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(54) **Title:** SYSTEM FOR TREATING A FLOW OF LIQUID

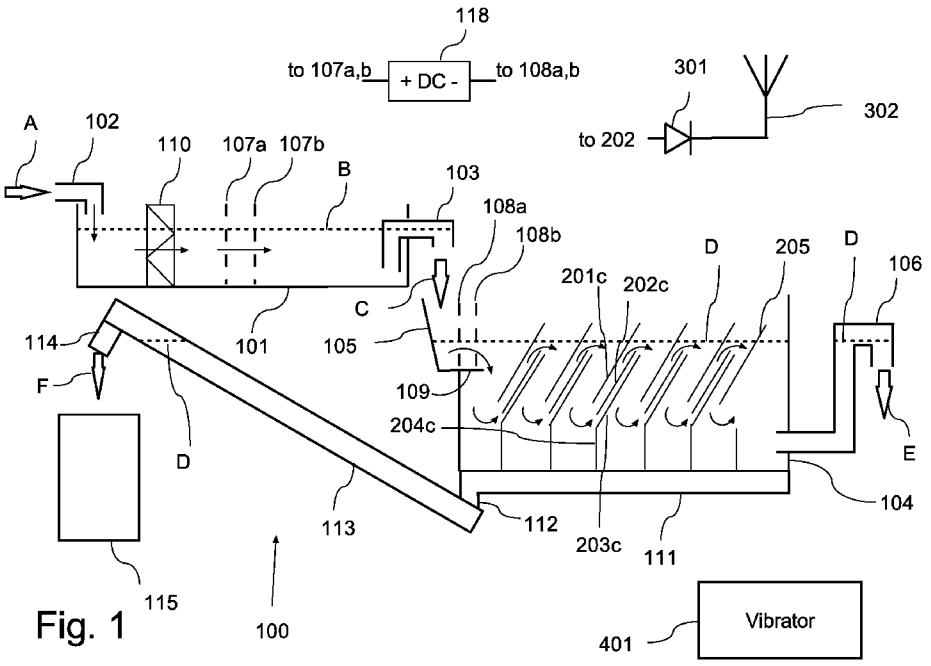

Fig. 1

(57) **Abstract:** There is provided a system (100) for treating a flow of liquid, such as a flow of wastewater or process water. The system (100) comprises an inlet housing (101) with a liquid inlet (102) and a liquid outlet (103), and a sedimentation housing (104) with a liquid inlet (105) and a liquid outlet (106). The liquid inlet (105) of the sedimentation housing is positioned for receiving a flow of liquid from the liquid outlet (103) of the inlet housing (101). The inlet housing (101) and the sedimentation housing (104) may be electrically isolated from each other when no liquid is flowing from the inlet housing (101) to the sedimentation housing (104). First electrode(s) (107 a, b) may be positioned within the inlet housing (101) between the liquid inlet and liquid outlet, for letting a flow of liquid passing therethrough, and second electrode(s) (108a, b) may be positioned within the sedimentation housing (104) next to the liquid inlet (105) of the sedimentation housing (104), for letting a flow of liquid passing therethrough.

WO 2024/074180 A1

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TITLE

SYSTEM FOR TREATING A FLOW OF LIQUID

TECHNICAL FIELD

The disclosure relates to a system for treating liquid or water, such as wastewater or process water. More particularly, the disclosure relates to a system for removal of undesirable substances from a flow of liquid or water.

BACKGROUND

A wide range of chemical processes may be effected using electrolysis—an area of chemistry known as electrochemistry. An increasingly significant electrochemical process is electrocoagulation, which may be used to separate contaminants from liquids. Such contaminants may include metals, solids, pathogens, colloids, chemicals, and various other undesirable substances.

Electrocoagulation may be used to treat a wide variety of liquids, but in the last decade electrocoagulation especially has been used increasingly for the treatment of industrial wastewater. For example, electrocoagulation may be used to treat water containing food and beverage manufacturing waste, oil wastes, dyes, suspended particulates, chemical waste, organic matter from various industrial processes and effluents, and drainage arising from mining activities (such as so-called acid mine drainage (AMD) where the drainage contains heavy metals or other environmental pollutants).

In an electrocoagulation process, a liquid being treated flows past an electric field generated between an anode and a cathode. Metal ions may be generated at the anode, along with production of both hydroxyl ions and higher energy hydroxyl radicals at the cathode. Gases may also be formed, such as hydrogen gas. Electrons can also travel through the liquid in a process known as electron flooding. Ionic species, radical species, electrons and gases may result in chemical modification of contaminants in the liquid (such as through oxidation), as well as destabilisation of electrical charges holding contaminants in the liquid (i.e. reduction of the net surface charge of the contaminants, which thereby

reduces repulsive charges). This latter effect may allow the contaminant particles to move closer together and allow aggregation (through, for example, van der Waals forces), and aggregation may also be aided by the presence of gelatinous polymeric metal hydroxides in the solution, formed when metal ions generated by sacrificial dissolution of the anode chemically combine with hydroxyl ions at the cathode.

Electrocoagulation can be a relatively complex process, and the apparatus and conditions under which the electrocoagulation is or will be performed significantly affects the efficiency of the process.

WO 2017/178707 discloses a mechanical system for treating continuously an incoming flow of wastewater, which system is suitable for electrocoagulation-based water treatment processes. The system has a rectangular metallic housing, which comprises vertical active plates, which act as anodes and cathodes. The treated water is fed in through an inlet, and the electrocoagulation occurs between a narrow gap between the two active plates. The two plates among a single electrode pair are located in different heights. The locations and heights of the active plates can be adjusted through groove elements. Non-active calming metal plates may also be used along the flow route of the treated water. Suspended materials will agglomerate and flow on top of the water surface as foam and floc, from where it may be separated by scraping it into a chute.

While various apparatuses for electrocoagulation are known, such as the system disclosed in WO 2017/178707, there still is a need for an improved system for treating a flow of liquid, such as a flow wastewater or process water, in order to remove undesirable substances from the liquid.

SUMMARY OF INVENTION

It is an object of the present disclosure to provide an improved system for treating a flow of liquid, such as a flow of wastewater or process water, which system may be optimized for removal of different types of undesirable substances.

This object is achieved in accordance with a first aspect by providing a system for treating a flow of liquid, such as a flow of wastewater or process water, which system comprises:

an inlet housing with a liquid inlet for incoming liquid to be treated and a liquid outlet, and

a sedimentation housing with a liquid inlet and a liquid outlet for treated outgoing liquid, wherein the liquid inlet of the sedimentation housing is positioned for receiving a flow of liquid being output from the liquid outlet of the inlet housing.

In a possible implementation form of the first aspect, the inlet housing and the sedimentation housing are electrically isolated from each other when no liquid is flowing from the inlet housing to the sedimentation housing.

In a possible implementation form of the first aspect, one or more first electrodes are positioned within the inlet housing between the liquid inlet and liquid outlet of the inlet housing, said first electrode(s) being kept in position within the inlet housing while being electrically isolated from the inlet housing and formed for letting a flow of liquid passing therethrough.

In a possible implementation form of the first aspect, one or more second electrodes are positioned within the sedimentation housing next to the liquid inlet of the sedimentation housing, said second electrode(s) being kept in position within the sedimentation housing while being electrically isolated from the sedimentation housing and formed for letting a flow of liquid passing therethrough.

In a possible implementation form of the first aspect, the inlet housing has an inlet end holding the liquid inlet and an outlet end holding the liquid outlet.

In a possible implementation form of the first aspect, the liquid outlet of the inlet housing is configured to maintain a liquid surface of liquid being treated within the inlet housing below an upper edge of the first electrodes.

In a possible implementation form of the first aspect, the sedimentation housing has an inlet end holding the liquid inlet and an outlet end holding the liquid outlet.

In a possible implementation form of the first aspect, a filtration element is positioned within the inlet housing between the liquid inlet and one of said one or more first electrodes. The filtration element may be a coalescing filter.

In a possible implementation form of the first aspect, the one or more first electrodes are substantially plate shaped and positioned substantially vertical to a flow direction of liquid flowing from the liquid inlet to the liquid outlet of the inlet housing.

In a possible implementation form of the first aspect, the one or more first electrodes hold a number of through holes or are formed as mesh plates for letting a flow of liquid to be treated passing therethrough.

In a possible implementation form of the first aspect, the first electrode(s) have bottom and side edges being kept in position close to respective bottom and side walls of the inlet housing to constitute a substantially close attachment therebetween. This is in order to have most or substantially all of the liquid flowing from the inlet to the outlet of the inlet housing passing through the one or more first electrodes.

In a possible implementation form of the first aspect, at least two of said first electrodes are positioned within the inlet housing between the liquid inlet and liquid outlet of the inlet housing, with at least two of said first electrodes being positioned parallel to each other with at distance to each other.

In a possible implementation form of the first aspect, the one or more second electrodes are substantially plate shaped.

In a possible implementation form of the first aspect, the one or more second electrodes hold a number of through holes or are formed as mesh plates for letting a flow of liquid passing therethrough.

In a possible implementation form of the first aspect, the second electrode(s) have side edges being kept in position close to respective side walls of the sedimentation housing.

In a possible implementation form of the first aspect, a first arranged second electrode is positioned within the sedimentation housing to thereby substantially cover the liquid inlet of the sedimentation housing. This is in order to have most or substantially all of the liquid flowing into the sedimentation housing through the liquid inlet passing through the first arranged second electrode.

In a possible implementation form of the first aspect, the liquid inlet of the sedimentation housing comprises a distribution housing for receiving the flow of liquid being output from the liquid outlet of the inlet housing to thereby secure a distributed flow of liquid into the sedimentation housing and through the first arranged second electrode.

In a possible implementation form of the first aspect, a second arranged second electrode is positioned within the sedimentation housing substantially parallel to and at a distance to the first arranged second electrode.

In a possible implementation form of the first aspect, a liquid-inlet bottom plate is provided at the liquid inlet of the sedimentation housing below the second electrode(s).

In a possible implementation form of the first aspect, the second electrode(s) have a bottom edge being kept in position close to the liquid-inlet bottom plate while being electrically isolated from the liquid-inlet bottom plate.

In a possible implementation form of the first aspect, the liquid-inlet bottom plate is positioned and dimensioned to substantially cover a bottom gap between the second electrodes. This is in order to have most or substantially all liquid flowing into the sedimentation housing through said liquid inlet passing through both said first arranged and second arranged second electrodes.

In a possible implementation form of the first aspect, there are several first electrodes being electrically connected together.

In a possible implementation form of the first aspect, there are several second electrodes being electrically connected together.

In a possible implementation form of the first aspect, the system further comprises an electric direct current source for applying a DC voltage between said one or more first electrodes and said one more second electrodes, to thereby cause a current flow between the first electrode(s) in the inlet housing and the second electrode(s) in the sedimentation housing when liquid is flowing from the inlet housing to the sedimentation housing.

In a possible implementation form of the first aspect, the one or more first electrodes act as one or more anodes and the one or more second electrodes act as cathodes.

In a possible implementation form of the first aspect, a positive voltage is applied to the one or more first electrodes acting as one or more anodes, with a negative voltage being applied to the one or more second electrodes acting as one or more cathodes.

In a possible implementation form of the first aspect, the sedimentation housing has two opposing sidewalls and a bottom connecting the inlet and outlet ends.

In a possible implementation form of the first aspect, the sedimentation housing holds a number of sedimentation modules, where each of said number of sedimentation modules comprises four plates, a first, a second, a third and a fourth plate, each plate having two side edges, an upper edge and a lower edge, said first, second and third plates being placed at a distance to each other in a consecutive and parallel manner at an inclined position to vertical pointing away from the inlet of the sedimentation housing. It is preferred that the side edges of the first, second and third plates are kept in position close to the sidewalls of the sedimentation housing.

In a possible implementation form of the first aspect, the upper edge of the first plate extends higher up within the sedimentation housing than the upper edges of the second and third plates, the lower edges of the first and second plates are positioned at a distance above the bottom of the sedimentation housing, while the lower edge of the third plate reaches an upper edge the fourth plate, which fourth plate has the lower edge secured to or positioned at the bottom of the sedimentation housing and the two side edges secured to or positioned at opposed side edges of a lower part of the sedimentation housing.

In a possible implementation form of the first aspect, the number of sedimentation modules are positioned in a consecutive manner within the sedimentation housing. It is preferred that the fourth plates of the modules are positioned substantially in parallel and with substantially equal distance to each other.

It is also an object of the present disclosure to provide a sedimentation housing for use in a system for treating a flow of liquid, such as a flow of wastewater or process water.

This object is achieved in accordance with a second aspect by providing a sedimentation housing to be used for treating a flow of liquid, such as a flow of wastewater or process water, said sedimentation housing having an inlet end with a liquid inlet and an outlet end with a liquid outlet, two opposing sidewalls and a bottom connecting the inlet and outlet ends; wherein

the sedimentation housing holds a number of sedimentation modules, where each of said number of sedimentation modules comprises four plates, a first, a second, a third and a fourth plate, each plate having two side edges, an upper edge and a lower edge, said first, second and third plates being placed at a distance to each other in a consecutive and parallel manner at an inclined position to vertical pointing away from the inlet of the sedimentation housing;

the side edges of the first, second and third plates are kept in position close to the sidewalls of the sedimentation housing;

the upper edge of the first plate extends higher up within the sedimentation housing than the upper edges of the second and third plates, the lower edges of the first and second plates are positioned at a distance above the bottom of the sedimentation housing, while the lower edge of the third plate reaches an upper edge the fourth plate, which fourth plate has the lower edge secured to or positioned at the bottom of the sedimentation housing and the two side edges secured to or positioned at opposed side edges of a lower part of the sedimentation housing; and

said number of sedimentation modules are positioned in a consecutive manner within the sedimentation housing with the fourth plates of the modules positioned substantially in parallel and with substantially equal distance to each other.

In a possible implementation form of the first or second aspect, the liquid outlet of the sedimentation housing is configured to maintain a liquid surface of liquid being treated

within the sedimentation housing below the upper edge of the first plates and above the upper edges of the second and third plates.

In a possible implementation form of the first or second aspect, a number of consecutive sedimentation chambers are formed with a first sedimentation chamber formed by the inlet end of the sedimentation housing, the third and fourth plates of a first sedimentation module, and parts of the sidewalls and bottom of the sedimentation housing; a following sedimentation chamber is formed by the third and fourth plates of the previous sedimentation module, the third and fourth plates of the next sedimentation module, and parts of the sidewalls and bottom of the sedimentation housing; and a last sedimentation chamber is formed by the third and fourth plates of the last sedimentation module, and the outlet end and parts of the sidewalls and bottom of the sedimentation housing.

In a possible implementation form of the first or second aspect, the bottom of the last sedimentation chamber is divided into first and second bottom sedimentation chambers by a final fourth plate, which is positioned parallel to the fourth plate of the last sedimentation module, and wherein the last sedimentation chamber holds a flow aligner plate positioned substantially parallel and at a distance to the third plate of the last sedimentation module, which flow aligner plate is held by opposite sidewalls of the sedimentation housing at an inclined position to vertical pointing away from the inlet of the sedimentation housing.

In a possible implementation form of the first or second aspect, the upper edge of the flow aligner plate extends higher up within the last sedimentation chamber than the upper edges of the second and third plates of the last sedimentation module, and wherein the lower edge of the flow aligner plate is positioned at a distance above the bottom of the sedimentation housing.

In a possible implementation form of the first or second aspect, then for at least part of or for all the sedimentation modules the surface of the second plate has a higher surface roughness than the surfaces of first and third plates.

In a possible implementation form of the first or second aspect, the first and third plates of the sedimentation modules are made of acid-free stainless steel.

In a possible implementation form of the first or second aspect, the second plates of the sedimentation modules are made of black steel.

In a possible implementation form of the first or second aspect, a sedimentation outlet housing is provided below the bottom of the sedimentation housing. It is preferred that a sedimentation outlet opening is provided at the bottom of each sedimentation chamber, with the sedimentation outlet openings facing the sedimentation outlet housing, whereby sediment entering the bottom of a sedimentation chamber can enter into the sedimentation outlet housing.

In a possible implementation form of the first or second aspect, the sedimentation outlet housing holds an outlet and a first auger, which first auger is configured for transferring incoming sediment to the outlet of the sedimentation housing.

In a possible implementation form of the first or second aspect, the bottom of the sedimentation housing also holds a first fluid return opening facing the second and last bottom sedimentation chamber at the outlet end of the sedimentation housing, and the sedimentation outlet opening of the first sedimentation chamber act as a second fluid return opening facing the bottom of the first sedimentation chamber.

In a possible implementation form of the first or second aspect, a second auger is provided within a second auger housing external to the sedimentation housing and the sedimentation outlet housing, said second auger housing having a bottom auger inlet connected to the outlet of the sedimentation housing by a watertight connection, and said second auger housing having a top auger outlet above the liquid outlet of the sedimentation housing.

In a possible implementation form of the first or second aspect, the second auger housing is arranged at an angle in the range of 20-60 degrees to the horizontal direction, such as about 30-40 degrees to the horizontal direction.

In a possible implementation form of the first or second aspect, the second auger housing and the second auger are dimensioned and arranged so that during an operation of

treating a flow of liquid entering the sedimentation housing, the top auger outlet is positioned above the liquid surface of the liquid within the sedimentation housing. Thus, the surface height of the liquid within the second auger housing will equal the surface height of the liquid within the sedimentation housing and be below the top auger outlet.

In a possible implementation form of the first or second aspect, then during an operation of treating a flow of liquid entering the sedimentation housing, the first and second augers are configured to operate at first and second speeds of rotation, respectively, with the first speed of rotation being higher than the second speed of rotation.

In a possible implementation form of the first or second aspect, then during an operation of treating a flow of liquid entering the sedimentation housing, the rotation speed of the second auger is kept at a speed, whereby substantially no liquid is output from the top auger outlet of the second auger housing, while at least part of the sediments entering the sedimentation outlet housing and passed by the first auger from the sedimentation outlet housing to the second auger housing is further passed by the second auger from the bottom auger inlet to the top auger outlet.

In a possible implementation form of the first or second aspect, at least part of or all of the second plates of the sedimentation modules are electrically connected together.

In a possible implementation form of the first or second aspect, the system further comprises a current rectifier for rectifying electric current and an ultra-high frequency, UHF, antenna, which UHF antenna is electrically connected via the current rectifier to the electrically connected second plates of the sedimentation modules.

In a possible implementation form of the first or second aspect, an electric vibrator is connected to an outer sidewall of the sedimentation housing for providing vibration to the sedimentation housing.

In a possible implementation form of the first or second aspect, the electric vibrator is configured for operating with a revolution in the range of 1000-6000 per minute, such as 2000-4000 per minute, such as about 3000 per minute.

In a possible implementation form of the first or second aspect, the electric vibrator is configured for operating with a centrifugal force in the range of 20-80 Newton, such as in the range of 30-60 Newton, such as about 40 Newton.

The foregoing and other objects are achieved by the features of the independent claims. Further implementation forms are apparent from the dependent claims, the description and the figures. These and other aspects of the invention will be apparent from the embodiments described below.

BRIEF DESCRIPTION OF THE DRAWINGS

In the following detailed portion of the present disclosure, the aspects, embodiments and implementations will be explained in more detail with reference to the example embodiments shown in the drawings, in which:

Fig. 1 is a schematic view of a system for treating a flow of liquid, such as a flow of wastewater or process water, according to an example embodiment;

Fig. 2a is a top view of an inlet housing being part of the system of Fig. 1 according to an example embodiment;

Fig. 2b is a front view of a first electrode for use in the inlet housing of Fig. 2 according to an example embodiment;

Fig. 3 is a longitudinal cut-through view of a sedimentation housing with a sedimentation outlet housing being part of the system of Fig. 1 according to an example embodiment;

Fig. 4a is a perspective side view of the sedimentation housing and sedimentation outlet housing of Fig. 3 according to an example embodiment;

Fig. 4b is a perspective side view of distribution housing forming a liquid inlet of the sedimentation housing of Fig. 3 according to an example embodiment;

Fig. 5 shows front views of a second electrode, a first plate, a second plate, a third plate and a fourth plate for use in the sedimentation housing of Figs. 3 and 4 according to an example embodiment;

Fig. 6 is a top view of the bottom of the sedimentation housing of Figs. 3 and 4 according to an example embodiment; and

Fig. 7 is a longitudinal cut-through view of the sedimentation outlet housing of Figs. 3 and 4 according to an example embodiment.

DETAILED DESCRIPTION

In the following references are made to Figs. 1 to 7, in which Fig. 1 is a schematic view of a system 100 for treating a flow of liquid, such as a flow of wastewater or process water, Fig. 2a is a top view of an inlet housing 101 being part of the system 100 of Fig. 1, Fig. 2b is a front view of a first electrode 107a,b for use in the inlet housing 101 of Fig. 2, and Fig. 3 is a longitudinal cut-through view of a sedimentation housing 104 with a sedimentation outlet housing 111 being part of the system 100 of Fig. 1.

Fig. 4a is a perspective side view of the sedimentation housing 104 and the sedimentation outlet housing 111, and Fig. 4b is a perspective side view of a distribution housing forming a liquid inlet 105 of the sedimentation housing 104.

Fig. 5 shows front views of a second electrode 108a,b, a first plate 201a,b,c, a second plate 202a,b,c, a third plate 203a,b,c, and a fourth plate 204a,b,c for use in the sedimentation housing 104.

Fig. 6 is a top view of the bottom 104d of the sedimentation housing 104, and Fig. 7 is a longitudinal cut-through view of the sedimentation outlet housing 111.

The system 100 comprises an inlet housing 101 having an inlet end with a liquid inlet 102 for incoming liquid A and an outlet end with a liquid outlet 103. The system 100 further comprises a sedimentation housing 104 with a liquid inlet 105 and a liquid outlet 106 for treated outgoing liquid E. The liquid inlet 105 of the sedimentation housing 104 is

positioned for receiving a flow of liquid C being output from the liquid outlet 103 of the inlet housing 101. The inlet housing 101 and the sedimentation housing 104 are electrically isolated from each other when no liquid is flowing from the inlet housing 101 to the sedimentation housing 104.

Two first electrodes 107a, 107b are positioned within the inlet housing 101 between the liquid inlet 102 and liquid outlet 103 of the inlet housing 101.The first electrodes 107a, 107b are kept in position within the inlet housing 101 while being electrically isolated from the inlet housing 101 and formed and positioned for letting a flow of liquid passing therethrough. A spacer 116 may be connected to the two first electrodes 107a, 107b for keeping a distance therebetween. The liquid outlet 103 of the inlet housing 101 is configured to maintain a liquid surface B of liquid being treated within the inlet housing 101 below an upper edge of the first electrodes 107a, 107b. The first electrodes 107a, 107b are substantially plate shaped and positioned substantially vertical to a flow direction of liquid flowing from the liquid inlet to the liquid outlet of the inlet housing 101. The first electrodes 107a, 107b hold a number of through holes or are formed as mesh plates for letting a flow of liquid to be treated passing therethrough. The first electrodes 107a, 107b have bottom and side edges being kept in position close to respective bottom and side walls of the inlet housing 101 to constitute a substantially close attachment therebetween, whereby most or substantially all of the liquid flowing from the inlet 102 to the outlet 103 of the inlet housing 101 passes through the first electrodes 107a, 107b. The two first electrodes 107a, 107b are positioned parallel to each other with at distance to each other, whereby substantially all of the liquid flowing from the inlet to the outlet of the inlet housing passes through each of said at least two first electrodes. The present disclosure also covers embodiments with only one first electrode 107a, 107b or with more than two first electrodes, such as three or four first electrodes. For embodiments with four electrodes, the electrode 107a may represent a first pair of two closely positioned first electrodes and the electrode 107b may represent a second pair of two closely positioned first electrodes.

A filtration element 110 may be positioned within the inlet housing 101 between the liquid inlet 102 and one of the first electrodes 107a. It is preferred that the filtration element is a coalescing filter, which may be configured for collection of small oil droplets having a diameter less than 1mm.

For the system 100 of Fig. 1, two second electrodes 108a, 108b are positioned within the sedimentation housing 104 next to the liquid inlet 105 of the sedimentation housing 104, where the second electrode 108a, 108b are kept in position within the sedimentation housing 104 while being electrically isolated from the sedimentation housing 104 and formed for letting a flow of liquid passing therethrough. The second electrodes 108a, 108b are substantially plate shaped and hold a number of through holes or are formed as mesh plates for letting a flow of liquid passing therethrough. The second electrodes 108a, 108b have side edges being kept in position close to respective side walls of the sedimentation housing 104, and a first arranged second electrode 108a is positioned within the sedimentation housing 104 to thereby substantially cover the liquid inlet 105 of the sedimentation housing 104, whereby liquid flowing into the sedimentation housing 104 through said liquid inlet 105 passes through the first arranged second electrode 108a.

The liquid inlet 105 of the sedimentation housing 104 comprises a distribution housing for receiving the flow of liquid C being output from the liquid outlet 103 of the inlet housing 101 to thereby secure a distributed flow of liquid into the sedimentation housing 104 and through the first arranged second electrode 108a. A second arranged second electrode 108b is positioned within the sedimentation housing 104 substantially parallel to and at a distance to the first arranged second electrode 108b. A liquid-inlet bottom plate 109 is provided at the liquid inlet 105 of the sedimentation housing 104 below the second electrodes 108a, 108b. The second electrodes 108a, 108 have a bottom edge being kept in position close the liquid-inlet bottom plate 109 while being electrically isolated from the liquid-inlet bottom plate 109. The liquid-inlet bottom plate 109 is positioned and dimensioned to substantially cover a bottom gap between the second electrodes 108a and 108b, whereby substantially all liquid flowing into the sedimentation housing 104 through the liquid inlet 105 passes through both the first arranged and the second arranged second electrodes 108a, 108b.

In order for the system 100 to operate for treating a flow of liquid, the first electrodes 107a, 107 of the inlet housing 101 are electrically connected together, and second electrodes 108a, 108b of the sedimentation housing are electrically connected together. During operation an electric direct current source 118 is provided for applying a DC voltage between the first electrodes 107a, 107b and the second electrodes 108a, 108b, to thereby cause a current flow between the first electrodes 107a, 107b and the second electrodes

108a, 108b when liquid is flowing from the inlet housing 101 to the sedimentation housing 104. Here, the first electrodes 107a, 107 may act as anodes and the second electrodes 108a, 108b may act as cathodes, with a positive voltage applied to the first electrodes 107a, 107b and with a negative voltage applied to the second electrodes 108a, 108b.

The sedimentation housing 104 has two opposing sidewalls and a bottom connecting the inlet and outlet ends, which sidewalls and bottom supports a number of sedimentation modules. The two sidewalls have a vertical positioned upper wall part 104a and a lower inclined wall part 104b, see Fig. 4a, in which the inlet end of the sedimentation housing is referenced by numeral 104c.

Each of the sedimentation modules comprises four plates, a first plate 201a,b,c, a second plate 202a,b,c, a third plate 203a,b,c and a fourth plate 204a,b,c, each plate 201a,b,c, 202a,b,c, 203a,b,c, 204a,b,c having two side edges, an upper edge and a lower edge. The first, second and third plates 201a,b,c, 202a,b,c and 203a,b,c are placed at a distance to each other in a consecutive and parallel manner at an inclined position to vertical pointing away from the inlet of the sedimentation housing 104, and the side edges of the first, second and third plates 201a,b,c, 202a,b,c and 203a,b,c are kept in position close to the inner sidewalls of the sedimentation housing 104. For the sedimentation modules, the upper edge of the first plate 201a,b,c extends higher up within the sedimentation housing than the upper edges of the second and third plates 202a,b,c, 203a,b,c, and the lower edges of the first and second plates 201a,b,c, 202a,b,c are positioned at a distance above the bottom 104d of the sedimentation housing 104, while the lower edge of the third plate 203a,b,c reaches an upper edge the fourth plate 204a,b,c. Each fourth plate 204a,b,c has the lower edge secured to or positioned at the bottom 104d of the sedimentation housing 104 and the two side edges secured to or positioned at opposed side edges of the lower inclined wall parts 104b of the sedimentation housing 104. As illustrated in Figs. 1 and 3, the number of sedimentation modules may be positioned in a consecutive manner within the sedimentation housing 104 with the fourth plates 204a,b,c of the modules positioned substantially in parallel and with substantially equal distance to each other.

As illustrated in Figs. 1 and 3, the liquid outlet 106 of the sedimentation housing 104 is configured to maintain a liquid surface D of liquid being treated within the sedimentation

housing below the upper edge of the first plates 201a,b,c and above the upper edges of the second and third plates 202a,b,c, 203a,b,c.

The sedimentation housing 104 holds a number of sedimentation chambers 206a,b,c,n,n+1 formed by parts of the sedimentation modules and the sedimentation housing 104. Thus, a number of consecutive sedimentation chambers are formed with a first sedimentation chamber 206a formed by the inlet end 104c of the sedimentation housing 104, the third and fourth plates 203a, 204a of a first sedimentation module, and parts of the sidewalls 104a, 104b and bottom 104d of the sedimentation housing. A following sedimentation chamber 206b is formed by the third and fourth plates of the previous sedimentation module 203a, 204a, the third and fourth plates of the next sedimentation module 203a, 204b, and parts of the sidewalls 104a, 104b and bottom 104d of the sedimentation housing 104, and a last sedimentation chamber is formed by the third and fourth plates of the last sedimentation module and the outlet end and parts of the sidewalls 104a, 104b and bottom 104d of the sedimentation housing 104.

The bottom of the last sedimentation chamber is divided into a first and a second bottom sedimentation chamber 206n and 206n+1 by a final fourth plate 204n, which is positioned parallel to the fourth plate of the last sedimentation module. The last sedimentation chamber may hold a flow aligner plate 205 positioned substantially parallel and at a distance to the third plate of the last sedimentation module, which flow aligner plate 205 is held by opposite sidewalls of the sedimentation housing at an inclined position to vertical pointing away from the inlet 105 of the sedimentation housing 104. The flow aligner plate 205 extends higher up within the last sedimentation chamber than the upper edges of the second and third plates of the last sedimentation module, and the lower edge of the flow aligner plate is positioned at a distance above the bottom 104d of the sedimentation housing.

With the above construction of the sedimentation housing 104, the flow of liquid entering the sedimentation housing 104 can be described as follows:

A flow of incoming liquid entering the first sedimentation chamber 206a at the liquid inlet 105 of the sedimentation housing is directed downwards by a front side of the first plate 201a of the first sedimentation module and directed upwards between the back side of the

first plate 201a of the first sedimentation module and the front side of the third plate 203a of the first sedimentation module and on both sides of the second plate 202a of the first sedimentation module.

For each of the remaining sedimentation chambers except the last sedimentation chamber: when the flow of liquid in a previous sedimentation chamber 206a,b,c reaches the upper edge of the third plate 203a,b,c of said previous sedimentation chamber, the liquid flows from the previous chamber 206a,b,c into the following sedimentation chamber 206b,c while being directed downwards by a front side of the first plate 201b,c of the following sedimentation module and directed upwards between the back side of the first plate 206b,c of the following sedimentation module and the front side of the third plate 203b,c of the following sedimentation module and on both sides of the second plate 202b,c of the following sedimentation module.

For the last sedimentation chamber: when the flow of liquid in the second last sedimentation chamber positioned before the last sedimentation chamber reaches the upper edge of the third plate of said second last sedimentation chamber, the liquid flows from the second last chamber into the last sedimentation chamber while being directed downwards by a front side of the flow aligner plate 205 of the last sedimentation chamber and flowing out of the last sedimentation chamber through the liquid outlet 106 at the outlet of the sedimentation housing 104.

The first, second and third plates 201a,b,c, 202a,b,c, 203a,b,c may be made of different materials, but it is preferred that the materials are selected so that the surface of the second plates 202a,b,c has a higher surface roughness than the surfaces of first and third plates 201a,b,c, 203a,b,c. Here, the first and third plates 201a,b,c, 203a,b,c of the sedimentation modules may be made of acid-free stainless steel, and the second plates 202a,b,c may be made of black steel. The fourth plates 204a,b,c, n, n+1 may also be made of black steel.

In order to remove any sediments from the sedimentation housing 104, a sedimentation outlet housing 111 is provided below the bottom 104d of the sedimentation housing. A number of sedimentation outlet openings 207a,b,c,n,n+1 are provided at the bottom of each sedimentation chamber 206a,b,c,n,n+1, where the sedimentation outlet openings

207a,b,c,n,n+1 face the sedimentation outlet housing 111, and sediments entering the bottom of a sedimentation chamber 206a,b,c,n,n+1 can enter into the sedimentation outlet housing 111. The sedimentation outlet housing 111 holds an outlet 112 and a first auger 501 with a motor 502, where the first auger 501 is configured for transferring incoming sediment to the outlet 112 of the sedimentation outlet housing 111. The last sedimentation outlet opening 207n+1 of the sedimentation housing 104 is dimensioned to operate as a first fluid return opening, and the sedimentation outlet opening 207a of the first sedimentation chamber is dimensioned to operate as a second fluid return opening facing the bottom of the first sedimentation chamber. During operation of the first auger 501, liquid will be inlet from the first fluid return opening 207n+1 and the sedimentation outlet openings 207b,c,n while being led back to the sedimentation housing 104 through the second fluid return opening 207a.

The system 100 also comprises a second auger within a second auger housing 113, which is external to the sedimentation housing 104 and the sedimentation outlet housing 104d. The second auger housing 113 has a bottom auger inlet connected to the outlet 112 of the sedimentation housing by a watertight connection, and the second auger housing 113 has a top auger outlet 114 above the liquid outlet 105 of the sedimentation housing 104. The second auger housing 113 is arranged at an angle in the range of 20-60 degrees to the horizontal direction, such as about 30-40 degrees to the horizontal direction. The second auger housing 113 and the second auger are dimensioned and arranged so that during an operation of treating a flow of liquid entering the sedimentation housing 104, the top auger outlet is positioned above the liquid surface D of the liquid within the sedimentation housing 104, whereby the surface of the liquid D within the second auger housing 113 is below the top auger outlet 114. A motor (not shown in the drawings) is provided for driving the second auger.

During an operation of treating a flow of liquid entering the sedimentation housing 104, the first 111 and second augers are configured to operate at different speeds of rotation, where the speed of rotation of the first auger 111 is higher than the speed of rotation of the second auger. The rotation speed of the second auger should be kept at a speed, whereby substantially no liquid is output from the top auger outlet 114 of the second auger housing 113, while at least part of the sediments entering the sedimentation outlet housing and passed by the first auger 111 from the sedimentation outlet housing to the second

auger housing 113 is further passed by the second auger from the bottom auger inlet to the top auger outlet 114. The sediments F being output from the stop auger outlet 114 may enter a bin 115.

It has been found by the inventor that the efficiency of the system 100 can be improved by use of an ultra-high frequency, UHF, antenna 302, which is electrically connected to the second plates 202a,b,c of the sedimentation modules. The UHF antenna may be connected to the second plates 202a,b,c via a current rectifier, such as a diode 301. Thus, at least part of or all of the second plates 202a,b,c of the sedimentation modules are electrically connected together, and may further be connected to the positive input of the diode 301, with the output of the diode 301 connected to the core of the UHF antenna cable.

In order to secure that all sediments within the sedimentation housing 104 reaches the sedimentation outlet housing 111 for removal, an electric vibrator 401 is connected to an outer sidewall of the sedimentation housing 104 for providing vibration to the sedimentation housing and the first, second and third plates 201a,b,c, 202a,b,c, 203a,b,c of the sedimentation modules. The electric vibrator may be configured for operating with a revolution in the range of 1000-6000 per minute, such as 2000-4000 per minute, such as about 3000 per minute, and the electric vibrator may be of the type NEA 504 provided by NetterVibration.

According to an example embodiment, the materials and dimensions of the components of the above-described system 100 are as listed below:

Inlet housing 101
Material: 5 mm black steel.
Dimensions:
Length: 1200mm.
Width: 400mm.
Height, side walls, inlet wall, outlet wall: 400mm.
Liquid inlet pipe 102: Diameter 75mm.
Placement of liquid inlet pipe 102: On top inlet wall.
Liquid outlet pipe 103: Diameter 110mm.

Placement of liquid outlet pipe 103: Dived inlet end, outlet part through the outlet wall, 10mm from top.

Type or material of filter 110

Coalescing filter for collection of small oil droplets with diameter less than 1 mm.
Dimension of filter: Width 390mm, height 330mm
Placement of filter in housing: 400mm from inlet end of inlet housing 101.

First electrodes or anodes 107a,107b

Material: Black steel, 5mm thick, with 88 perforated holes of 10x10mm2.
Dimensions: Width 390mm, height 330mm.
First electrode 107a placed 850mm from inlet end of inlet housing 101.
Distance between the first electrodes 107a and 107b is 150mm.
A steel rod 116 with a spacer may be provided for maintaining the distance between the first electrodes 107a, 107b.

Sedimentation housing 104

Liquid inlet 105 of sedimentation housing 104 comprises a distribution housing, see Fig. 4b, made of 5mm black steel, with a length i of 350mm, a height j of 250mm, a lower width l of 100mm and an upper width k of 130mm.
A liquid-inlet bottom plate 109 with length of 390mm and width of 70mm is placed at the liquid inlet 105 inside the sedimentation housing 104 to cover a bottom gap between second electrodes 108a, 108b.

The walls of sedimentation housing 104 is made of 5 mm black steel, with the following dimensions, see also Fig 4a:
Length a: 1500mm
Width b: 400mm
Height c of upper wall part 104a: 600mm.
Length d of lower inclined wall part 104b: 210mm.
Width of bottom 104d of sedimentation housing: 100mm.
Liquid outlet pipe 106: Diameter 110mm.
Placement of liquid outlet pipe 106: Inlet part 400mm from top, outlet part raised to 120mm from top.

Sedimentation outlet housing 111

Length: 1500mm.

Width e: 100mm.

Height f: 100mm.

Dimensions of sedimentation outlet openings 207b,c,n in the bottom: 80mm x 10mm.

Number of sedimentation outlet openings 207b,c,n without first and second fluid return openings 207n+1 and 207a: 11.

First fluid return opening 207n+1: 80mm x 80mm.

Second fluid return opening 207a: 100mm x 100mm.

Width g of outlet 112: 80mm.

Diameter of first auger 501: 80mm.

Second electrodes or cathodes 108a, 108b

Material: Black steel, 5mm thick, perforated with holes of 10mm diameter, 60% perforation of surface.

Width: 390mm.

Height: 270mm.

The first of the second electrodes 108a is arranged to cover an opening between the distribution housing and the sedimentation housing 104, and the second of the second electrodes 108b is arranged within the sedimentation housing 104 at a distance of 30mm to the first of the second electrodes 108a. Both second electrodes 108a, 108b are on top of the liquid inlet bottom plate 109.

Sedimentation modules

There are 11 sedimentation modules, each made up of four plates.

First plate 201a,b,c: Acid proof stainless steel, 2mm thick, height 450mm, width 390mm.

Second plate 202a,b,c: Black steel, 5mm thick, height 330mm, width 390mm, perforated with 88 openings of 10x10mm2 .

Third plate 203a,b,c: Acid proof stainless steel, 2mm thick, height 350mm, width 390mm.

Fourth plate 204a,b,c,n: Black steel, 5mm thick, upper width 400mm, lower width 100mm, length of sloping sides 210mm.

Flow aligner plate 205: Acid proof stainless steel, 2mm thick, height 450mm, width 390mm.

Arrangement of plates within sedimentation housing 104

The first, second and third plates 201a,b,c, 202a,b,c and 203a,b,c are placed in the sedimentation housing 104 at a distance to each other in a consecutive and parallel manner at an inclined position with an angle between 50-60 degrees to horizontal, such as 55 degrees. The distance between the first and second plates 201a,b,c and 202a,b,c of each sedimentation module is about 20mm, and the distance between the second and third plates 202a,b,c and 203a,b,c of each sedimentation module is about 10mm. The first, second and third plates 201a,b,c, 202a,b,c and 203a,b,c are removable attached to the inner sidewalls of the sedimentation housing 104. The flow aligner plate 205 is also removable attached to the sedimentation housing at the same angle and same height as the first plates 201a,b,c

Each fourth plate 204a,b,c has the lower edge secured to or positioned at the bottom 104d of the sedimentation housing 104 and the two side edges secured to opposed side edges of the lower inclined wall parts 104b of the sedimentation housing 104. The distance from the inlet end 104c of the sedimentation housing to the first fourth plate 204a is about 70mm, which is also the distance from one fourth plate to the following fourth plate.

The upper edges of the first plates 201a,b,c are positioned about 120mm below the upper edges of the sedimentation housing 104 and extend about 110 mm higher up within the sedimentation housing 104 than the upper edges of the second plates 202a,b,c, and the upper edges of the second plates 202a,b,c extend about 10mm higher up within the sedimentation housing 104 than the upper edges of the third plates 203a,b,c. The lower edges of the first and second plates 201a,b,c, 202a,b,c are positioned at a distance above the bottom 104d of the sedimentation housing 104, while the lower edge of each of the third plates 203a,b,c reaches an upper edge a fourth plate 204a,b,c. The distance from one first plate to the following first plate is 70mm, which is also the distance from the last first plate to the flow aligner plate 205.

Second auger housing 113

The second auger housing 113 has a diameter of 100mm, a length of 2000mm, and is arranged at an angle about 32 degrees to the horizontal direction. The second auger has diameter of 80mm and a length of 1800mm.

Current rectifier 301 and UHF antenna 302

All the second plates 202a,b,c are connected to the positive side of a diode current rectifier 301, with the negative side of the diode 301 connected to the core a UHF antenna cable of a UHF antenna 302. The diode current rectifier is a standard diode 800 V, 3 Amp, with 0,5mm2 cable legs, and the UHF antenna is a TRIAX Digi 14 DVB -T LTE 700, 14 elements, LTG 5 filter for 700 Mhz LTE protection.

Vibrator 401

An electric vibrator 401 is connected to an outer sidewall of the sedimentation housing 104. The electric vibrator is a NEA 504 vibrator provided by NetterVibration, and may be operating with a revolution of about 3000 revolutions per minute.

DC current source 118

AC to DC adapter, 12 Volt DC, max 1000 mA.

A number of test procedures for treating a flow of polluted wastewater by use of a system having the above-described dimensions and components have been performed as follows:

Number of tests: 25.

Each test is performed on about 4000 liter of tap water being polluted by adding 200mg of Millisil W6 test particles per liter of tap water. Millisil is a silica powder, which may be used in tests of the efficiency of particle separators for separation of particles such as heavy metals, since up to 99% of heavy metals in rainwater, wastewater or process water may adhere to the sand or silica particles within such types of water.

Test procedure:

1. The 12 Volt DC current source 118 is turned on, the electric vibrator 401 is turned on, and the first auger 501 starts rotating with 98,2 rotations per minute. The second auger of the second auger housing 113 is not in use during this test, since the amount of sediments reaching the sedimentation outlet housing 111 during the test period is quite small. However, the rotation of the first auger 501 provides a flow of liquid from the outlet end of the sedimentation housing 104 through the first fluid opening 207n+1 into the inlet end of the sedimentation housing 104 via the second fluid return opening 207a.

2. Tap water is supplied at a rate of 1,5 liter/second via an inlet pipe to the liquid inlet 102 and into the inlet housing 101, from where it continues to the sedimentation housing 104 and out through the liquid outlet 106 of the sedimentation housing 104.

3. After the 20 minutes, the Millisil powder starts being added to the tap water. The Millisil powder is added into the water at the inlet pipe 3 meters before the water runs into the liquid inlet 102 and into the inlet housing 101.

The Millisil powder is added as a solution from test tubes at a rate of 300mg/second for a period of about 4 minutes and 50 seconds, at which time the supply of Millisil is stopped, and a liquid inlet test sample is taken from the water at the liquid outlet 103 of the inlet housing 101, and a liquid outlet test sample is taken from the liquid outlet 106 of the sedimentation housing 104. The inlet and outlet liquid test samples have a volume of 1 liter.

4. After taking the liquid inlet and outlet test samples, Millisil starts being added again for about 4 minutes and 50 seconds, at which time the supply of Millesil is stopped and a new liquid inlet test sample and a new liquid outlet test sample are obtained.

5. Step 3 is repeated 3 times, giving a total of 5 sets of test samples before the test is stopped and the supply of tap water and Millesil is stopped. Also, the DC current source 118 is turned off, the electric vibrator 401 is turned off and the rotation of the first auger 501 is stopped. Total test time is about 45 minutes.

During normal operation, in which the system runs continuously for many hours, the DC current source 118 is turned on, the electric vibrator 401 is turned on for 3-5 minutes at intervals of 15 minutes, the first auger 501 runs continuously with 98,2 rotations per minute, while the second auger runs continuously with 18 rotations per minute.

The obtained 5 liquid inlet test samples and 5 liquid outlet test samples have been analyzed for their contents of Millisil, and the results show that the contents of Millisil have been reduced by 88% by passing through the sedimentation housing 104, which is considered very satisfying.

CLAIMS

1. A system (100) for treating a flow of liquid, such as a flow of wastewater or process water, said system comprising:

an inlet housing (101) with a liquid inlet (102) for incoming liquid (A) to be treated and a liquid outlet (103), and

a sedimentation housing (104) with a liquid inlet (105) and a liquid outlet (106) for treated outgoing liquid (E), wherein the liquid inlet (105) of the sedimentation housing (104) is positioned for receiving a flow of liquid (C) being output from the liquid outlet (103) of the inlet housing (101); characterised in that

one or more first electrodes (107a, 107b) are positioned within the inlet housing (101) between the liquid inlet (102) and liquid outlet (103) of the inlet housing (101), said first electrode(s) (107a, 107b) being kept in position within the inlet housing (101) while being electrically isolated from the inlet housing (101) and formed for letting a flow of liquid passing therethrough; and

one or more second electrodes (108a, 108b) are positioned within the sedimentation housing (104) next to the liquid inlet (105) of the sedimentation housing (104), said second electrode(s) (108a, 108b) being kept in position within the sedimentation housing while (104) being electrically isolated from the sedimentation housing (104) and formed for letting a flow of liquid passing therethrough.

2. A system (100) according to claim 1, wherein the inlet housing (101) and the sedimentation housing (104) are electrically isolated from each other when no liquid is flowing from the inlet housing (101) to the sedimentation housing (104).

3. A system (100) according to claim 1 or 2, wherein a filtration element (110), such as a coalescing filter, is positioned within the inlet housing (101) between the liquid inlet (102) and one of said one or more first electrodes (107a, 107b).

4. A system (100) according to any one of the claims 1 to 3, wherein said one or more first electrodes (107a, 107b) are substantially plate shaped and positioned substantially vertical; and

wherein said one or more first electrodes (107a, 107b) hold a number of through holes or are formed as mesh plates for letting a flow of liquid to be treated passing therethrough.

5. A system (100) according to claim 4, wherein at least two of said first electrodes (107a, 107b) are positioned within the inlet housing (101) between the liquid inlet (102) and liquid outlet (103) of the inlet housing (101), with at least two of said first electrodes (107a, 107b) being positioned parallel to each other with at distance to each other.

6. A system (100) according to any one of the claims 1 to 5, wherein said one or more second electrodes (108a, 108b) are substantially plate shaped; and
wherein said one or more second electrodes (108a, 108b) hold a number of through holes or are formed as mesh plates for letting a flow of liquid passing therethrough.

7. A system (100) according to claim 6, wherein a first arranged second electrode (108a) is positioned within the sedimentation housing (104) to thereby substantially cover the liquid inlet (105) of the sedimentation housing (104).

8. A system (100) according to claim 7, wherein the liquid inlet (105) of the sedimentation housing (104) comprises a distribution housing for receiving the flow of liquid (C) being output from the liquid outlet (103) of the inlet housing (101) to thereby secure a distributed flow of liquid into the sedimentation housing (104) and through the first arranged second electrode (108a).

9. A system (100) according to claim 7 or 8, wherein a second arranged second electrode (108b) is positioned within the sedimentation housing (104) substantially parallel to and at a distance to the first arranged second electrode (108a).

10. A system (100) according to claim 9, wherein a liquid-inlet bottom plate (109) is provided at the liquid inlet (105) of the sedimentation housing (104) below the second electrode(s) (108a, 108b); and
wherein the second electrode(s) (108a, 108b) have a bottom edge being kept in position close to the liquid-inlet bottom plate (109) while being electrically isolated from the liquid-inlet bottom plate (109).

11. A system (100) according to any one of the claims 1 to 10, wherein there are several first electrodes (107a,107b) being electrically connected together; and/or

wherein there are several second electrodes (108a, 108b) being electrically connected together.

12. A system (100) according to any one of the claims 1 to 11, wherein the system further comprises an electric direct current source (118) for applying a DC voltage between said one or more first electrodes (107a, 107b) and said one more second electrodes (108a, 108b), to thereby cause a current flow between the first electrode(s) (107a, 107b) in the inlet housing (101) and the second electrode(s) (108a, 108b) in the sedimentation housing (104) when liquid is flowing from the inlet housing (101) to the sedimentation housing (104).

13. A system (100) according to any one of the claims 1 to 12, wherein the sedimentation housing (104) has two opposing sidewalls (104a, 104b) and a bottom (104d) connecting the inlet (104c) and outlet ends;

wherein the sedimentation housing holds a number of sedimentation modules, where each of said number of sedimentation modules comprises four plates, a first (201a,b,c), a second (202a,b,c), a third (203a,b,c) and a fourth plate (204a,b,c), each plate having two side edges, an upper edge and a lower edge, said first (201a,b,c), second (202a,b,c) and third plates (203a,b,c) being placed at a distance to each other in a consecutive and parallel manner at an inclined position to vertical pointing away from the inlet (105) of the sedimentation housing (104); and

wherein the side edges of the first (201a,b,c), second (202a,b,c) and third plates (203a,b,c) are kept in position close to the sidewalls (104a, 104b) of the sedimentation housing (104).

14. A system (100) according to claim 13, wherein the upper edge of the first plate (201a,b,c) extends higher up within the sedimentation housing (104) than the upper edges of the second and third plates (202a,b,c, 203a,b,c), the lower edges of the first and second plates (201a,b,c, 202a,b,c) are positioned at a distance above the bottom (104d) of the sedimentation housing (104), while the lower edge of the third plate (203a,b,c) reaches an upper edge the fourth plate (204a,b,c), which fourth plate

(204a,b,c) has the lower edge secured to or positioned at the bottom (104d) of the sedimentation housing (104) and the two side edges secured to or positioned at opposed side edges of a lower part of the sedimentation housing; and

wherein the liquid outlet (106) of the sedimentation housing (104) is configured to maintain a liquid surface (D) of liquid being treated within the sedimentation housing (104) below the upper edge of the first plates (201a,b,c) and above the upper edges of the second and third plates (202a,b,c, 203a,b,c).

15. A system (100) according to claim 14, wherein a number of consecutive sedimentation chambers (206a,b,c,n,n+1) are formed with a first sedimentation chamber (206a) formed by the inlet end (104c) of the sedimentation housing (104), the third and fourth plates (203a, 204a) of a first sedimentation module, and parts of the sidewalls (104a, 104b) and bottom (104d) of the sedimentation housing (104); a following sedimentation chamber (206b) is formed by the third and fourth plates (203a, 204a) of the previous sedimentation module, the third and fourth plates (203b, 204b) of the next sedimentation module, and parts of the sidewalls (104a, 104b) and bottom (104d) of the sedimentation housing (104); and a last sedimentation chamber is formed by the third and fourth plates of the last sedimentation module, and the outlet end and parts of the sidewalls (104a, 104b) and bottom (104d) of the sedimentation housing (104).

16. A system (100) according to claim 15, wherein the bottom of the last sedimentation chamber is divided into first and second bottom sedimentation chambers (206n, 206n+1) by a final fourth plate (204n), which is positioned parallel to the fourth plate of the last sedimentation module, and wherein the last sedimentation chamber holds a flow aligner plate (205) positioned substantially parallel and at a distance to the third plate of the last sedimentation module, which flow aligner plate (205) is held by opposite sidewalls of the sedimentation housing at an inclined position to vertical pointing away from the inlet (105) of the sedimentation housing (104); and

wherein the upper edge of the flow aligner plate (205) extends higher up within the last sedimentation chamber than the upper edges of the second and third plates of the last sedimentation module, and wherein the lower edge of the flow aligner plate (205) is positioned at a distance above the bottom (104d) of the sedimentation housing (104).

17. A system (100) according to claim 15 or 16, wherein a sedimentation outlet housing (111) is provided below the bottom (104d) of the sedimentation housing (104);

wherein a sedimentation outlet opening (207a,b,c,n,n+1) is provided at the bottom of each sedimentation chamber, said sedimentation outlet openings (207a,b,c,n,n+1) facing the sedimentation outlet housing (111), whereby sediment entering the bottom of a sedimentation chamber can enter into the sedimentation outlet housing (111); and

wherein the sedimentation outlet housing (111) holds an outlet (112) and a first auger (501), which first auger (501) is configured for transferring incoming sediment to the outlet (112) of the sedimentation outlet housing (111).

18. A system (100) according to claim 17, wherein a second auger is provided within a second auger housing (113) external to the sedimentation housing (104) and the sedimentation outlet housing (111), said second auger housing (113) having a bottom auger inlet connected to the outlet (112) of the sedimentation outlet housing (111) by a watertight connection, and said second auger housing (113) having a top auger outlet (114) above the liquid outlet (106) of the sedimentation housing (104).

19. A system (100) according to any one of the claims 13 to 18, wherein at least part of or all of the second plates (202a,b,c) of the sedimentation modules are electrically connected together;

wherein the system (100) further comprises a current rectifier (301) for rectifying electric current and an ultra-high frequency, UHF, antenna (302), which UHF antenna is electrically connected via the current rectifier (301) to the electrically connected second plates (202a,b,c) of the sedimentation modules; and/or

wherein an electric vibrator (401) is connected to an outer sidewall of the sedimentation housing (104) for providing vibration to the sedimentation housing (104).

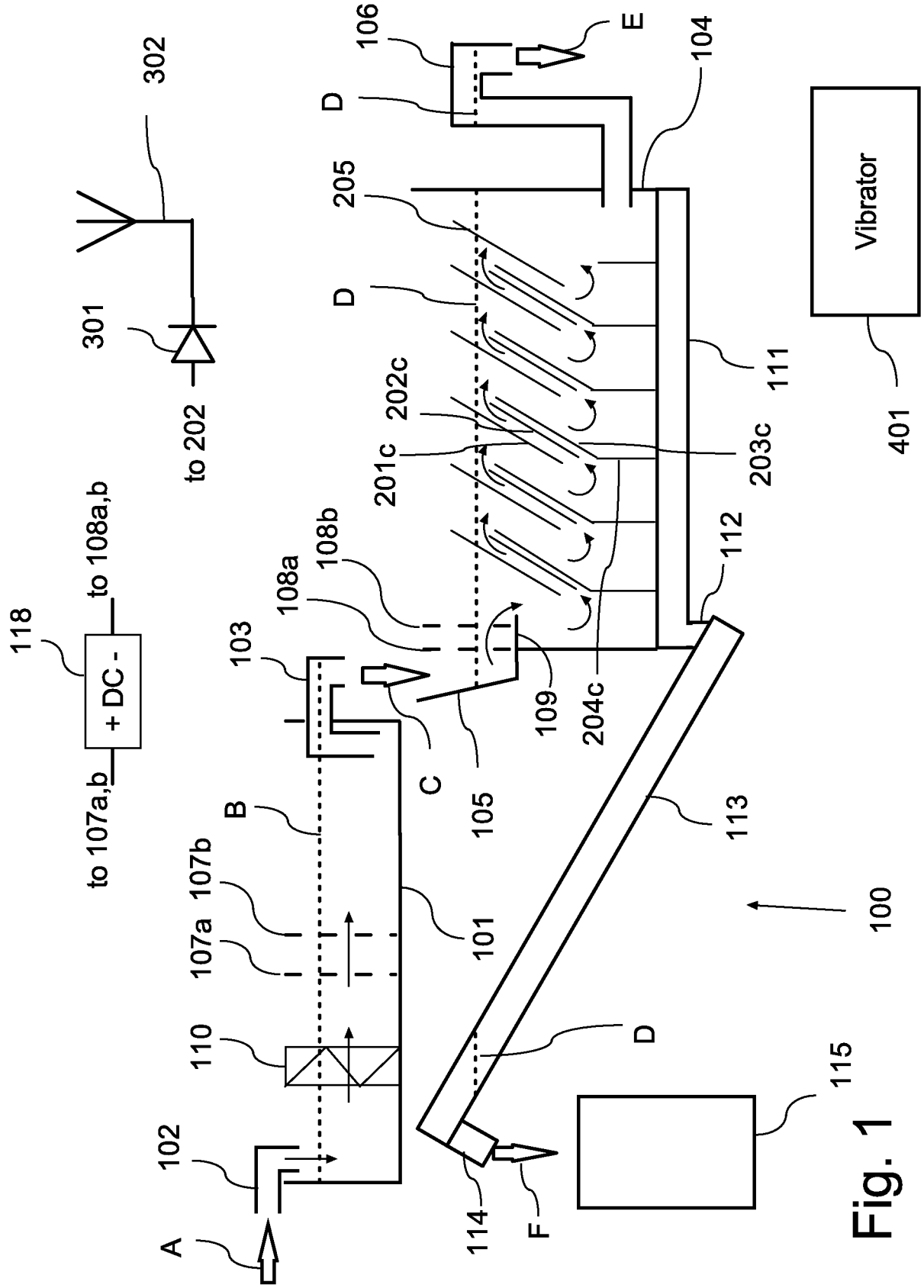

302
301
to 202
106
E
D
104
205
D
202c
201c
203c
111
Vibrator
401
112
108b
108a
103
118
to 108a,b
+ DC -
to 107a,b
109
204c
C
105
B
113
107b
107a
101
100
110
D
102
115
A
114
F

Fig. 1

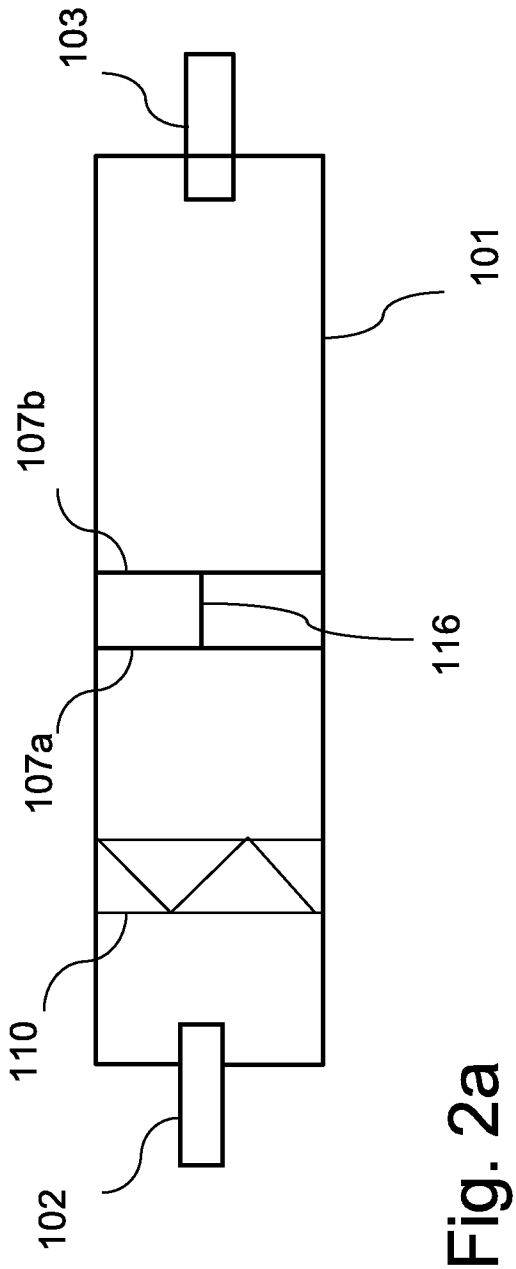


Fig. 2a

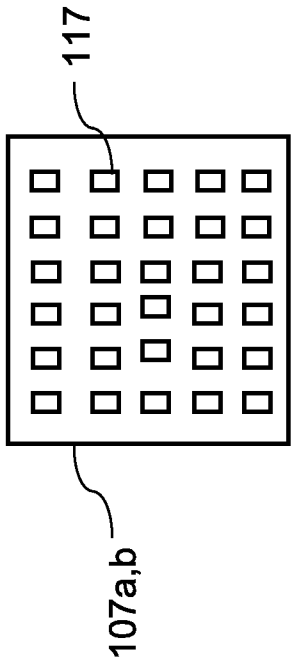


Fig. 2b

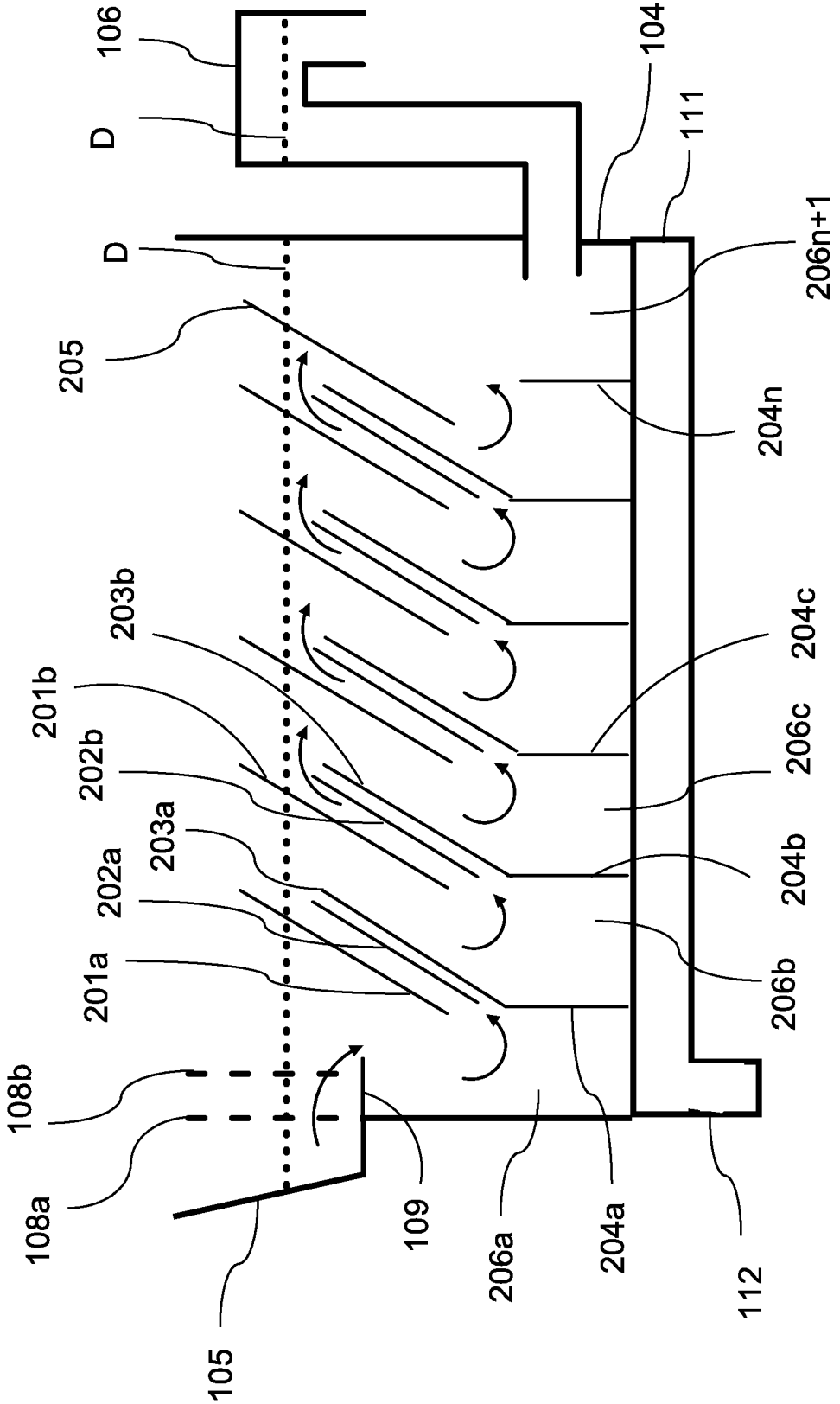

106
D
D
205
104
111
206n+1
204n
203b
201b
202b
203a
202a
201a
204c
206c
204b
206b
108b
108a
109
206a
204a
112
105

Fig. 3

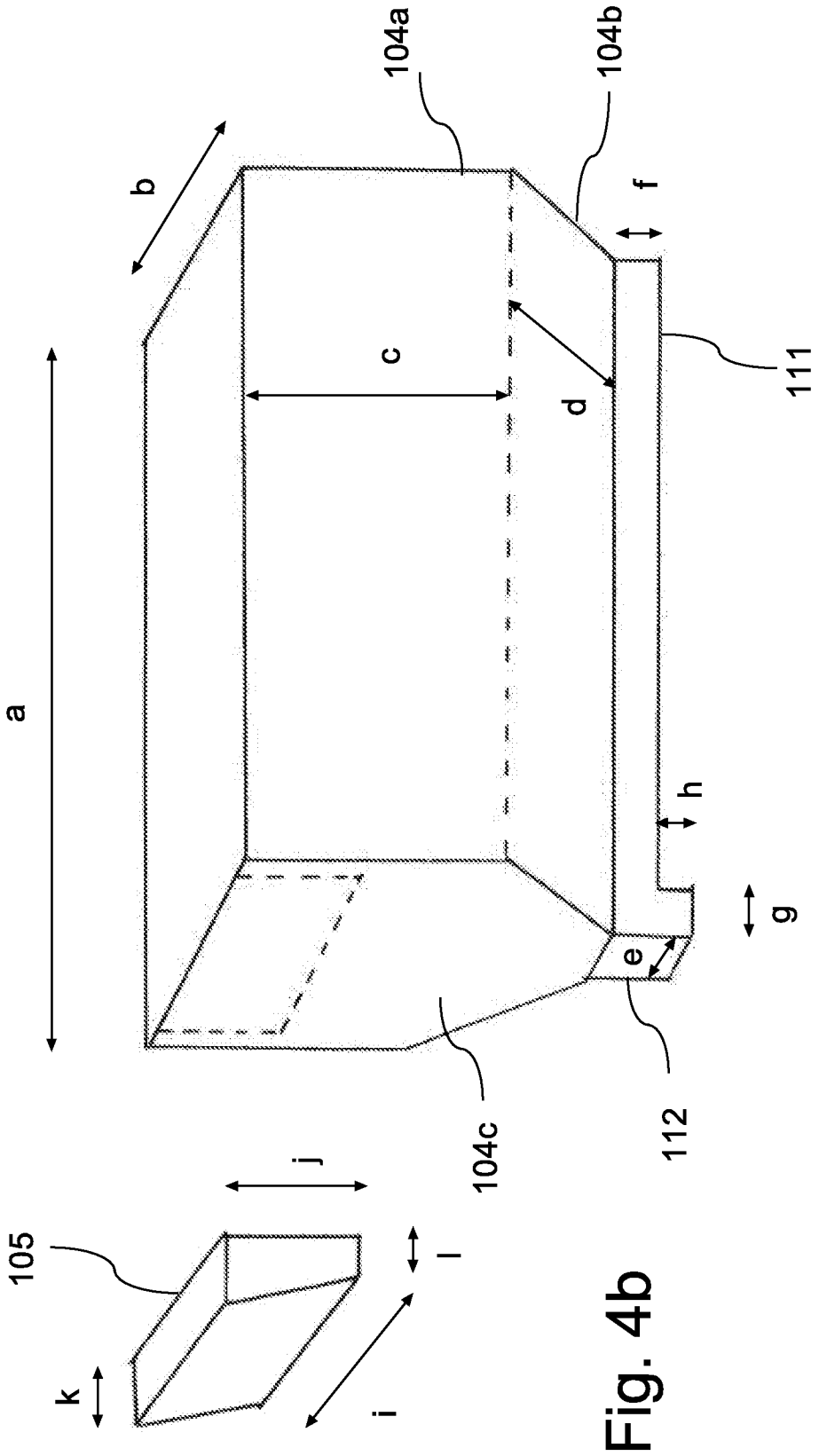


Fig. 4a

Fig. 4b

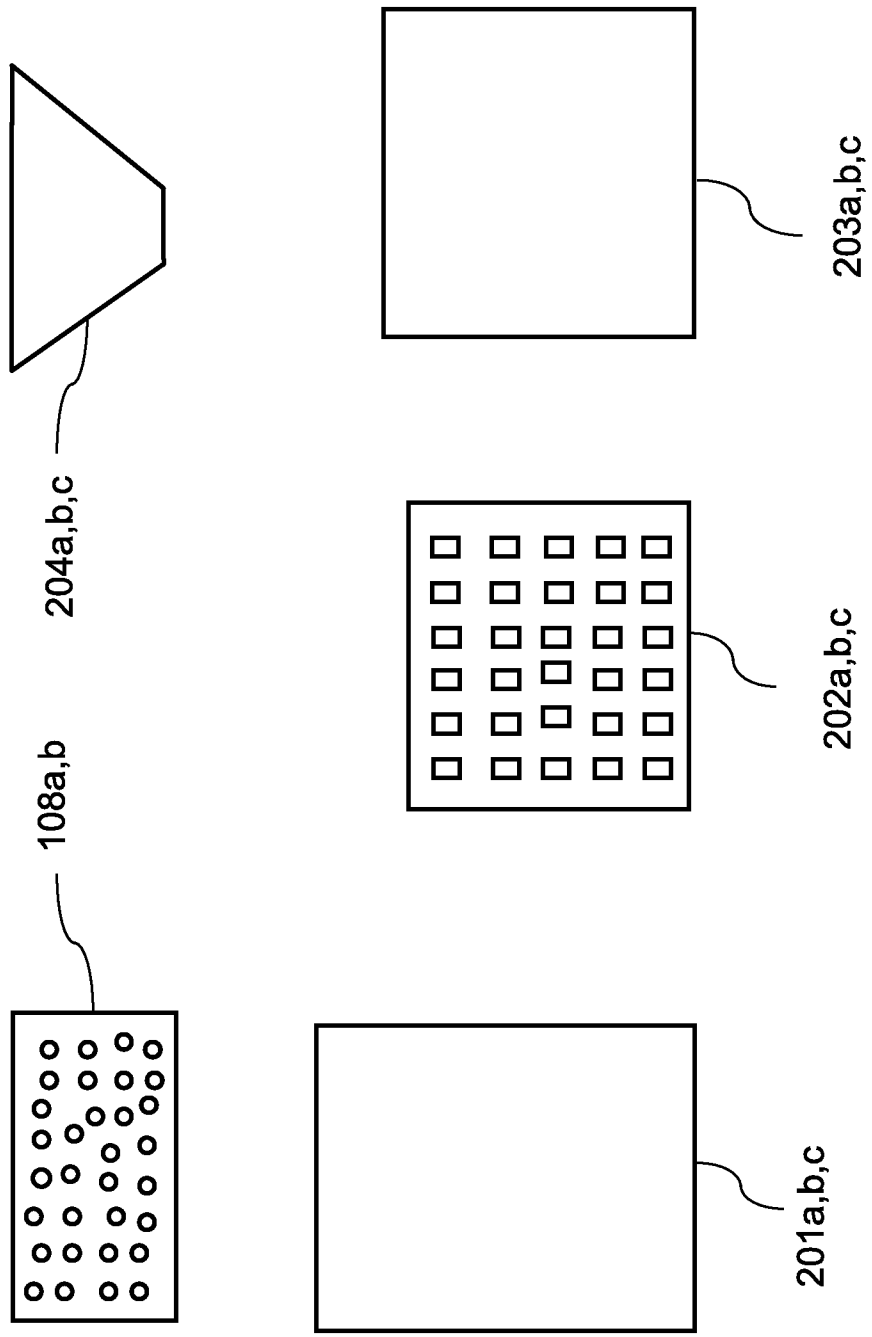
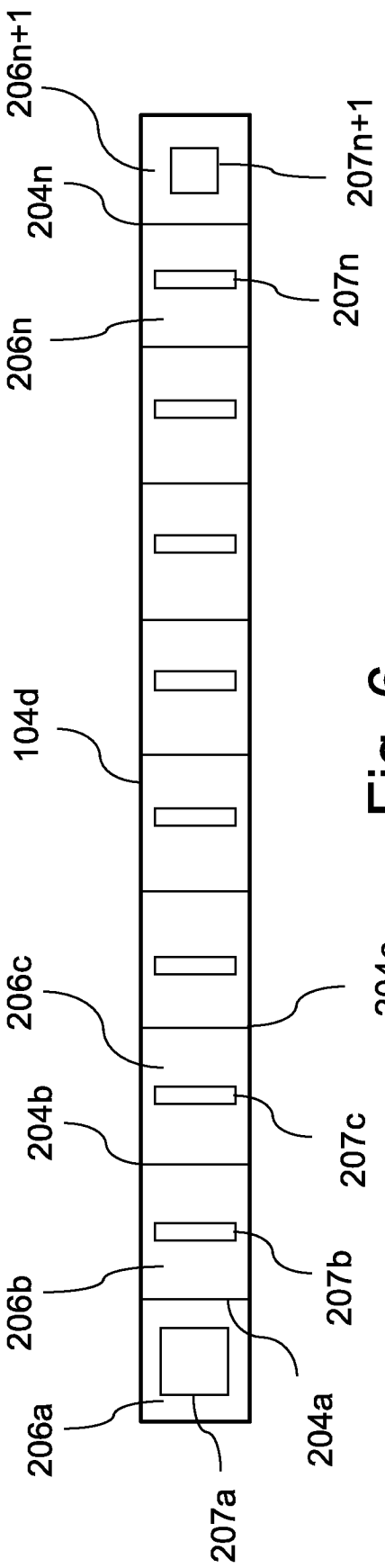


Fig. 5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207n+1
204n
207n
206n
104d
206c
204c
204b
207c
206b
207b
206a
204a
207a

Fig. 6

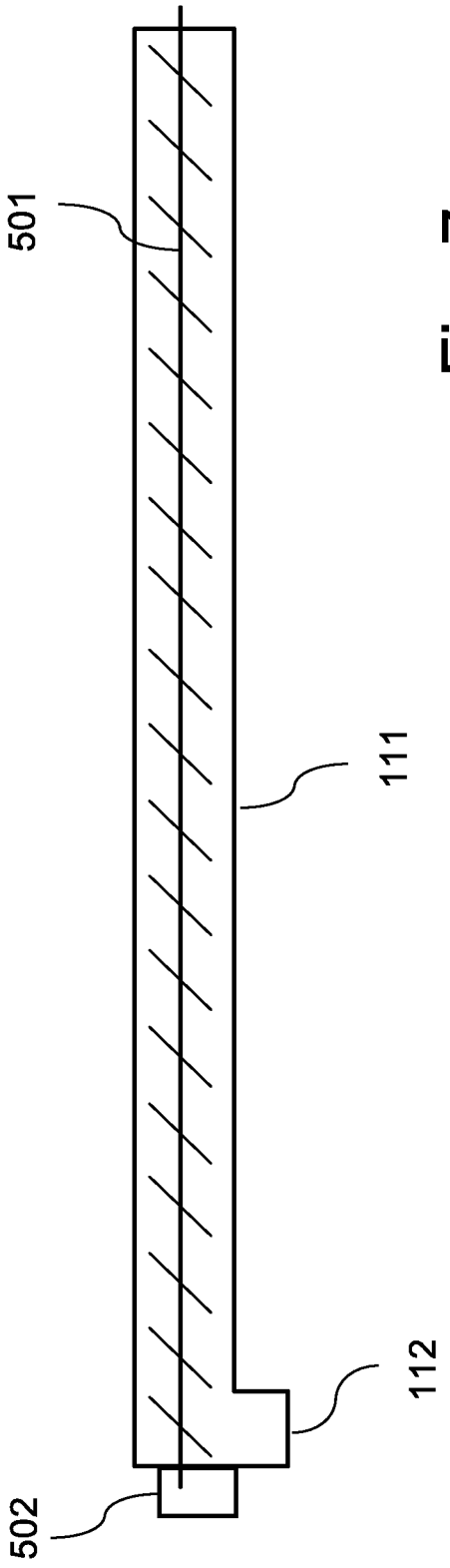
501
111
112
502

Fig. 7

INTERNATIONAL SEARCH REPORT

International application No.
PCT/DK2023/050232

A. CLASSIFICATION OF SUBJECT MATTER

C02F 1/46 (2023.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

C02F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

DK, FI, NO, SE: Class as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPODOC, WPI, English full text

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2022165594 A1 (GRAFOID INC [CA]) 11 August 2022 (2022-08-11) Section [0078], fig. 4A.	1 - 19
D,A	WO 2017178707 A1 (NBTEC OY [FI]) 19 October 2017 (2017-10-19) Whole document	1 - 19
A	EP 3074347 A1 (KOLINA LTD [GB]) 05 October 2016 (2016-10-05) Whole document	1 - 19
A	GB 2055897 A (DULAC F M J) 11 March 1981 (1981-03-11) Whole document	1 - 19
A	US 2018141836 A1 (HU BO [US]) 24 May 2018 (2018-05-24) Whole document	1 - 19
A	US 4181591 A (KING ARTHUR S [US]) 01 January 1980 (1980-01-01) Whole document	1 - 19

☑ Further documents are listed in the continuation of Box C. ☑ See patent family annex.

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"D" document cited by the applicant in the international application
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"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
14 November 2023	**22 November 2023**

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 113856254 A (BEIJING ENTERPRISES WATER CHINA INVEST CO LTD) 31 December 2021 (2021-12-31) Whole document	1 - 19
A	WO 2004056711 A1 (ENVIROGAIN INC [CA]) 08 July 2004 (2004-07-08) Whole document	1 - 19

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/DK2023/050232

Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)			Publication date (day/month/year)
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				FI	127889	B	30 April 2019
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