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(54) **PREFABRICATED WATER CONTROL SYSTEM**

(57) The present invention relates to a prefabricated water control system comprising an I-, L-, or inverted T-shaped prefabricated element, one or more gate members, and two support units.

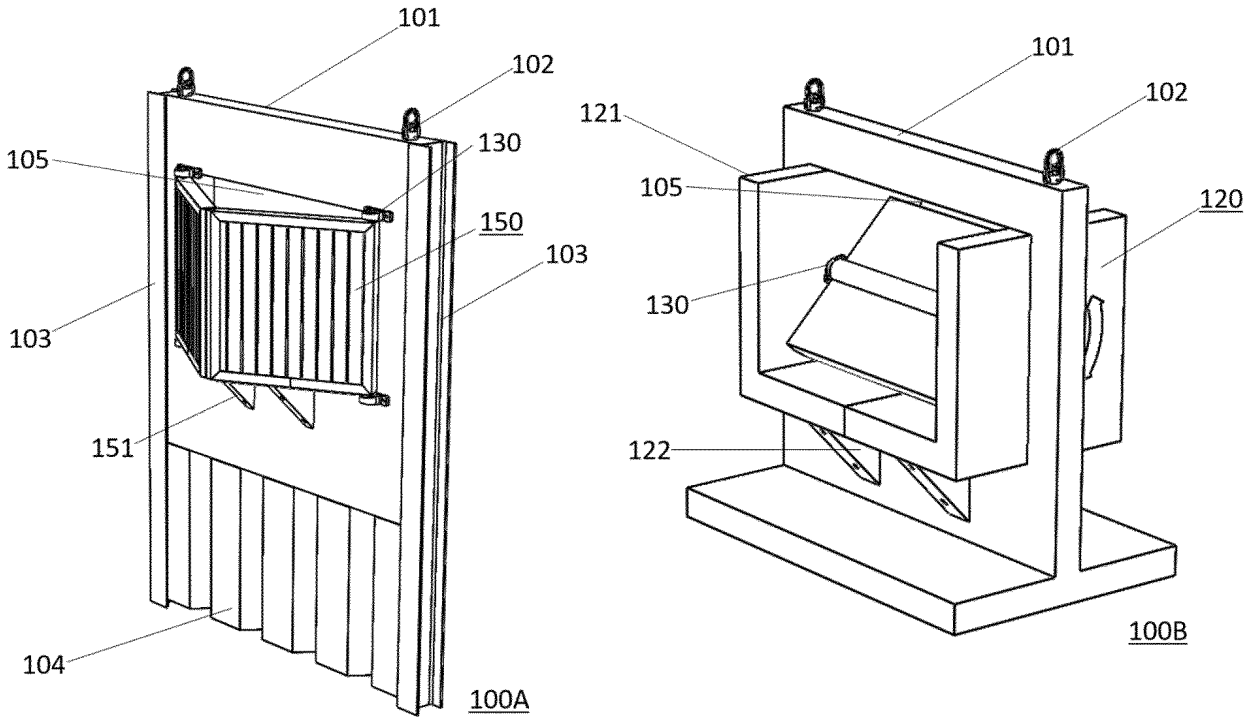

Fig. 1

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Description

Technical field of the invention

[0001] The present invention relates to prefabricated water control systems.

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. A specific problem with such water control systems is that they are difficult to service and time-consuming to replace.

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

[0005] EP3199706 discloses a pre-fabricated water control sluice gate system comprising a first frame, a lifting anchor or coupler adapted for receiving a lifting anchor, one or more sluice gate members, and an actuator adapted for moving the sluice gate members.

Description of the invention

[0006] One aspect relates to prefabricated water control system comprising:

a. a prefabricated element having a shape substantially corresponding to an I-form, an L-form, or an inverted T-form and having a substantially vertical wall component with a front side, a back side, a bottom section, and two side faces, said prefabricated element further comprising:

i. a first opening in said wall component extending from said front side to said back side; and
ii. at least one lifting anchor or coupler adapted for receiving a lifting anchor;

b. one or more gate members adapted to regulate the size of said first opening in said wall component, thereby regulating the waterflow therethrough; and
c. two support units each adapted for slidingly supporting one of said side faces of said wall component and for being mounted into the bank of a water canal into which the water control system is positioned.

[0007] Preferably, the prefabricated water control system further comprises a sheet pile wall or a base plate adapted for supporting said bottom section of said wall component.

[0008] The relatively simple shape (I, L, or T) of the prefabricated element combined with the support units allows for a prefabricated water control system that is easy to mount, service, and replace. Preferably, the wall component should be vertical, but it is contemplated within the scope of the invention that the wall element could also be offset with -20 to 20 degrees from vertical, and maybe more.

[0009] In one or more embodiments, the prefabricated element is a pre-cast reinforced concrete element.

[0010] The term "pre-cast" as used throughout this application means the opposite of cast in situ. In other words, the pre-cast reinforced concrete element 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.

[0011] 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.

[0012] The prefabricated element 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 prefabricated element.

[0013] 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.

[0014] 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.

[0015] Suitable examples of gate member(s) may be selected from a turn gate, a tilt gate, a raise gate, a double gate, or the like.

[0016] To further improve the mounting operation, the service operation, and/or the replacement operation, the prefabricated water control system may further comprise a base plate adapted for supporting the bottom section of the wall component. The base plate may preferably be configured with a hole or recess at each side, said hole or recess adapted for receiving one of said support units. This configuration secures that there is sufficient space for the wall component to slidably engage with the support units. Alternatively, the support units may be mounted onto the base plate. When the prefabricated element has an L- or inverted T-shape, the shape is formed by the wall component and a base plate. This base plate may also be configured with a hole or recess at each side, said hole or recess adapted for receiving

one of said support units.

[0017] In one or more embodiments, the support units each comprises a first flange adapted for supporting a part of said front side or back side of said wall component. Alternatively, at least one of said support units comprises a first flange adapted for supporting a part of said front side of said wall component, and wherein at least the other support unit comprises a second flange adapted for supporting a part of said back side of said wall component. These configurations allow the support units also to support the wall component in the water flow direction that may come from either direction depending on the water level on both sides of the water control system. Furthermore, the flanges may help directing the prefabricated element into place during the mounting operation.

[0018] In one or more embodiments, the bottom section of the wall component comprises one or more channels, and one or more flaps or valves adapted for closing and opening said one or more channels collectively and/or individually. The channels use the water pressure difference across the wall component to flush water through the channels, thereby removing sediments that would otherwise block the functioning of the gate members. In one or more embodiments, the bottom section of said wall component comprises a plurality of channels, and one or more flaps adapted for closing and opening said plurality of channels collectively and/or individually; and wherein said flaps are arranged on a single rotating and/or sliding shaft.

[0019] In one or more embodiments, the prefabricated element has a shape substantially corresponding to an L-form, or an inverted T-form shaped by said wall component and a base plate (i.e., these two components combine to form the shape), and wherein said base plate comprises air and/or water channels adapted to be connected to a source of compressed air and/or water. Water and/or compressed air may thereby be used to remove sediments blocking the function of the one or more gate members.

[0020] In one or more embodiments, the prefabricated element has a shape substantially corresponding to an L-form, or an inverted T-form shaped by said wall component and a base plate, and wherein said base plate comprises one or more 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.

[0021] Another aspect relates to a method for segregating a body of water into two distinct parts with a prefabricated water control system according to the present invention.

[0022] Another aspect relates to a method for segregating a body of water into two distinct parts with a prefabricated water control system comprising the steps of:

- sinking a prefabricated water control system according to the present invention at a predetermined location in the body of water, the vertical wall component of the prefabricated element having been chosen so as to have sufficient height to protrude above the water level of the body of water after said prefabricated water control system is sunk at its predetermined location; and
- building a dam up against the outer face of the support units. 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.

[0023] 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.

[0024] 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

[0025]

Figure 1 shows two prefabricated water control systems in accordance with various embodiments of the invention.

Figure 2 shows a prefabricated element having an I-shape in accordance with various embodiments of the invention.

Figure 3 shows a prefabricated element having an L-shape in accordance with various embodiments of the invention.

Figure 4 shows a prefabricated element having an inverted T-shape in accordance with various embodiments of the invention.

Figure 5 shows a prefabricated element in accordance with various embodiments of the invention, having an I-shape, and being mounted on a sheet pile.

Figure 6 shows a prefabricated element in accordance with various embodiments of the invention, having an L-shape, and mounted on a base plate.

Figure 7 shows a prefabricated element in accordance with various embodiments of the invention, having an L-shape, and mounted on a base of two sets of sheet piles.

Figure 8 shows a prefabricated gate member in the form of a turn gate.

Figure 9 shows a prefabricated gate member in the form of a tilt gate.

Figure 10 shows a prefabricated gate member in the form of a sliding gate.

Figure 11 shows a prefabricated gate member in the form of a double port gate.

Figure 12 shows a prefabricated element having an inverted T-shape in accordance with various embodiments of the invention, and where the base part comprises five channels, and a single flap adapted for closing and opening the channels collectively.

Detailed description of the invention

[0026] The following description is to be seen as non-limiting examples of prefabricated water systems 100A, 100B according to various embodiments of the present invention. The prefabricated water system 100A to the left shows a prefabricated water control system with a double gate 150 in accordance with various embodiments of the invention. The prefabricated water system 100B to the right shows a prefabricated water control system with a turn gate 120 in accordance with various embodiments of the invention.

[0027] In general, the prefabricated water control system 100 comprises an I-, L-, or inverted T-shaped prefabricated element 101, one or more gate members 120, 140, 150 (Figures 1, and 8-11), two support units 103 (Figures 1, and 5), and optionally, but preferably, a sheet pile wall 104 (Figures 1, 5, and 7), or a base plate 106 (Figure 6). The prefabricated element comprises a substantially vertical wall component 107 (Figure 2), and, if L- og inverted T-shaped, also a base plate 108 (best seen in Figures 3 and 4). The base plate 108 may be configured with a hole or recess 109 as exemplified in Figure 3 with an optional part 109 at each side that can be omitted, thereby resulting in the formation of a recess 109. The hole or recess 109 is adapted for receiving one of said support units 103. Figure 5 shows a prefabricated water control system 100 where each support unit 103 comprises a first flange 110 adapted for supporting a part of the front side or back side of said wall component 107, and a second flange 111 adapted for supporting a part of the back side of said wall component 107. A suitable and general example of a support unit could be an H-beam, I-beam, angle beam, T-beam, or the like, preferably made of steel, preferably stainless. Preferably an H-beam. Alternatively, beams with flanges suitable for supporting a part of the back and/or front side of said wall component may be used, preferably made of steel, preferably stainless.

[0028] A specific example of a turn gate 120 may be seen in Figures 1 and 8. Figure 8 shows a prefabricated turn gate 120 mounted in a prefabricated frame 121 and mounted in two bearings 130. The turn gate 120 also comprises a prefabricated mounting 122 adapted for fastening to the wall component 107 and for supporting the frame 121.

[0029] Figure 9 shows a prefabricated gate member in the form of a tilt gate 131 and comprising two bearings 130 for mounting the tilt gate 131 on the wall component 107. The tilt gate 131 can be mounted on all four sides of the opening 105, such that it either close from the side, the top, or the bottom. Figure 10 shows a prefabricated gate member in the form of a sliding gate 140. The sliding gate 140 is mounted in a frame 141 adapted for mounting in the opening 105, or alternatively, in front of, or behind the opening 105. Figure 11 shows a prefabricated gate member 150 in the form of a double port gate 150. A prefabricated mounting 151 is used for mounting the double port gate 150 to the wall component as well as for defining a bottom in said double port gate 150. Each gate is mounted in bearings 130 for opening and closing the gates.

[0030] Figure 12 shows a prefabricated element having an inverted T-shape in accordance with various embodiments of the invention, and where the base part of the wall component 107 comprises five (i.e., multiple) channels, and a single flap adapted for closing and opening the channels collectively. Such channels and flap may obviously also be included in the other examples.

References

[0031]

100	Prefabricated water control system
101	Prefabricated element
102	Lifting anchor
103	Support unit
104	Sheet pile
105	Opening
106	Baseplate
107	Wall component
108	Baseplate
109	Optional part/recess
110	First flange
111	Second flange
120	Turn gate
121	Prefabricated frame
122	Prefabricated mounting
130	Bearing
131	Tilt gate
140	Sliding gate
150	Double gate

151 Prefabricated mounting
160 Channel
170 Flap

Claims

1. A prefabricated water control system (100) comprising:

a. a prefabricated element (101);
b. one or more gate members (120, 131, 140, 150); and
c. two support units (103) each adapted for slidingly supporting said prefabricated element (101);

characterized in that said prefabricated element (101) has a shape substantially corresponding to an I-form, an L-form, or an inverted T-form and having a substantially vertical wall component (107) with a front side, a back side, a bottom section, and two side faces, said prefabricated element (101) further comprising:

i. a first opening (105) in said wall component (107) extending from said front side to said back side; and
ii. at least one lifting anchor (102) or coupler adapted for receiving a lifting anchor;

wherein said one or more gate members (120, 131, 140, 150) are adapted to regulate the size of said first opening (105) in said wall component (107), thereby regulating the waterflow therethrough;
wherein said two support units (103) each are adapted for slidingly supporting one of said side faces of said wall component (107) and for being mounted into the bank of a water canal into which the water control system (100) is positioned.

2. A prefabricated water control system (100) according to claim 1, further comprising a base plate (106) adapted for supporting said bottom section of said wall component (107), said base plate (106) configured with a hole or recess at each side, said hole or recess adapted for receiving one of said support units (103).

3. A prefabricated water control system (100) according to claim 1, further comprising a sheet pile wall (104) adapted for supporting said bottom section of said wall component (107).

4. A prefabricated water control system (100) according to any one of the claims 1-3, wherein said support units (103) each comprises a first flange (110) and optionally a second flange (111) adapted for supporting a part of said front side or back side of said wall component (107).

5. A prefabricated water control system (100) according to any one of the claims 1-3, wherein at least one of said support units (103) comprises a first flange (110) adapted for supporting a part of said front side of said wall component (107), and wherein at least the other support unit (103) comprises a second flange (111) adapted for supporting a part of said back side of said wall component (107).

6. A prefabricated water control system (100) according to any one of the claims 1-5, wherein said gate member(s) (120, 131, 140, 150) are selected from a turn gate (120), a tilt gate (131), a raise gate (140), a double gate (150), or the like.

7. A prefabricated water control system (100) according to any one of the claims 1-6, wherein said bottom section of said wall component (107) comprises one or more channels (160), and one or more flaps (107) or valves adapted for closing and opening said one or more channels (160) collectively and/or individually.

8. A prefabricated water control system (100) according to any one of the claims 1-6, wherein said bottom section of said wall component comprises a plurality of channels (160), and one or more flaps (170) adapted for closing and opening said plurality of channels (160) collectively and/or individually; and wherein said flaps (170) are arranged on a single rotating and/or sliding shaft.

9. A prefabricated water control system (100) according to any one of the claims 1-8, wherein said prefabricated element (101) has a shape substantially corresponding to an L-form, or an inverted T-form shaped by said wall component (107) and a base plate (108), and wherein said base plate (108) comprises air and/or water channels adapted to be connected to a source of compressed air and/or water.

10. A prefabricated water control system (100) according to any one of the claims 1-9, wherein said prefabricated element (101) has a shape substantially corresponding to an L-form, or an inverted T-form shaped by said wall component (107) and a base plate (108), and wherein said base plate (108) comprises one or more suction channels adapted to be connected to a source of suction.

11. A prefabricated water control system (100) according to any one of the claims 1-9, wherein said prefabricated element (101) has a shape substantially corresponding to an L-form, or an inverted T-form shaped by said wall component (107) and a base

plate (108), and wherein said base plate (108) is configured with a hole or recess (109) at each side, said hole or recess adapted for receiving one of said support units (103).

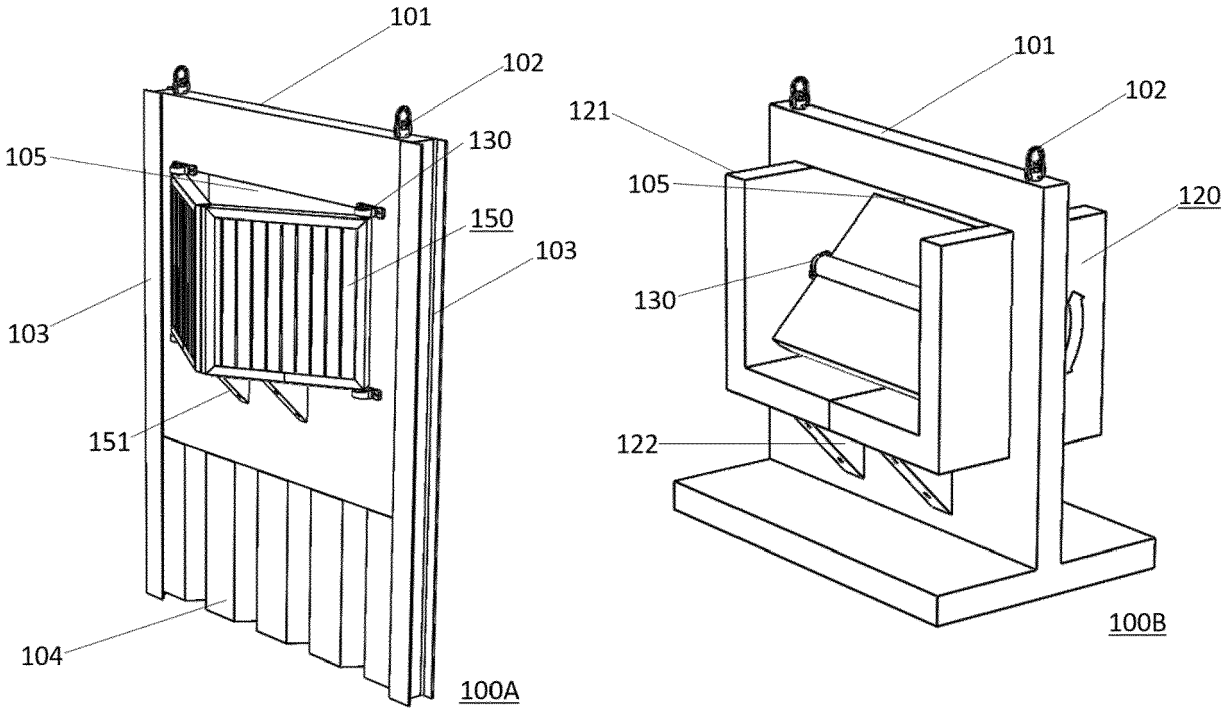
101
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Fig. 1

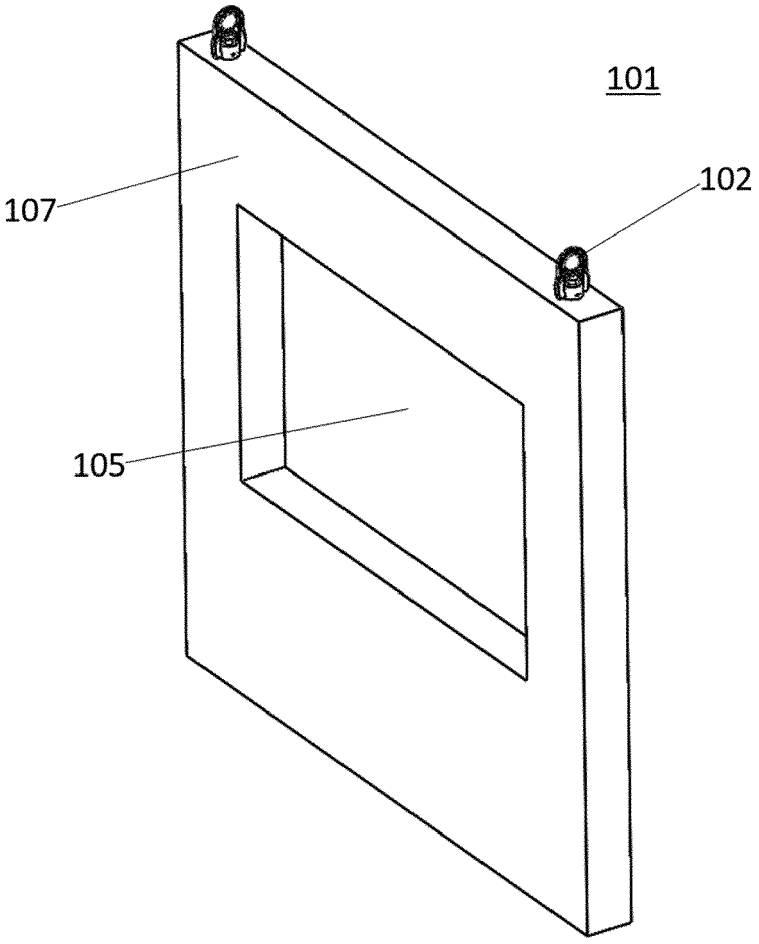

Fig. 2

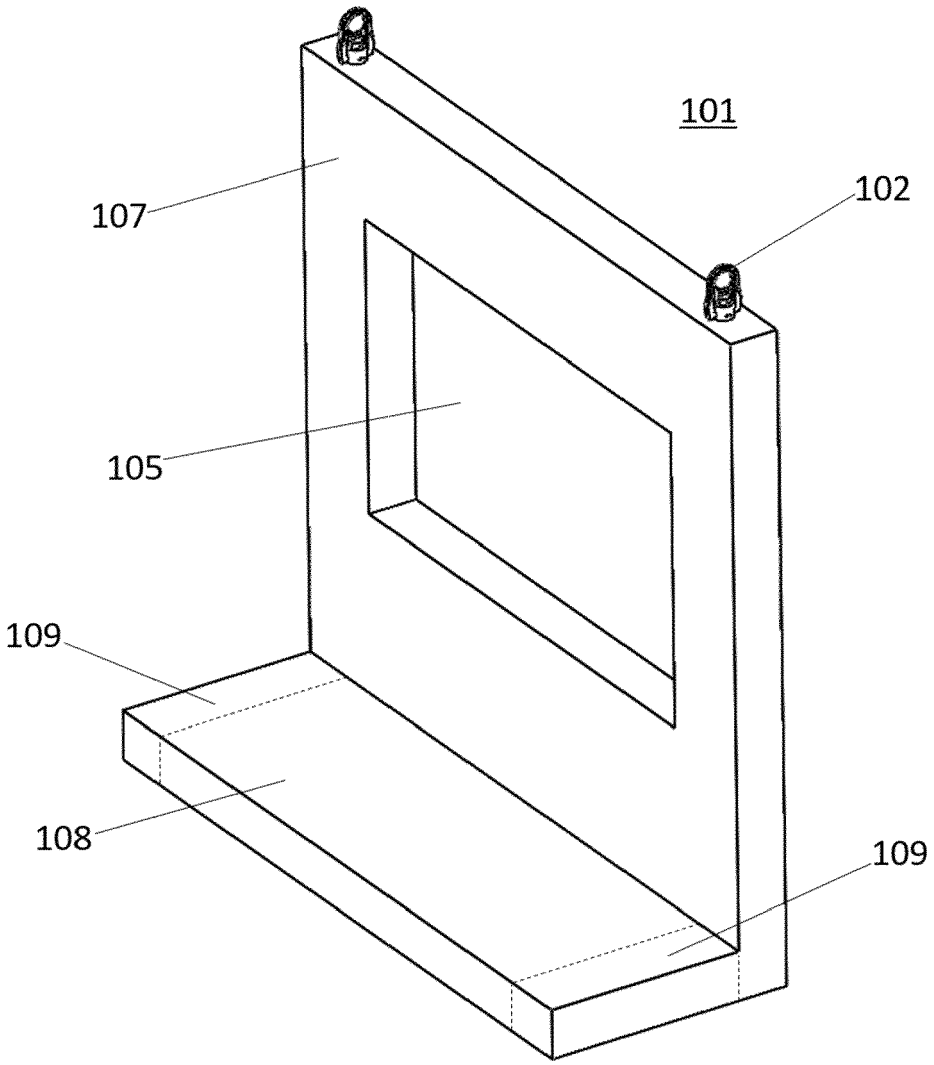

Fig. 3

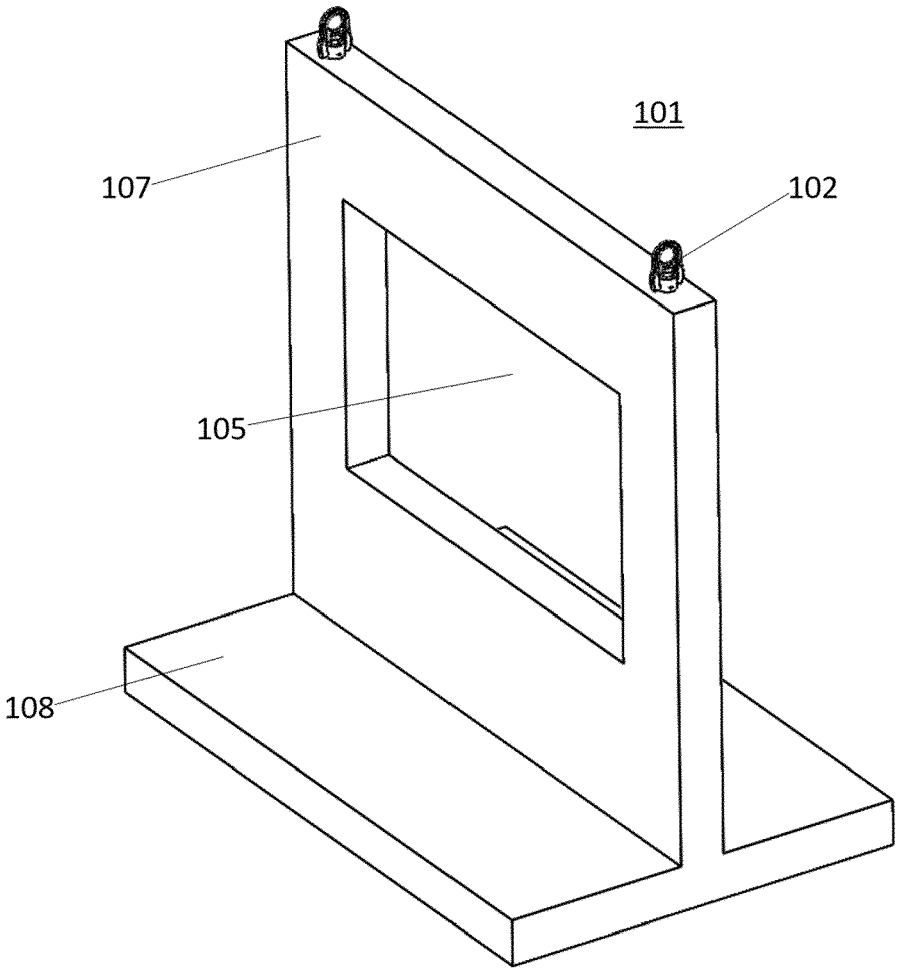

Fig. 4

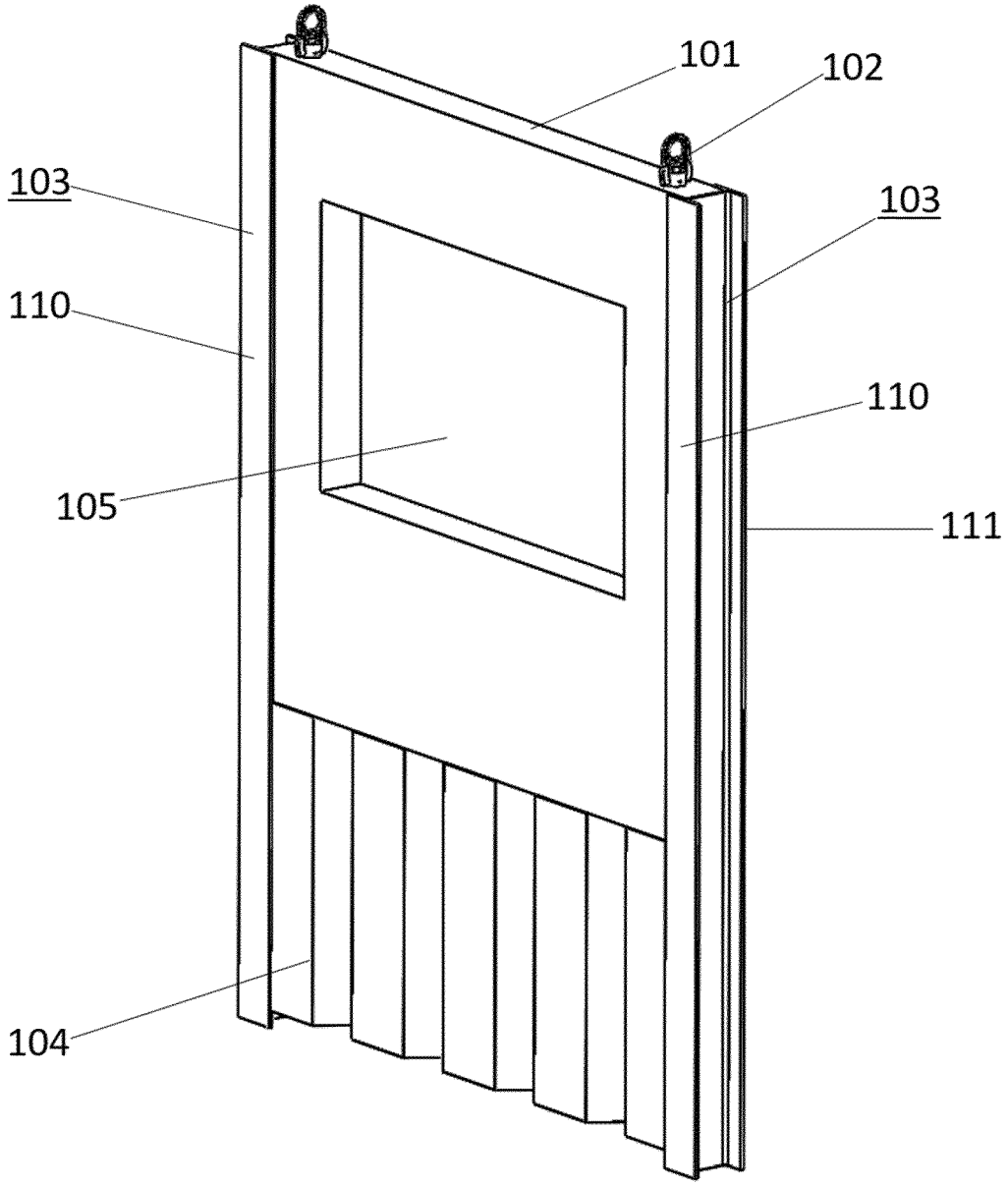

Fig. 5

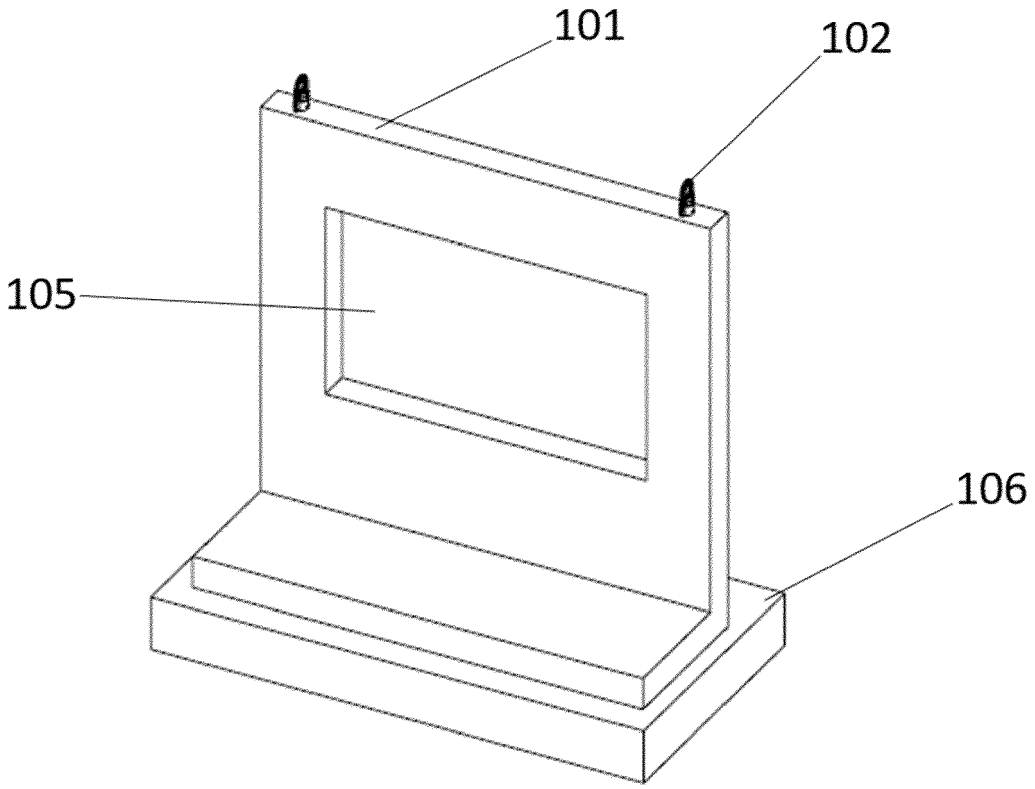

Fig. 6

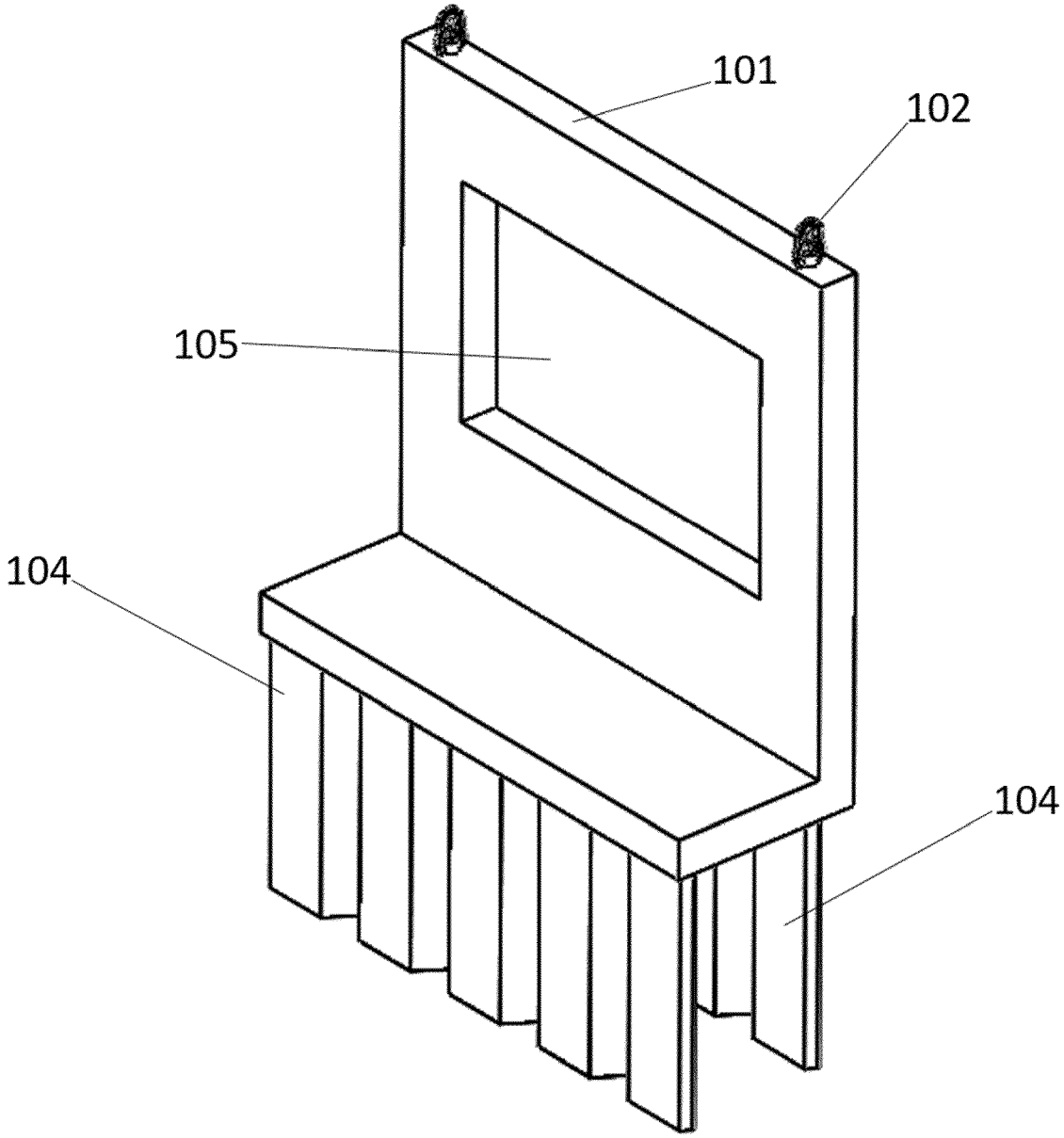

Fig. 7

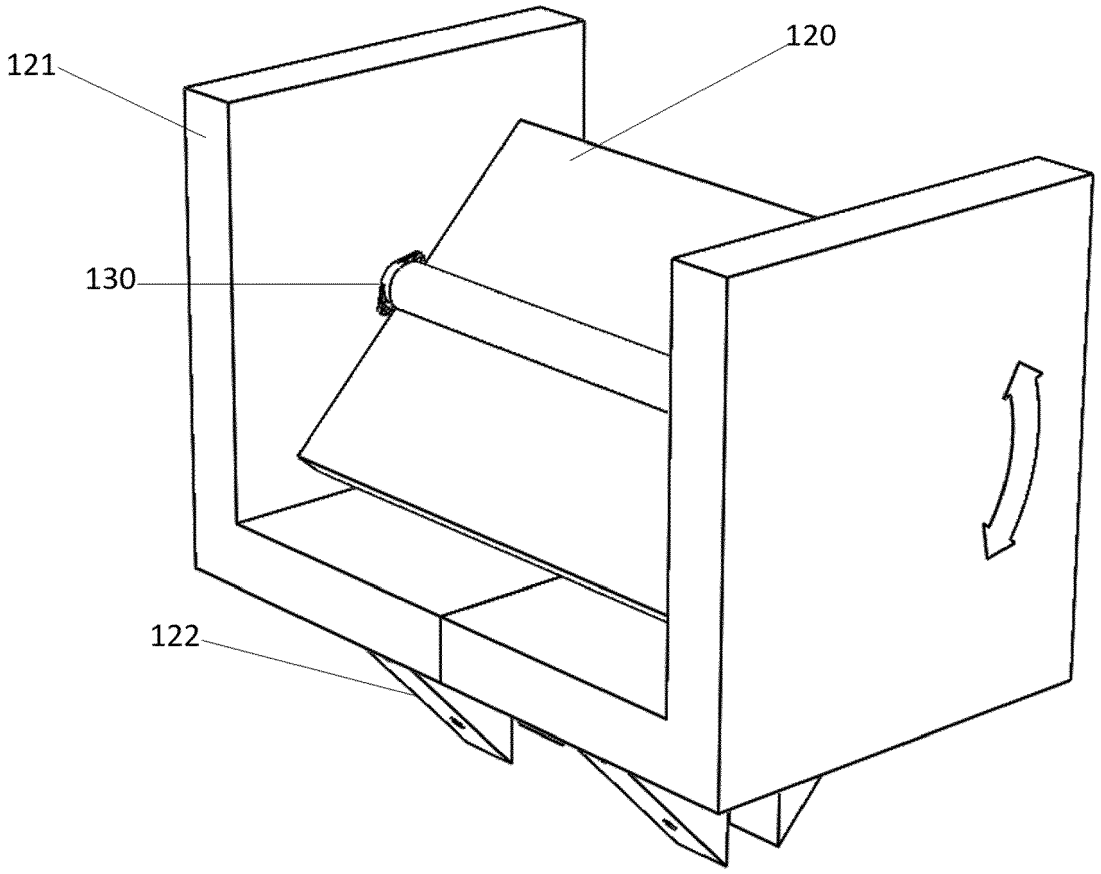

Fig. 8

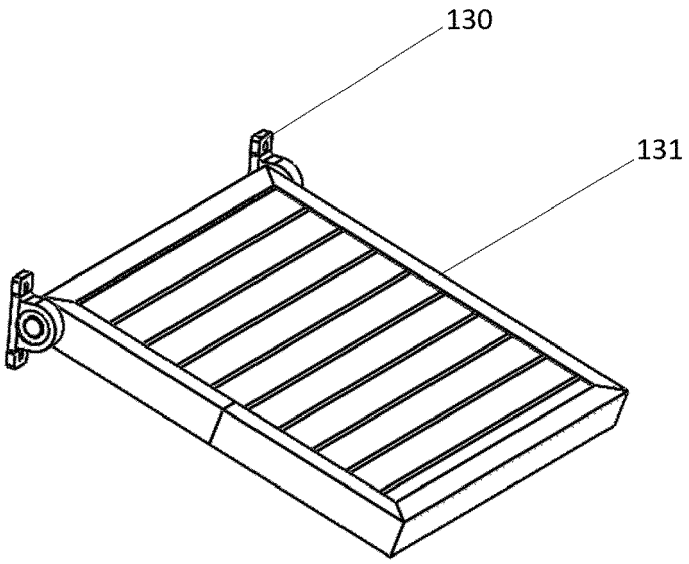

Fig. 9

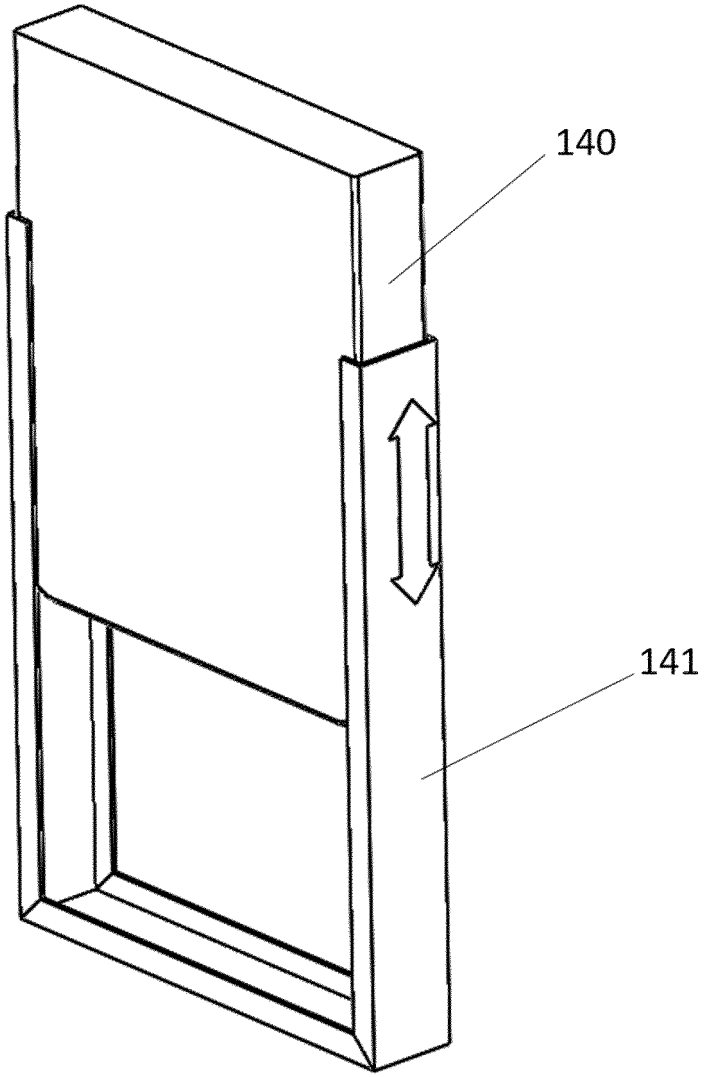

Fig. 10

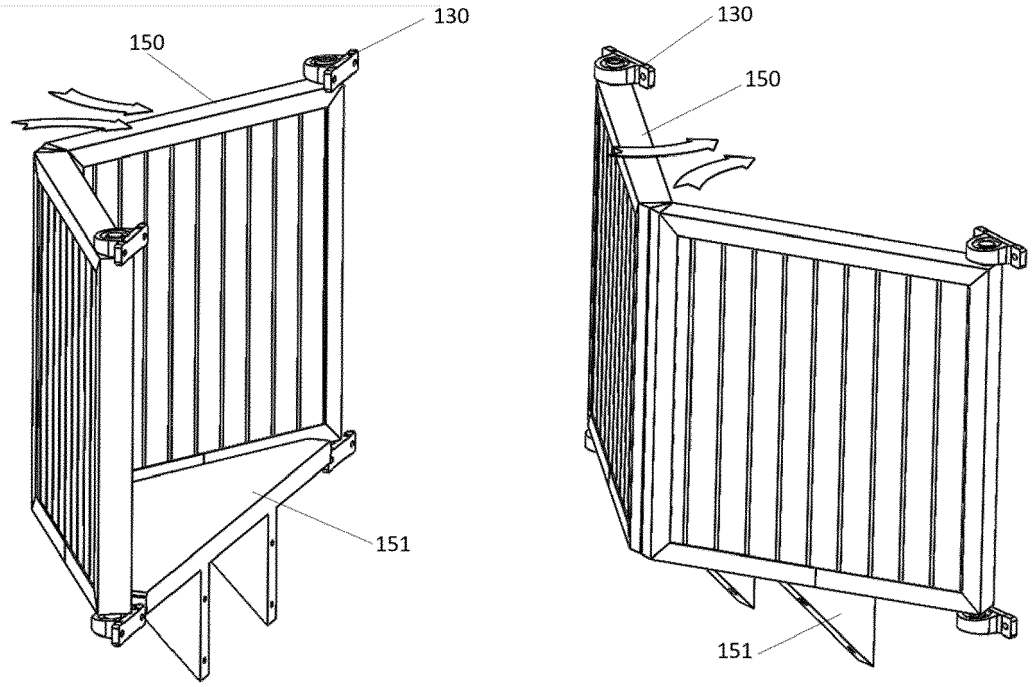

Fig. 11

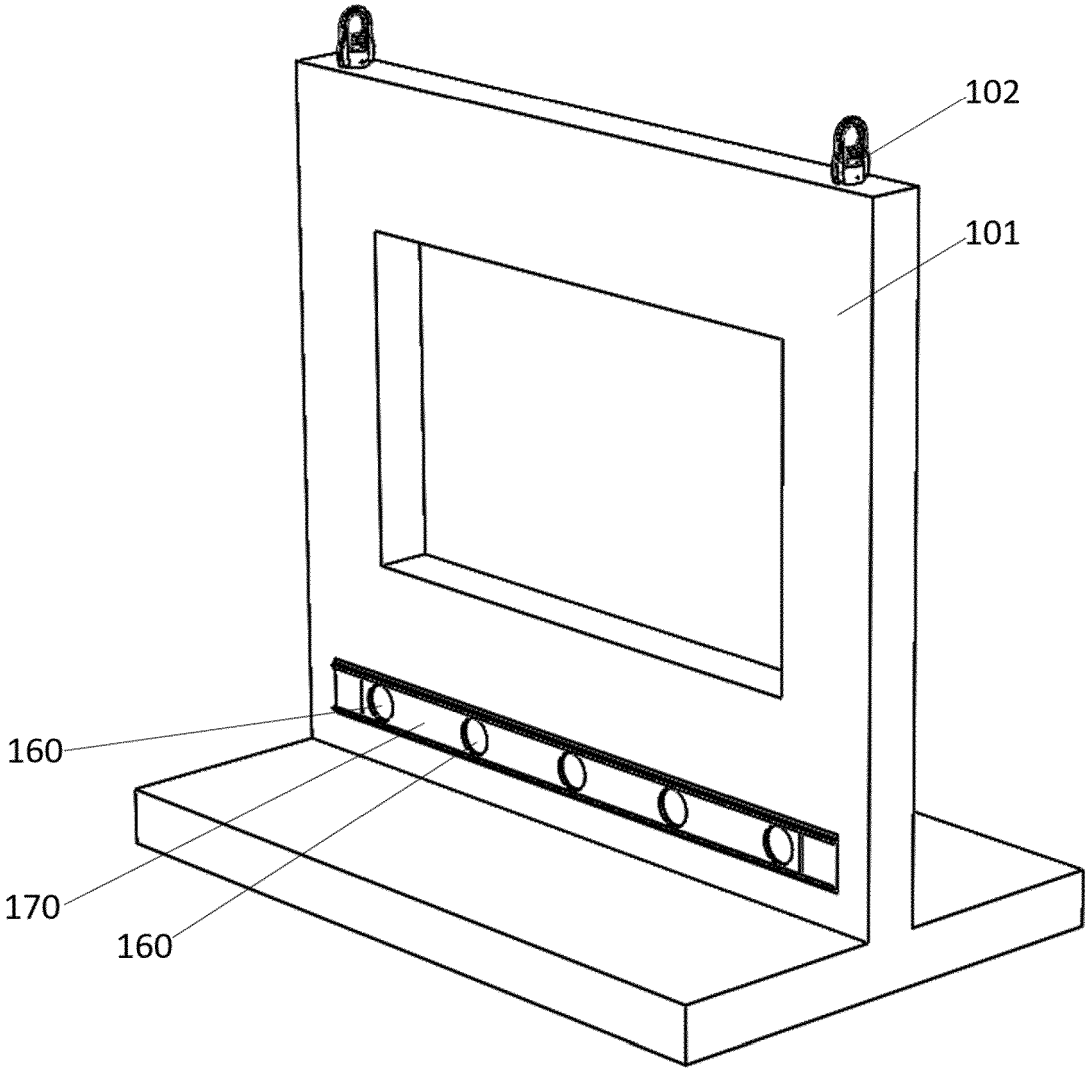

Fig. 12

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EUROPEAN SEARCH REPORT

Application Number
EP 21 21 3691

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
E02C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	22 April 2022	Fordham, Alan

CATEGORY OF CITED DOCUMENTS

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