel may be varied by raising or lowering the liquid level in the decanter through adjustment of the height of the outlet channel members 5 and 6. Similarly, the lower zone in the vessel may be varied by varying the position of the inlet chamber 2 and/or the loading well 4. It is clear that the outlet channel members 5 and 6 may also be subdivided into individual compartments, in the same manner as the chamber 2 and the loading well 4, and that each of such compartments may be provided with its own individual outlet means. Instead of the sawtooth-shaped serrations on the upper edges 10 and 25, other configurations may also be selected.

The apparatus according to the present invention may find use not only in the sugar making industry, but in any application where a technological process requires sedimentation with the shortest possible dwell time of the material in the decanting apparatus. Furthermore, the novel apparatus may also be used to separate soluble material which are contained in the thickened sludge, for instance to remove the sugar content from the saturating sludge in the sugar industry.

With respect to the latter possibility it should be mentioned that the removal of sugar from the saturating sludge in the sugar industry is almost always connected with the filtration. After filtration of the sludge from the juice the final technological process prior to the removal of the sludge from the processing sequence is the sugar removal from the sludge. It is well known, however, that all filtration apparatus permits only an uneven and partial removal of the sugar from the sludge. This is true not only for press devices, but also for vacuum or pressure filters. In addition, where sugar removal is carried out in filtration apparatus the disadvantage obtains that the hydrated sludge particles are subject to mechanical forces in the filter apparatus with the result that, as tests have shown, larger quantities of dissolved nonsugar matter enter the sugar-removal washwater then is the case if the sugar-removal process utilizing the present apparatus is used, that is the embodiment illustrated in FIG. 8.

Attempts in the sugar industry to desugar the sludge in decanters, have always been unsuccessful heretofore. Primarily this was due, apparently, to the fact that the known decanting apparatus has permitted the removal of sugar from the sludge only by using quantities of water so large that this type of removal was not practical. By resorting to the apparatus according to the present invention, as embodied in the construction as shown in FIG. 8, where of course the conduit 45 may be of different configuration or may be replaced with a plurality of conduits, the particles which are to be desugared move in counterflow to the wash or desugaring water issuing from the conduit 45, as indicated by the broken-line curved arrow 50 and the solid-line curved arrow 49. Because of this counterflow, which is possible with the apparatus according to the present invention, the removal of sugar from the particles can be carried out with considerably less water than was heretofore necessary in decanters and thus becomes feasible in decanting apparatus. In addition, the particles are subjected to mechanical forces.

Generally speaking, the decanter according to the present invention may be used for settling and separating of soluble materials from the liquid phase simultaneously, and in all circumstances where the particle which is to be removed from the soluble matter of the liquid phase is suitable for sedimentation in the liquid. It is immaterial whether the end product is desired to be the sedimented solid matter, whether it is desired to obtain the dissolved materials, or whether both are desired to be obtained. The important feature which makes all this possible is the fact that the distribution of the suspension—and the washwater if the embodiment of FIG. 8 is involved-as well as the removal of the liquid and of the thickened particles takes place evenly over the entire length of the decanting vessel.

If the inlet for the washwater—that is the conduit 45 or analogous means—may be adjusted as to height within the vessel 1, then the most practical position for the inlet with reference to the constantly varying sludge content in the sludge-collecting member, or with reference to the adjustable outlet of the loading well for the suspension may be selected. The adjustment of any of the components which have been described herebefore as being capable of being adjustably mounted, may be effected automatically. Also, the conduit 45 or analogous means need not always be located directly below the outlet of the loading well 4; it may be sufficient if it is located in the space between this outlet and the sludge-collecting chamber or zone. A basic advantage of the apparatus according to the present invention over those known from the art is the fact that with the present apparatus the washing-out—that is desugaring where the apparatus is sued in the sugar-making industry—can be carried out in a single stage and that a much smaller quantity of washing water is necessary than herebefore.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of constructions differing from the types described above.

While the invention has been illustrated and described as embodied in a decantation apparatus, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

What is claimed as new and desired to be protected by Letters Patent is set forth in the appended claims.

We claim:

1. A decantation apparatus, comprising a horizontally elongated vessel having a top section and a bottom section and arranged to be filled to a predetermined level of said top section; feed means for feeding a suspension whose solid component is to be withdrawn from said vessel at said bottom section, and whose liquid component is to be withdrawn at said top section; a distributor chamber extending lengthwise of said vessel substantially coextensive therewith in said top section, and communicating with said feed means; an elongated loading well extending lengthwise of said distributor chamber below the same and substantially coextensive therewith, said loading

well communicating with said distributor chamber and projecting downwardly into said bottom section, a pair of outlet-channel members extending lengthwise of said loading well at opposite lateral sides thereof at said predetermined level; and discharge means in said bottom section extending lengthwise of said vessel at least substantially coextensive therewith for discharging the solid component of said suspension from said vessel.

2. An apparatus as defined in claim 1, said loading well and said distributor chamber being arranged laterally of one another; and further comprising wall means separating said loading well and distributor chamber from one another, said wall means having an overflow edge over which suspension flows from said distributor chamber into said loading well.

3. An apparatus as defined in claim 2, wherein said wall means is arranged in a vertical plane.

4. An apparatus as defined in claim 2, wherein said wall means has a surface located in a plane inclined to the vertical and extending from said overflow edge to said loading well.

5. An apparatus as defined in claim 2, wherein said overflow edge is at least substantially straight and continuous.

6. An apparatus as defined in claim 2, wherein said overflow edge is of sawtooth-shaped serrated configuration.

7. An apparatus as defined in claim 2, wherein said distributor chamber has a lower portion and an upper portion, said overflow edge being located in said upper portion and said feed means communicating with said lower portion; and wherein the cross-sectional area of said overflow chamber increases from said lower portion to said upper portion.

8. An apparatus as defined in claim 2; and further comprising dividing walls longitudinally subdividing at least one of said distributor chamber and loading well into a plurality of longitudinally arrayed compartments.

9. An apparatus as defined in claim 8, wherein said wall means divides said distributor chamber into said compartments. and wherein said feed means comprises a plurality of feed conduits each communicating with one of said compartments.

10. An apparatus as defined in claim 2, wherein said distributor chamber has a bottom wall which is inclined to the horizontal.

11. An apparatus as defined in claim 2, wherein at least one of said distributor chamber and loading well is mounted for raising and lowering in vertical direction in said vessel.

12. An apparatus as defined in claim 2, wherein said distributor chamber comprises a substantially cylindrical peripheral wall provided with a slot extending along said overflow edge; and further comprising a celled rotary distributor element mounted in said distributor chamber for rotation about an axis coincident with the longitudinal axis of said cylindrical peripheral wall.

13. An apparatus as defined in claim 12, said distributor element comprising a rotary shaft coincident with said longitudinal axis, and a plurality of baffles projecting substantially radially from said shaft and extending over at least substantially the entire length thereof within said cylindrical peripheral wall.

14. An apparatus as defined in claim 13, wherein said baffles extend in parallelism with the axis of said shaft.

15. An apparatus as defined in claim 13, wherein said baffles are convoluted about said shaft.

16. An apparatus as defined in claim 12, wherein said baffles are provided with a plurality of apertures.

17. An apparatus as defined in claim 1, wherein said channels have upper open sides and lateral lengthwise extending walls provided with upper free edges at said upper open side over which said liquid component flows into the respective channel.

18. An apparatus as defined in claim 17, wherein said upper free edges are serrated in sawtooth-shaped configuration.

19. An apparatus as defined in claim 1, wherein said channels have opposite ends and are provided with a pair of end walls each closing one of said opposite ends; further comprising outflow conduit means penetrating at least one end wall of each of said channels and communicating with the interior of the latter; and wherein said vessel has respective vessel end walls and said outflow conduit means extends through at least one of said vessel end walls to the exterior of said vessel.

20. An apparatus as defined in claim 1, wherein said vessel has opposite end walls; said channels each having two end portions, and at least one of said end portions of each channel penetrating one of said opposite vessel end walls to the exterior of said vessel.

21. An apparatus as defined in claim 1, wherein said channels are mounted adjustably in substantially vertical direction.

22. An apparatus as defined in claim 1, wherein said discharge means comprises a feed screw rotatable about its axis and operative for advancing said solid component lengthwise of said axis in response to such rotation.

23. An apparatus as defined in claim 1, wherein said discharge means comprises wall means defining an elongated sleeve-shaped housing extending below said bottom section, said bottom section and said housing having registering longitudinally extending slots, and said housing further having an additional downwardly directed longitudinally extending slot; and discharge means further comprising a celled rotatable discharge element extending lengthwise of said housing rotatable therein and operative for receiving solid component through said registering slots and expelling it through said additional slot.

24. An apparatus as defined in claim 23, said celled discharge element comprising a driven rotatable shaft, and a plurality of discharge baffles projecting outwardly from said shaft and extending lengthwise thereof at least substantially coextensive therewith.

25. An apparatus as defined in claim 24, said baffles extending in parallelism with said shaft.

26. An apparatus as defined in claim 24, said baffles being convoluted about said shaft.

27. An apparatus as defined in claim 23, said wall means further comprising a pair of upright lateral walls defining between each other an elongated collection zone for said solid component intermediate said bottom region and said housing and in communication with both through the respective registering slots thereof.

28. An apparatus as defined in claim 27; and further comprising a vibrator device secured to at least one of said upright lateral walls exteriorly of said collection zone.

29. An apparatus as defined in claim 28; comprising support means supporting said vessel in predetermined position; and elastic means associated with said vessel and support means for facilitating the efficacy of said vibrator device.

30. An apparatus as defined in claim 1; and further comprising an elongated pipe extending through said vessel lengthwise thereof downwardly spaced from said loading well, said pipe comprising orifices for ejection of a washing liquid therefrom; and guide baffles extending lengthwise of said pipe intermediate the same and said loading well.

31. An apparatus as defined in claim 30, said orifices being distributed at least substantially evenly over the entire length of said pipe.

32. An apparatus as defined in claim 30, at least one of said pipe and guide baffles being mounted for adjustment of its position in vertical direction.

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