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(54) **PRE-FABRICATED WATER CONTROL SLUICE GATE SYSTEM WITH ANTI-SEDIMENTATION FUNCTION**

(57) The present invention relates a pre-fabricated water control sluice gate system comprising a frame, a gate member, and an actuator adapted for moving the gate member. One or more channels extends through the base member of the frame and extends from one side of the gate member to the other side of the gate member.

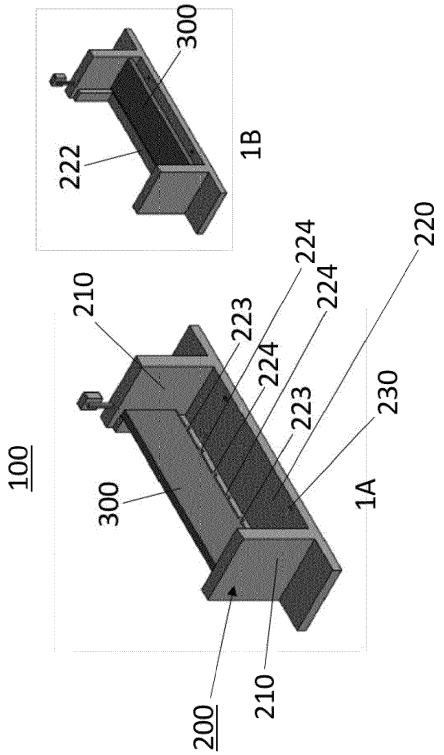

Fig. 1

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Description

Technical field of the invention

[0001] The present invention relates to sluice gates.

Background of the invention

[0002] Sluice gates are used selectively to control water flow from one area of a channel to another by opening or closing off the channel to the water flow.

[0003] The frame/foundation of the sluice gate is cast directly at the application site of the sluice gate. Hence, the construction time is long, as the cement needs to settle and harden before a gate member can be installed therein. The hardening of the cement may be affected by the weather conditions, resulting in a frame/foundation of poor quality and strength. Furthermore, sedimentation prevents the functioning of the sluice gate.

[0004] It is therefore desirable to provide a system, which can eliminate some or all of the above problems.

Description of the invention

[0005] One aspect relates to a pre-fabricated water control sluice gate system comprising:

a. a frame comprising:

i. two side panels;
ii. a base panel interconnecting the two side panels; and
iii. at least one lifting anchor or coupler adapted for receiving a lifting anchor;

b. one or more gate members; and
c. an actuator adapted for moving the one or more gate members;

wherein the side and/or base panels are adapted for mounting the one or more gate members thereto; wherein a) a part of the base panel is configured as a lower gate member extending between the two side panels, and wherein the lower gate member comprises one or more channels of a first type extending from one side of the lower gate member to the other; and wherein the one or more channels of a first type are configured for being in a closed configuration and in an open configuration, and/or b) wherein the base panel comprises one or more channels of a second type extending from one side of the gate member to the other side of the gate member, and wherein one or more inlets and one or more outlets of a channel a second type is positioned on each side of the lower gate member, and wherein the one or more channels of a second type are configured for being in a closed configuration and in an open configuration.

[0006] The channels of a first type and/or the channels of a second type use the water pressure difference across the gate member to flush water through the channels, thereby removing sediments that would otherwise block the functioning of the sluice gate.

[0007] In one or more embodiments, a part of the base panel is configured as a lower gate member extending between the two side panels.

[0008] In one or more embodiments, the frame is a pre-cast reinforced concrete frame.

[0009] The term "pre-cast" as used throughout this application means the opposite of cast in situ. In other words, the pre-cast reinforced concrete frame is finished as finished structures when shipped to a builder or customer, rather than being poured into temporary forms at the building site or place of use.

[0010] As used herein, the term "reinforced concrete" refers to concrete into which reinforcement bars or fibres have been cast to carry tensile loads in order to strengthen a structure that would otherwise be brittle.

[0011] The frame may also be made of metal, wood, or a castable material. It is to be understood that any suitable castable material, such as cement, mortar, concrete, ceramics, thermoset plastics, and thermoplastics can be used for producing the frame.

[0012] In one or more embodiments, the side and/or base panels are made from a reinforced castable material.

[0013] In one or more embodiments, the side and/or base panels are made from a reinforced castable material, and wherein the reinforcement extends beyond the side and/or base panels.

[0014] As used herein, the term "reinforced castable material" refers to a castable material into which reinforcement bars or fibres have been cast to carry tensile loads in order to strengthen a structure that would otherwise be brittle.

[0015] In the present context, the term "lifting anchor" should be broadly construed to encompass any such device for lifting the frame with or without gate members and actuators installed therein. Alternatively, a coupler adapted for receiving a lifting anchor is embedded in the frame. The coupler may comprise internal or external threading, depending on the configuration of the lifting anchor.

[0016] In one or more embodiments, the lifting anchor or coupler adapted for receiving a lifting anchor is mechanically tied into the reinforcing members embedded in the castable material, such as concrete.

[0017] In order to avoid that water will undermine the base panel; it may be an advantage to extend the base panels beyond the side panels, preferably beyond the front, back and outer side/face of the side panel. In one or more embodiments, the base panel extends beyond the side panels.

[0018] In one or more embodiments, the base panel extends beyond the front of the side panels.

[0019] In one or more embodiments, the base panel extends beyond back of the side panels.

[0020] In one or more embodiments, the base panel

extends beyond the outer side/face of the side panels.

[0021] In one or more embodiments, the base panel extends beyond the front and/or the back and/or the outer side of the side panels.

[0022] In one or more embodiments, the part of the base panel extending beyond the side panels comprises channels adapted for receiving an earth anchor.

[0023] In one or more embodiments, the reinforcement extends beyond the side and/or base panels.

[0024] In one or more embodiments, the reinforcement extends beyond the side panels, preferably beyond the front and back of the side panel. This will allow the pre-fabricated sluice gate system to be built into other reinforced concrete structures.

[0025] In one or more embodiments, the reinforcement extends beyond the front of the side panels.

[0026] In one or more embodiments, the reinforcement extends beyond the back of the side panels.

[0027] In one or more embodiments, the reinforcement extends beyond the outer side/face of the side panels.

[0028] In one or more embodiments, the reinforcement extends beyond the front and/or the back and/or the outer side of the side panels.

[0029] In one or more embodiments, the one or more channels of a first type and/or of a second type comprises one or more flaps or valves adapted for closing and opening the one or more channels collectively and/or individually.

[0030] In one or more embodiments, the lower gate member comprises a plurality of channels of a first type; wherein each of the channels comprises a flap adapted for closing and opening the one or more channels of a first type, and wherein the flaps are arranged on a single rotating and/or sliding shaft.

[0031] In one or more embodiments, the lower gate member and/or the base panel comprises air and/or water channels adapted to be connected to a source of compressed air and/or water. In one or more embodiments, a part of the base panel is configured as a lower gate member extending between the two side panels. The lower gate member may in one or more embodiments comprise air/water channels adapted to be connected to a source of water and/or compressed air. Water and/or compressed air may thereby be used to remove sediments blocking the function of the one or more gate members.

[0032] In one or more embodiments, the pre-fabricated water control sluice gate system further comprises means for delivering water and/or compressed air.

[0033] In one or more embodiments, the base panel comprises suction channels adapted to be connected to a source of suction. With or without the function of the air/water channels, the suction channels may be used to remove sediments blocking the function of the one or more gate members.

[0034] In one or more embodiments, the base panel comprises one or more channels of a second type extending from one side of the lower gate member to the other side of the lower gate member, and wherein one or more inlets and one or more outlets of a channel is positioned on each side of the lower gate member, and wherein the one or more channels of a second type are configured for being in a closed configuration and in an open configuration.

[0035] In one or more embodiments, each of the channels of a second type comprises a flap adapted for closing and opening the one or more channels, and wherein the flaps are arranged on a single rotating and/or sliding shaft.

[0036] In one or more embodiments, each of the channels of a second type comprises a plurality of channels; wherein each of the channels comprises a flap adapted for closing and opening the one or more channels, and wherein the flaps are arranged on a single rotating and/or sliding shaft.

[0037] In one or more embodiments, the channels of a second type are in liquid communication with one or more suction channels adapted to be connected to a source of suction.

[0038] In one or more embodiments, the channels of a second type are in liquid communication with one or more channels adapted for liquid communication with a reservoir.

[0039] In one or more embodiments, the pre-fabricated sluice gate system further comprises a venturi injector unit positioned downstream to the one or more gate members; wherein the venturi injection unit comprises one or more venturi injectors comprising an input port adapted for receiving a part of the water passing the one or more gate members, an output port, and an injection port; wherein the channels of a second type are in liquid communication with an injection port of one or more venturi injectors. This configuration allows sedimentation to be removed at positions close to the inlets and outlets of the channels of a second type, and the sedimentation is delivered further downstream through the output port(s) of the venturi injector(s).

[0040] In one or more embodiments, the channels of a second type comprise suction channels adapted to be connected to a source of suction.

[0041] In one or more embodiments, the channels of a second type comprise channels adapted for liquid communication with a reservoir.

[0042] In one or more embodiments, the inner side of the side panels each comprises a channel configured for receiving a moving gate member.

[0043] In one or more embodiments, the outer face of the side panels each comprises a channel configured for receiving a reinforcement plate adapted for being imbedded in the adjacent dam section.

[0044] In one or more embodiments, the outer face of the side panels each comprises a channel configured for receiving a reinforcement plate adapted for being imbedded in the adjacent dam section.

[0045] Another aspect relates to a method for segregating a body of water into two distinct parts with a pre-

fabricated water control sluice gate system comprising the steps of:

- sinking a pre-fabricated sluice gate system according to the present invention at a predetermined location in the body of water, the pre-cast reinforced concrete side panels of the pre-cast reinforced concrete frame having been chosen so as to have sufficient height to protrude above the water level of the body of water after the sluice gate system is sunk at its predetermined location; and
- building a dam up against the outer face of the side panels. This method has a particular advantage over existing methods in that no preliminary dam has to be built, and water pumped out of the area, to secure the location on which the water control sluice gate system is to be build/cast.

[0046] Yet another aspect relates to a method for segregating a body of water into two distinct parts with a pre-fabricated water control sluice gate system comprising the steps of:

- sinking a pre-fabricated sluice gate system according to according to the present invention at a predetermined location in the body of water, the side panels of the frame having been chosen so as to have sufficient height to protrude above the water level of the body of water after the sluice gate system is sunk at its predetermined location; and
- building a dam up against the outer face of the side panels.

[0047] As used in the specification and the appended claims, the singular forms "a", "an", and "the" include plural referents unless the context clearly dictates otherwise. Ranges may be expressed herein as from "about" or "approximately" one particular value and/or to "about" or "approximately" another particular value. When such a range is expressed, another embodiment includes from the one particular value and/or to the other particular value. Similarly, when values are expressed as approximations, by use of the antecedent "about", it will be understood that the particular value forms another embodiment.

[0048] It should be noted that embodiments and features described in the context of one of the aspects of the present invention also apply to the other aspects of the invention.

Brief description of the figures

[0049]

Figure 1 shows a pre-fabricated water control sluice gate system with one gate member (flap gate) in accordance with various embodiments of the invention;

Figure 2 shows a pre-fabricated water control sluice gate system with one gate member (vertical rising gate) in accordance with various embodiments of the invention;

Figure 3 shows a first example of a flap adapted for opening and closing the channels of a first type;

Figure 4 shows a second example of a flap adapted for opening and closing the channels of a first type;

Figure 5 shows a third example of a flap adapted for opening and closing the channels of a first type;

Figure 6 shows a pre-fabricated water control sluice gate system with channels of a second type in accordance with various embodiments of the invention; and

Figure 7 shows a pre-fabricated water control sluice gate system with channels of both a first type and a second type in accordance with various embodiments of the invention.

Detailed description of the invention

[0050] Figure 1 shows a pre-fabricated water control sluice gate system with one gate member (flap gate) 300 in accordance with various embodiments of the invention. Figure 1A shows the gate member 300 in a closed position, and a Figure 1B shows the gate member in an open position.

[0051] The pre-fabricated water control sluice gate system 100 comprises a frame 200, the flap gate 300, and an actuator 400 adapted for moving the flap gate 300. The frame 200 comprises two side panels 210, a base panel 220 interconnecting the two side panels 210, and lifting anchors 230. The side panels 210 are adapted for mounting the flap gate 300 thereto.

[0052] A part of the base panel 220 is configured as a lower gate member 222 extending between the two side panels 210. The lower gate member 222 comprises a plurality of channels 224 of a first type extending from one side of lower gate member 222 to the other; and channels 224 of a first type are configured for being in a closed configuration and in an open configuration (not shown). The lower gate member 222 is also shown with air channels 223 adapted to be connected to a source of compressed air, but this is optional, and could be replaced by more channels 224 of a first type.

[0053] Figure 2 shows a pre-fabricated water control sluice gate system with one gate member (vertical rising gate) in accordance with various embodiments of the invention. Figures 2A (perspective view) and 2B (cross-sectional view) show the gate member 300 in an open position, while Figure 2C (cross-sectional view) shows the gate member in a closed position.

[0054] Figure 3 shows a first example of a flap 225

adapted for opening and closing the channels of a first type. The lower gate member 222 comprises a plurality of channels 224 of a first type extending from one side of lower gate member 222 to the other. A single flap 225 is used to open and close all the channels 224 of a first type. The single flap 225 is moved by a piston rod.

[0055] Figure 4 shows a second example of flaps 225 adapted for opening and closing the channels of a first type. The flaps are interconnected by connecting rods, and moved by a piston rod.

[0056] Figure 5 shows a third example of a flap adapted for opening and closing the channels of a first type. The flaps are working independently of one another.

[0057] Figure 6 shows a cross-section of a pre-fabricated water control sluice gate system with channels of a second type in accordance with various embodiments of the invention. The base panel 220 is shown comprising a channel 226 of a second type extending from one side of the gate member 300 to the other side of the gate member 300. The channel 226 of a second type is shown with one inlet 227 and two outlets 228 positioned on each side of the lower gate member 222. The channel 226 of a second type is configured for being in a closed configuration and in an open configuration by use of the valve 225. Figure 7 shows a pre-fabricated water control sluice gate system with channels of both a first type 224 and a second type 226 in accordance with various embodiments of the invention. The channels of a second type 226 are in liquid communication with a suction channel 500 adapted to be connected to a source of suction.

References

[0058]

100	Pre-fabricated water control sluice gate system
200	Frame
210	Side panel
220	Base panel
222	Lower gate member
223	Air channels adapted to be connected to a source of compressed air
224	Channel of a first type
225	Flap
226	Channel of a second type
227	Inlet
228	Outlet
230	Lifting anchor
300	Gate member
400	Actuator
500	Suction channel

Claims

1. A pre-fabricated water control sluice gate system (100) comprising:

a. a frame (200) comprising:

i. two side panels (210);
ii. a base panel (220) interconnecting the two side panels (210); and
iii. at least one lifting anchor (230) or coupler adapted for receiving a lifting anchor;

b. one or more gate members (300); and
c. an actuator (400) adapted for moving the one or more gate members;

wherein the side (210) and/or base (220) panels are adapted for mounting the one or more gate members (300) thereto; wherein a) a part of the base panel (220) is configured as a lower gate member (222) extending between the two side panels (210), **characterized in that** the lower gate member (222) comprises one or more channels (224) of a first type extending from one side of lower gate member (222) to the other; and wherein the one or more channels (224) of a first type are configured for being in a closed configuration and in an open configuration, and/or b) wherein the base panel (220) comprises one or more channels (226) of a second type extending from one side of the gate member (300) to the other side of the gate member (300), and wherein one or more inlets (227) and one or more outlets (228) of a channel (226) is positioned on each side of the lower gate member (222), and wherein the one or more channels (226) of a second type are configured for being in a closed configuration and in an open configuration.

2. A pre-fabricated sluice gate system (100) according to claim 1, wherein the one or more channels of a first type (224) and/or of a second type (226) comprises one or more flaps (225) or valves adapted for closing and opening the one or more channels (224, 226) collectively and/or individually.

3. A pre-fabricated sluice gate system (100) according to claim 1, wherein the lower gate member (222) comprises a plurality of channels (224) of a first type; wherein each of the channels (224) comprises a flap (225) or valve adapted for closing and opening the one or more channels of a first type, and wherein the flaps (225) or valves are configured to be operated collectively and/or individually.

4. A pre-fabricated sluice gate system (100) according to claim 1, wherein the lower gate member (222) comprises a plurality of channels (224) of a first type; wherein each of the channels (224) of a first type comprises a flap adapted for closing and opening the one or more channels, and wherein the flaps are arranged on a single rotating and/or sliding shaft.

5. A pre-fabricated sluice gate system (100) according to any one of the claims 1-4, wherein the lower gate member (222) and/or the base panel (220) comprises air and/or water channels adapted to be connected to a source of compressed air and/or water.

6. A pre-fabricated sluice gate system (100) according to any one of the claims 1-5, wherein the base panel (220) comprises one or more channels (226) of a second type extending from one side of the lower gate member (222) to the other side of the lower gate member (222), and wherein one or more inlets (227) and one or more outlets (228) of a channel (226) is positioned on each side of the lower gate member (222), and wherein the one or more channels (224) of a second type are configured for being in a closed configuration and in an open configuration.

7. A pre-fabricated sluice gate system (100) according to claim 6, wherein each of the channels of a second type (226) comprises a flap (225) or valve adapted for closing and opening the channel of a second type, and wherein the flaps (225) or valves are configured to be operated collectively and/or individually.

8. A pre-fabricated sluice gate system (100) according to any one of the claims 6-7, wherein the channels of a second type (226) are in liquid communication with one or more suction channels (500) adapted to be connected to a source of suction.

9. A pre-fabricated sluice gate system (100) according to any one of the claims 6-8, wherein the channels of a second type (226) are in liquid communication with one or more channels adapted for liquid communication with a reservoir.

10. A pre-fabricated sluice gate system (100) according to any one of the claims 6-9, further comprising a venturi injector unit positioned downstream to the one or more gate members (300); wherein the venturi injection unit comprises one or more venturi injectors comprising an input port adapted for receiving a part of the water passing the one or more gate members (300), an output port, and an injection port; wherein the channels of a second type (226) are in liquid communication with an injection port of one or more venturi injectors.

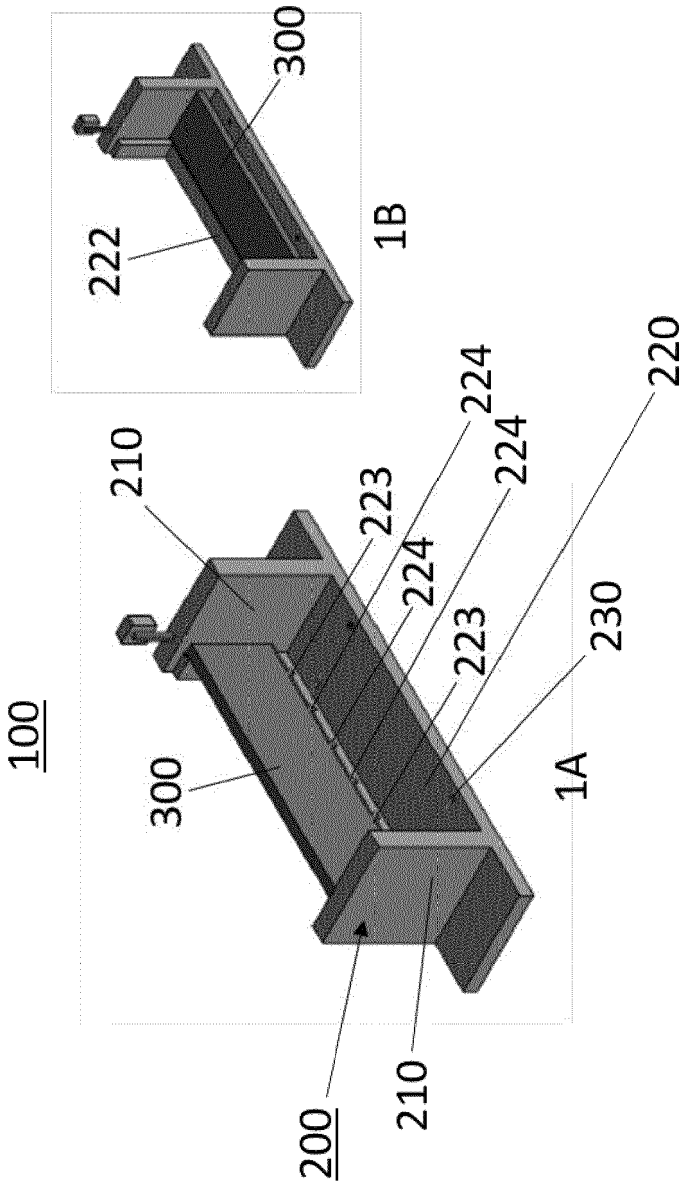

Fig. 1

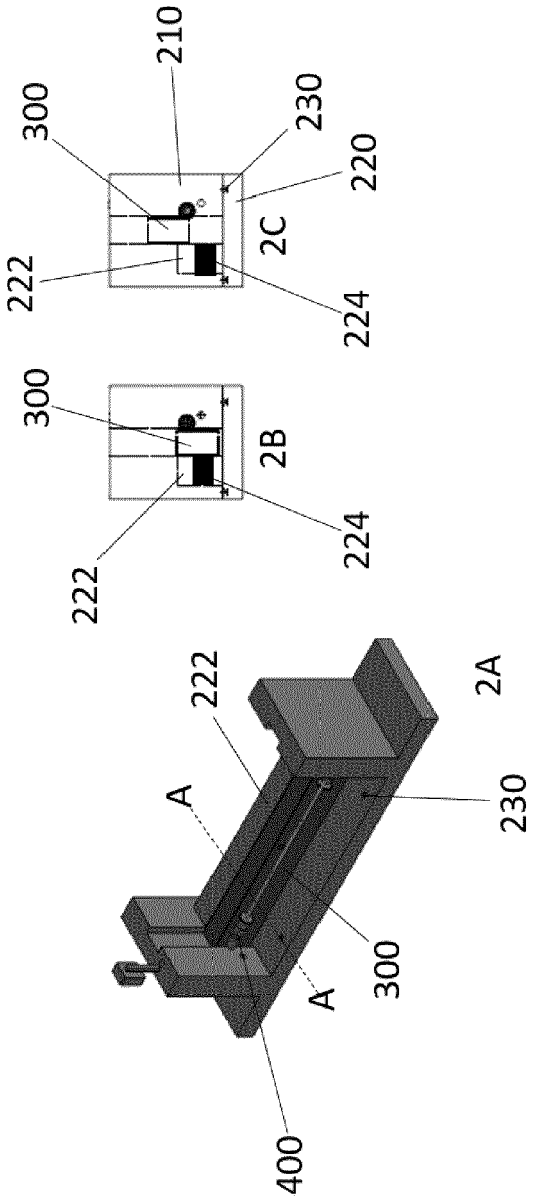

Fig. 2

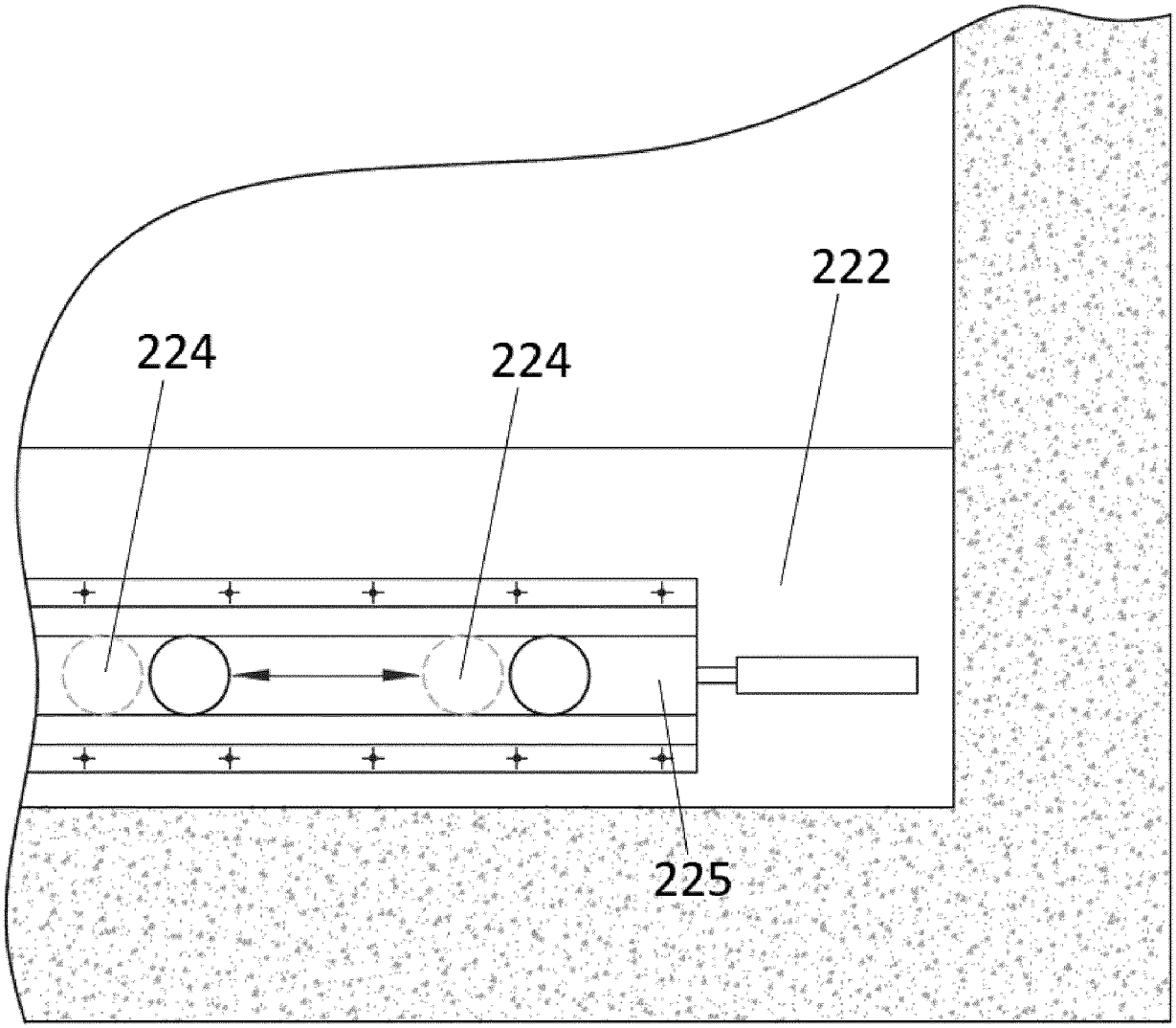

Fig. 3

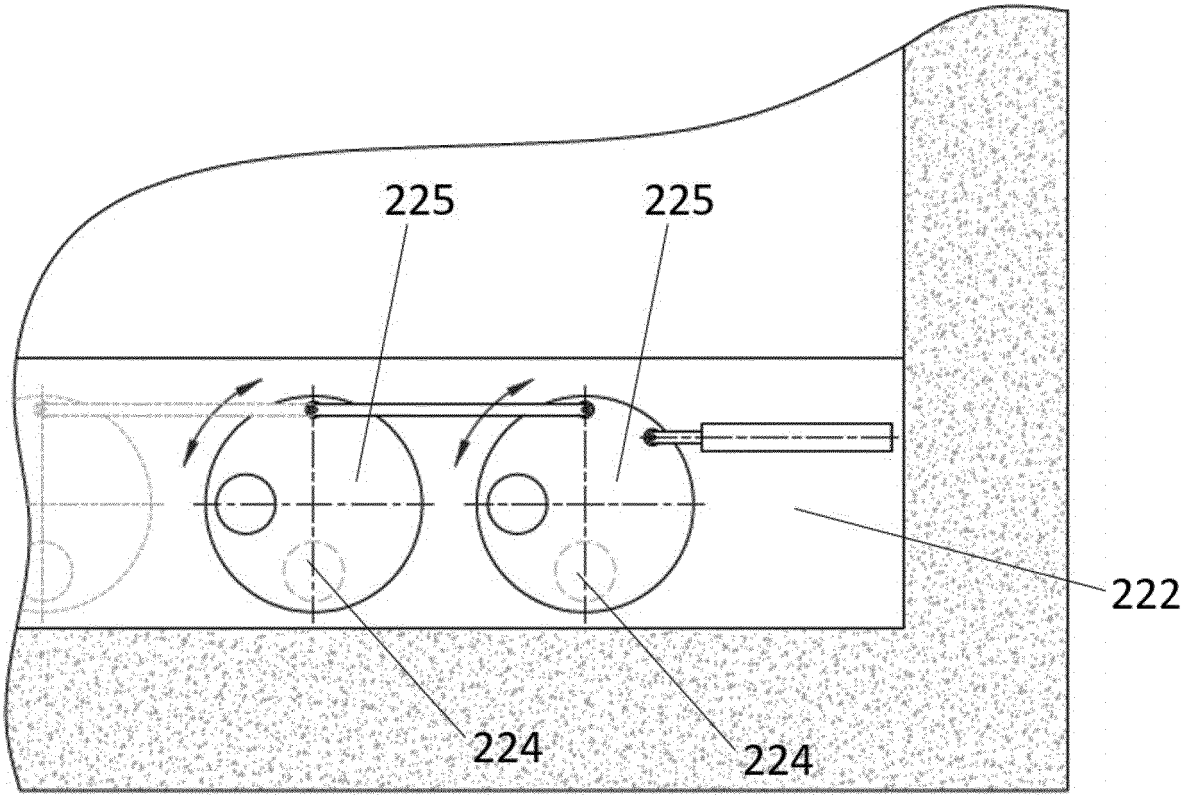

Fig. 4

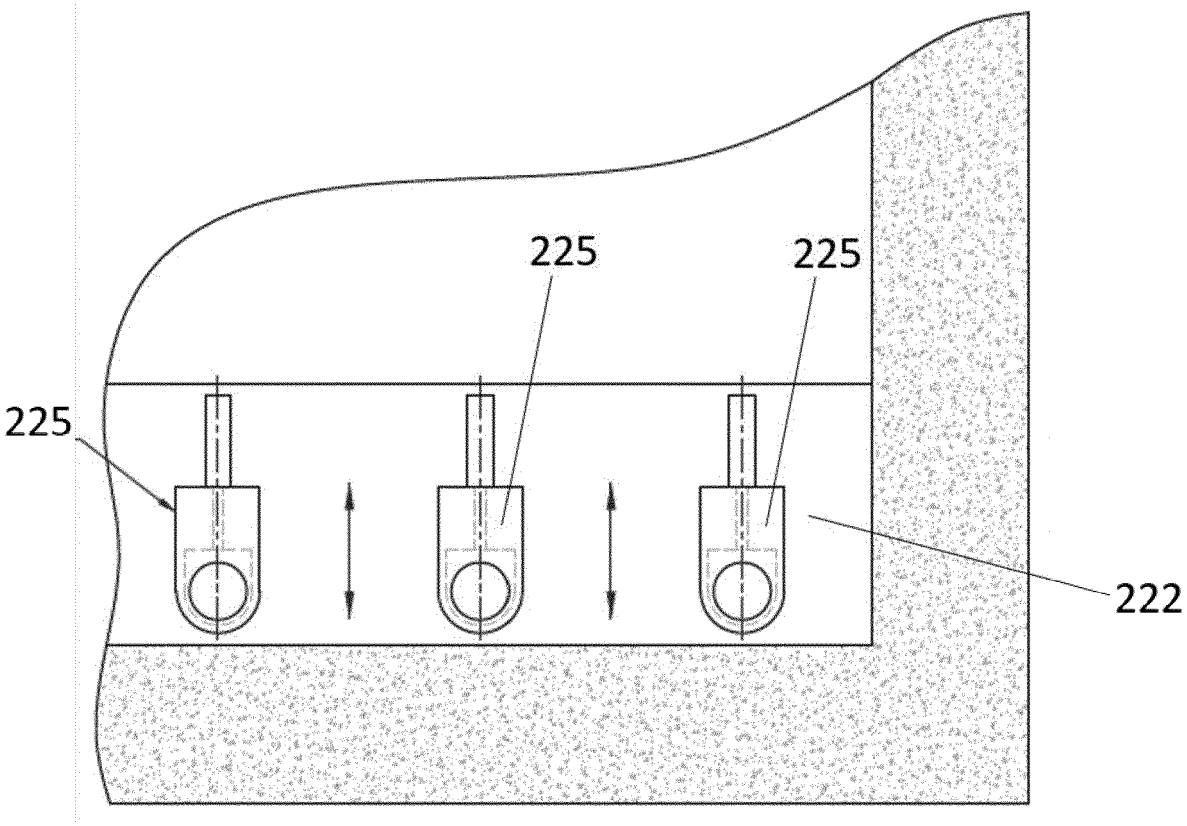

Fig. 5

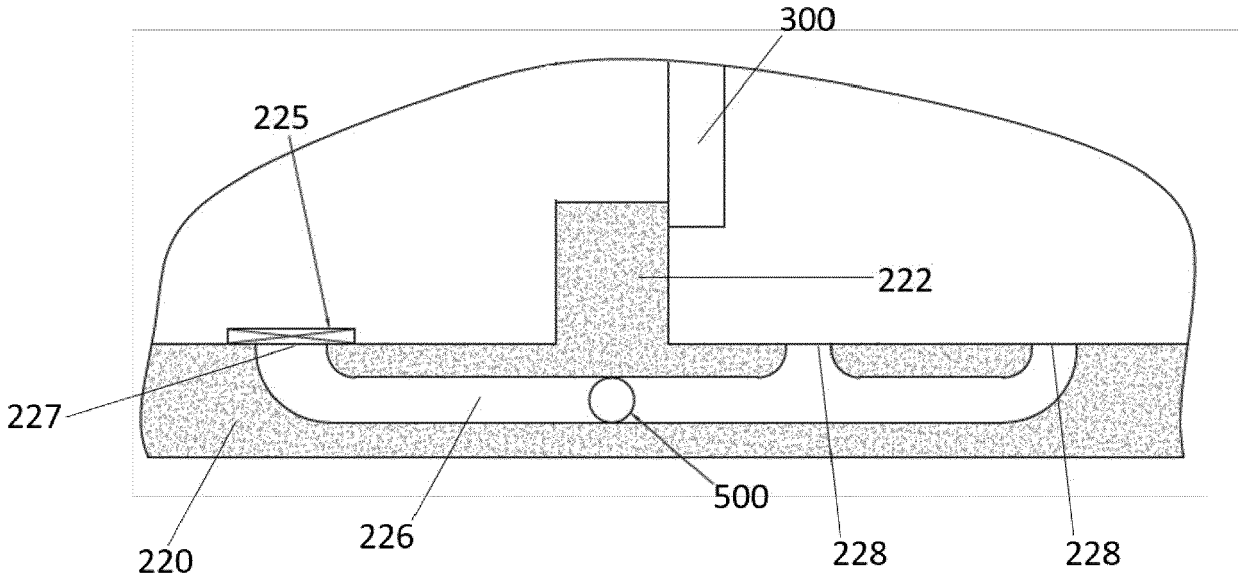

Fig. 6

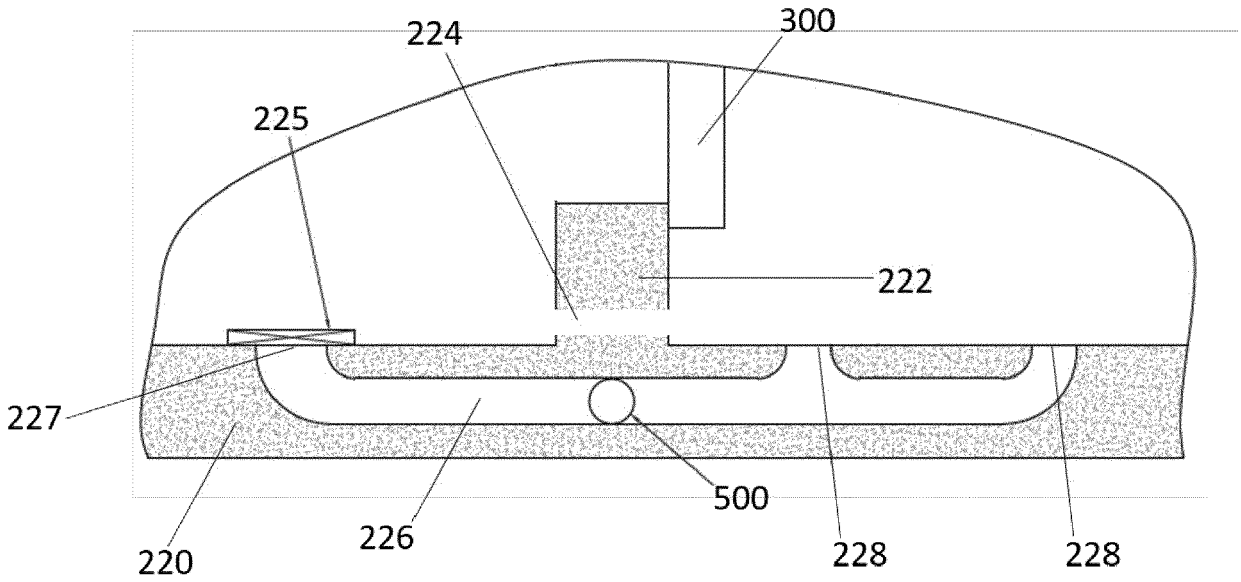

Fig. 7

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EUROPEAN SEARCH REPORT

Application Number
EP 18 20 4786

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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TECHNICAL FIELDS SEARCHED (IPC)
E02B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	3 April 2019	De Coene, Petrus

CATEGORY OF CITED DOCUMENTS

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