(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 922 773 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
15.12.2021 Bulletin 2021/50

(51) Int Cl.:
E02B 3/10 *(2006.01)* ***E02B 7/44*** *(2006.01)*
E02B 7/50 *(2006.01)*

(21) Application number: **21178269.3**

(22) Date of filing: **08.06.2021**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(30) Priority: **08.06.2020 IT 202000013510**

(71) Applicant: **EM Solutions S.r.l.**
08100 Nuoro (IT)

(72) Inventors:
- **FOSSON, Roberto**
  11029 Verres (Aosta) (IT)
- **BOSONIN, Eliana**
  11029 Verres (Aosta) (IT)

(74) Representative: **Savoca, Agatino et al**
Jacobacci & Partners S.p.A.
Corso Emilia, 8
10152 Torino (IT)

(54) **AUTOMATIC ANTI-FLOODING BARRIER**

(57) An automatic anti-flooding barrier (9) comprises a support frame, a platform (14), hinged to this support frame and movable from a horizontal position to a vertical position, and a pair of linear actuators (16), each hinged at a first end to the support frame, and at an opposite end to the platform (14), so as to propel the latter to a vertical position.

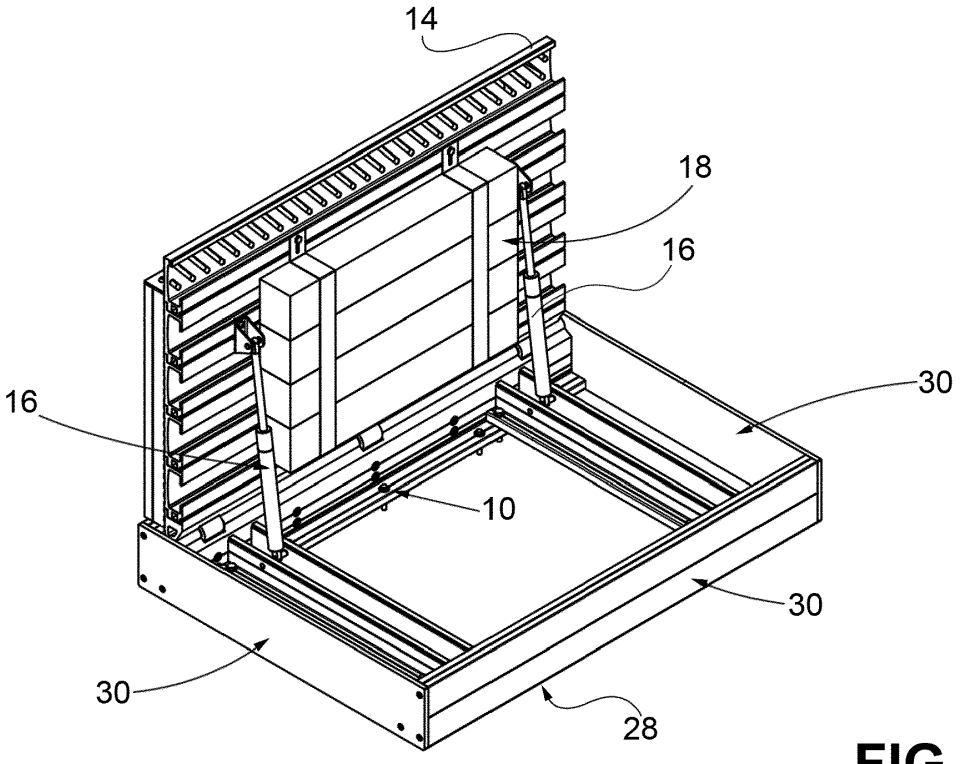


FIG.2

EP 3 922 773 A1

Description

Technical field

[0001] The present invention is generally within the field of hydraulic engineering; in particular, the invention relates to an automatic anti-flooding barrier.

Prior art

[0002] There are known protection systems used both against sudden flooding due to heavy rainfall or river flooding, and for the containment of fluids that must be conveyed to areas other than the one concerned in the event of accidental spillage of industrial or fire-fighting liquids.

[0003] Such systems generally take the form of barriers that rise to occlude an opening when the trench with which they are associated is flooded by a fluid.

[0004] Currently, most of these systems are manual, which involves the presence of an operator who, at the time of an emergency, activates the barrier for these purposes.

[0005] Automatic or semi-automatic barriers are known, however, wherein a platform is housed in, or rests on, a trench or compartment which, when filled with water, allows the platform to rise due to the resulting hydrostatic thrust.

[0006] An example wherein a platform which, housed in a trench, rises vertically under the pressure of water rising in the trench, thus forming a bulkhead that prevents fluid from passing through a back opening, is known from document IT 10 2016 000108874.

[0007] A further example of a platform which, under the thrust of the water, rotates about a hinge, finally arranging itself in a vertical position, is known from WO 2012 076855 A1. In this case, the vertical position is obtained by means of the differential hydrostatic thrust that the platform receives by virtue of its geometry, having a larger cross section near the hinge, so as to generate an asymmetrical lift.

[0008] However, since these systems are essentially passive, and their operation is linked only to the hydrostatic thrust, they do not always ensure a prompt and complete response from the barrier, which limits their effectiveness or compromises their reliability.

[0009] A solution making use of a hydrostatic thrust assist system is known from CN 10 5672212, which employs a pair of gas springs to propel the barrier to a vertical position.

[0010] This system provides for the springs to exert a constant thrust on the barrier, which is held in the lowered position by means of rotating hooks integral with a rod connected to a float. As the trench fills with water, the float rises and causes the rod to rotate, which in turn causes the hooks to rotate and disengage from the barrier which, under the thrust of the springs, is arranged in the vertical position.

[0011] However, a solution configured in this way is complex from a structural point of view, since it requires a plurality of components to hold the barrier in the closed position, and also involves a large amount of space, since a trench deep enough to accommodate the springs (which must always be in an inclined position) and the release mechanism is required.

Summary of invention

[0012] An object of the present invention is to overcome the aforementioned problems.

[0013] To achieve this result, a barrier according to the invention is provided with a platform rotatably supported by a frame, to which in turn are hinged linear actuators capable of imparting to the platform a thrust such as to drive it in a vertical position in the moment wherein this platform, under the action of a fluid pressing on a lower face thereof, rises with respect to a horizontal position.

[0014] Since the actuators are activated only when the platform rises spontaneously due to the hydrostatic thrust of the fluid flowing into the trench, it is not necessary to set up the complex release mechanism present in the prior art, and the overall dimensions are minimized.

[0015] The linear actuators may be traditional gas springs, which therefore do not require a hydraulic or electrical supply (with the consequent problems of maintenance or possible malfunction due to the device interacting with the fluid collected by the barrier).

[0016] The frame may thus be partially housed within a trench in a masonry structure or a box raised above ground level, of which the platform constitutes the cover when in a horizontal position.

[0017] In this way, it is possible to obtain a barrier with immediate and safe activation, as the rise of the platform to the vertical position is assisted by the actuators hinged to the frame.

[0018] The aforesaid and other objects and advantages are achieved, according to one aspect of the invention, by an automatic anti-flooding barrier having the features defined in claim 1. Preferred embodiments of the invention are defined in the dependent claims.

Brief description of the drawings

[0019] The functional and structural features of some preferred embodiments of an automatic barrier according to the invention will now be described. Reference is made to the appended drawings, wherein:

- Fig. 1 is a schematic perspective view of a masonry structure suitable to accommodate an anti-flooding barrier, according to an embodiment of the present invention;
- Fig. 2 is a schematic perspective view of a barrier in the open position, according to an embodiment of the present invention;
- Fig. 3 is a schematic perspective view of the barrier

in Fig. 2, shown from a different angle;

- Fig. 4 is a schematic side view in cross section of the barrier in Fig. 2 in the closed position;
- Fig. 5a and 5b are a schematic perspective and side view, respectively, of a detail of the connection portion between the frame and the platform with said platform in a raised position, according to an embodiment of the present invention;
- Fig. 5c and 5d are a schematic perspective and side view, respectively, of a detail of the connection portion between the frame and the platform with said platform in a lowered position, according to the embodiment of the present invention shown in Fig. 5a and 5b;
- Fig. 6a and 6b are a schematic perspective and side view, respectively, of a detail of the connection portion between the frame and the platform with said platform in a raised position, according to an alternative embodiment of the present invention;
- Fig. 6c and 6d are a schematic perspective and side view, respectively, of a detail of the connection portion between the frame and the platform with said platform in a lowered position, according to the embodiment of the present invention shown in Fig. 5a and 5b;
- Fig. 7 and 8 are a schematic top view and perspective view, respectively, of a barrier integrated into a masonry structure, with the platform in a partially raised position, according to an embodiment of the present invention;
- Fig. 9 is a schematic side view in cross section of a barrier with the platform in a partially raised position, wherein fluid flows entering below the platform are shown, according to an embodiment of the present invention;
- Fig. 10 is a schematic side view of a modularly constructed platform and a detail of this platform, according to an embodiment of the present invention;
- Fig. 11 illustrates a series of schematic side views of a modularly constructed platform according to further embodiments of the present invention;
- Fig. 12a and 12b are two front schematic views of a barrier elevated above the walking surface, with the platform in a raised and lowered position, respectively, according to an embodiment of the present invention, wherein the fluid conveyance box is surrounded on three sides by a plurality of ramps;
- Fig. 13 is a schematic perspective view of a barrier elevated above the walking surface, according to an embodiment of the present invention wherein the fluid conveyance box is surrounded on two opposite sides by a pair of ramps;
- Fig. 14 is a schematic perspective view of a barrier in the open position, elevated above the walking surface, according to an embodiment of the present invention, wherein the access flow of the fluid below the ramps is visible; and
- Fig. 15 and 16 are a side view in cross section of a barrier provided with ramps and a side view of a ramp, respectively, according to an embodiment of the present invention.

Detailed description

[0020] Before describing a plurality of embodiments of the invention in detail, it should be clarified that the invention is not limited in its application to the construction details and configuration of the components presented in the following description or illustrated in the drawings. The invention may assume other embodiments and be implemented or constructed in practice in different ways. It should also be understood that the phraseology and terminology have a descriptive purpose and should not be construed as limiting.

[0021] Referring, by way of example, to the figures, an automatic anti-flooding barrier 9 comprises a support frame, which comprises a primary beam 10, extended along a first longitudinal direction, and a pair of secondary beams 12, projecting from the primary beam 10 along a second transverse direction, perpendicular to the first longitudinal direction, and mutually spaced along said first longitudinal direction.

[0022] The support frame may in turn be at least partially housed in a masonry structure 8 (of which one embodiment is depicted in Fig. 1), comprising a vertical opening A, through which the passage of fluid is to be prevented, and a trench facing said opening, adapted to collect the fluid directed toward this opening. The trench may in turn have a drain 8a for the outflow of the fluid collected.

[0023] A platform 14 is also provided, hinged to the primary beam 10 and movable from an inactive position, wherein said platform 14 lies in a plane parallel to the plane defined by the longitudinal and transverse directions, to an active position, wherein said platform 14 lies in a plane perpendicular to the plane defined by the longitudinal and transverse directions, said platform 14 being suitable, when in the active position (conveniently, a vertical position), for preventing a fluid from passing therethrough.

[0024] The platform 14 is adapted to form, when in the inactive position (conveniently, a horizontal position), the cover of a compartment within which a fluid is collected, whereby said fluid, having surpassed a level whereby it comes into contact with the platform 14, imparts on this platform a hydrostatic thrust toward the active position until it causes the platform 14 to rise from the inactive position.

[0025] The barrier further comprises a pair of linear actuators 16, each having a first end hinged to a respective secondary beam 12, and an opposite end hinged to the platform 14, said actuators being capable of pushing the platform 14 to said active position when the platform 14 is in a position other than the inactive position.

[0026] In this way, when the pressure of the fluid on a lower face of the platform 14 is such that it causes it to

deviate from the inactive position, the linear actuators 16 intervene to assist the rotation of the platform 14 toward the active position.

[0027] Preferably, the linear actuators 16 are configured whereby, in the inactive position of the platform 14, they lie substantially parallel to the platform 14 (expediently, a horizontal position). Thus, in this inactive position of the platform 14, linear actuators 16 do not exert on said platform an action likely to generate a torque about the hinge axis of said platform 14 such as to cause this platform to be raised from its inactive position. According to a preferred embodiment, the linear actuators 16 are configured as gas springs.

[0028] A float 18 may also be provided integral with a lower face of the platform 14 (i.e., the face turned toward the secondary beams 12), said float 18 being configured to impart a thrust on the platform 14 in the direction of its active position, when said float 18 is at least partially immersed in a fluid.

[0029] According to one embodiment, a section of the platform assembly 14 and float 18, considered with respect to a longitudinal centerline plane of the platform 14 (i.e., a plane extended along the transverse direction and perpendicular to the plane defined by the longitudinal and transverse directions), is symmetrical with respect to a transverse centerline plane of the platform 14 (i.e., a plane extended along the longitudinal direction and perpendicular to the plane defined by the longitudinal and transverse directions).

[0030] According to an alternative embodiment, a section of the platform assembly 14 and float 18, considered with respect to a longitudinal centerline plane of the platform 14 (i.e., a plane extended along the transverse direction and perpendicular to the plane defined by the longitudinal and transverse directions), is asymmetrical with respect to a transverse centerline plane of the platform 14 (i.e., a plane extended along the longitudinal direction and perpendicular to the plane defined by the longitudinal and transverse directions), said section having a greater area in the portion thereof distal from the primary beam 10 relative to said transverse centerline plane. In this way, there would be a differential thrust on the platform 14 according to its angle of rotation, whereby, in a first phase (when the platform is in the inactive position) there would be a maximum contribution to the movement of the platform 14 provided by the hydrostatic thrust, until the platform 14 has reached a certain angle, after which the contribution provided by the thrust of the linear actuators 16 will prevail.

[0031] Alternatively, or in combination with the features of the invention described above, there may be a primary gasket 22 adapted to form a watertight seal between the primary beam 10 and the platform 14 when the platform 14 is in the active position.

[0032] According to one embodiment, the primary gasket 22 may comprise a primary body 23 that is fixed to the support frame (e.g., the primary body 23 may be accommodated in a housing formed in the primary beam 10 or the support frame, as in the illustrated example) and a flap or projection 24 protruding from the primary body 23 in the direction of the platform 14 (as shown by way of example in Fig. 4a-4d). Said projection 24 is in contact with the platform 14 so as to form a watertight seal between the primary body 23 and said platform 14 even when said platform is in the inactive position and is elastically deformable in response to the movement of said platform so as to remain in contact therewith in its motion from the inactive position to the active position. Said projection 24 may, for example, be pressed upright and adhere to the platform 14 when said platform is in the active position and extended obliquely when the platform 14 returns to the inactive position.

[0033] According to an alternative embodiment (illustrated by way of example in Fig. 5a-5d), the gasket 22 may be configured whereby, when the platform 14 is in the inactive position, an unsealed opening is provided between said platform and the primary gasket 22 adapted to allow an amount of fluid to pass between said primary gasket 22 and platform 14. In this way, the fluid that was not initially intercepted by the barrier 9 could, once it reaches the primary beam 10, be intercepted by said opening, which would then act as an additional drainage channel to convey the fluid below the platform 14 (i.e., dropping the fluid into the basin on which the platform 14 may be positioned).

[0034] To this end, the primary gasket 22 may comprise a primary body 23, which is fixed to the support frame (e.g., the primary body 23 may be accommodated in a housing formed in the primary beam 10 or in the support frame, as in the illustrated example), and expediently a flap or projection 24, which is configured to avoid contact with the platform 14 when said platform is in the inactive position, so as to form an unsealed opening between said platform 14 and the primary body 23, adapted to allow an amount of fluid to pass between said primary gasket 22 and platform 14. Said lip or projection 24 is further configured to adhere to said platform 14 when this platform is in its active position, so as to form a watertight seal between said primary body 23 and said platform 14; for example, said projection 24 may expediently be elastically deformable in response to the movement of the platform 14, so as to remain in contact therewith when this platform is in its active position. For example, the projection 24 may be configured to deform in a vertical position and adhere to the platform 14 when this platform is in the active position, whereby a watertight seal is formed between the primary body 23 and said platform 14.

[0035] According to one embodiment, the support frame comprises a pair of uprights 20, extended along a third vertical direction (perpendicular to the first longitudinal direction and the second transverse direction), and mutually spaced along said first longitudinal direction, said uprights 20 being adapted to form an abutment surface against which the platform 14 abuts when in its active position. Expediently, the uprights 20 will be on either

side of the opening that the platform 14 would occlude when in the active position.

[0036] Secondary gaskets 26 may be provided, applied to the uprights 20 and/or the platform 14, said secondary gaskets 26 being adapted to form a watertight seal between the uprights 20 and the platform 14 when this platform is in its active position.

[0037] The automatic barrier 9 may further comprise a box 28 formed of four walls 30 that define a compartment occluded at its top by the platform 14 when this platform is in the inactive position. The box 28 will expediently house at least part of the primary 10 and secondary 12 beams.

[0038] According to one embodiment, the platform 14 may be formed from a plurality of modules 15, for example extended along the longitudinal direction and juxtaposed along the transverse direction (as visible in Fig. 8 and 9). The modules 15 may be secured to each other by interlocking or other means of restraint, such as bolts, welds, etc.

[0039] The barrier 9 may also comprise one or more ramps 32, sloping toward the outside of the box 28 from an upper edge of at least one wall 30 of this box 28 flush with the platform 14, said ramps 32 being adapted to allow a vehicle to climb from the support surface of the box 28 to the platform 14. This embodiment (in its variants, illustrated by way of example in Fig. 10a to 14) is advantageous when there is no trench or underground compartment, or one wishes to raise the platform 14 above the walking level.

[0040] According to one embodiment, one or more ramps 32 may in turn be hinged to the respective top edge of the box 28.

[0041] Preferably, the platform 14 and/or the box 28 and/or the ramps 32 comprise orifices 33, 34 (e.g., grates 33 extended along part of the surface of the platform 14, or passages 34 formed at the base of the ramps 32), adapted to permit the passage of a fluid through the thickness of the platform 14 and/or into the box 28.

[0042] Various aspects and embodiments of an anti-flooding barrier according to the invention have been described. It is understood that each embodiment may be combined with any other embodiment. Furthermore, the invention is not limited to the described embodiments, but may be varied within the scope defined by the appended claims.

Claims

1. An automatic anti-flooding barrier (9), comprising:

- a support frame, comprising a primary beam (10), extended along a first longitudinal direction, and a pair of secondary beams (12), protruding from the primary beam (10) along a second transverse direction, perpendicular to the first longitudinal direction, and mutually spaced along said first longitudinal direction; and
- a platform (14), hinged to the primary beam (10) and movable from an inactive position, wherein said platform (14) lies on a plane parallel to the plane defined by the longitudinal and transverse directions, to an active position, wherein said platform (14) lies on a plane perpendicular to the plane defined by the longitudinal and transverse directions, said platform (14) being suitable, when in the active position, to prevent the passage of a fluid therethrough;

characterized in that it comprises a pair of linear actuators (16), each having a first end hinged to a respective secondary beam (12), and the opposite end hinged to the platform (14), said actuators being adapted to thrust the platform (14) towards said active position when the platform (14) is in a position other than the inactive position.

2. The barrier according to claim 1, wherein the linear actuators (16) are configured in such a way that, in the inactive position of the platform (14), they lie substantially parallel to the platform (14).

3. The barrier according to claim 1 or 2, wherein the linear actuators (16) are configured as gas springs.

4. The barrier according to any of the preceding claims, further comprising a float (18), integral with a face of the platform (14) facing the secondary beams (12), said float (18) being configured to impart a thrust to the platform (14) in the direction of the active position thereof, when said float (18) is at least partially immersed in a fluid.

5. The barrier according to claim 4, wherein a section of the assembly of the platform (14) and float (18), considered with respect to a longitudinal centerline plane of the platform (14), extended along the transverse direction and perpendicular to the plane defined by the longitudinal and transverse directions, is symmetrical with respect to a transverse centerline plane of the platform (14), extended along the longitudinal direction and perpendicular to the plane identified by the longitudinal and transverse directions.

6. The barrier according to claim 4, wherein a section of the assembly of the platform (14) and float (18), considered with respect to a longitudinal centerline plane of the platform (14), extended along the transverse direction and perpendicular to the plane defined by the longitudinal and transverse directions, is asymmetrical with respect to a transversal centerline plane of the platform (14), extended along the longitudinal direction and perpendicular to the plane defined by the longitudinal and transverse directions,

said section presenting a greater area at the portion thereof distal from the primary beam (10) with respect to said transverse centerline plane.

7. The barrier according to any of the preceding claims, comprising a primary gasket (22), adapted to form a watertight seal between the primary beam (10) and the platform (14) when the latter is in the active position.

8. The barrier according to claim 7, wherein the primary gasket (22) comprises a primary body (23), fixed to the primary beam, and a projection (24) protruding from the primary body (23) in the direction of the platform (14), said projection (24) being in contact with said platform (14) in such a way as to form a watertight seal between the primary body (23) and said platform (14), said projection being elastically deformable in response to the movement of the platform (14), so as to remain in contact with said platform (14) during the motion of the latter from the inactive position to the active position.

9. The barrier according to any of claims 1 to 7, wherein the primary gasket (22) comprises a primary body (23), fixed to the support frame, and a projection (24) configured to avoid contact with the platform (14) when said platform is in the inactive position, so as to form an unsealed opening between said platform (14) and the primary body (23), said opening being suitable to allow a flow of fluid to pass between said primary gasket (22) and platform (14), said projection (24) being further configured to adhere to the platform (14) when said platform is in the active position, so as to form a watertight seal between said primary body (23) and said platform (14).

10. The barrier according to any of the preceding claims, wherein the support frame comprises a pair of uprights (20), extended along a third vertical direction, perpendicular to the first longitudinal direction and to the second transverse direction, and mutually spaced along said first longitudinal direction, said uprights (20) being adapted to form an abutment surface against which the platform (14) abuts when in the active position.

11. The barrier according to claim 10, comprising secondary gaskets (26), applied to the uprights (20) and/or to the platform (14), said secondary gaskets (26) being adapted to form a watertight seal between the uprights (20) and the platform (14), when said platform is in the active position.

12. The barrier according to any of the preceding claims, comprising a box (28) formed by four walls (30) which define a compartment closed at its top by the platform (14) when this platform is in the inactive position.

13. The barrier according to claim 12, comprising one or more ramps (32), sloping towards the outside of the box (28) starting from an upper edge of at least one wall (30) of the latter flush with the platform (14), said ramps (32) being adapted to allow the ascent of a vehicle from the support plane of the box (28) to the platform (14).

14. The barrier according to claim 12 or 13, wherein the platform (14) and/or the box (28) and/or the ramps (22) comprise orifices (33, 34), suitable for allowing the passage of a fluid through the thickness of the platform (14) and/or inside the box (28).

15. The barrier according to any of the preceding claims, wherein the platform (14) is formed by a plurality of modules (15), extended along the longitudinal direction and juxtaposed along the transverse direction.

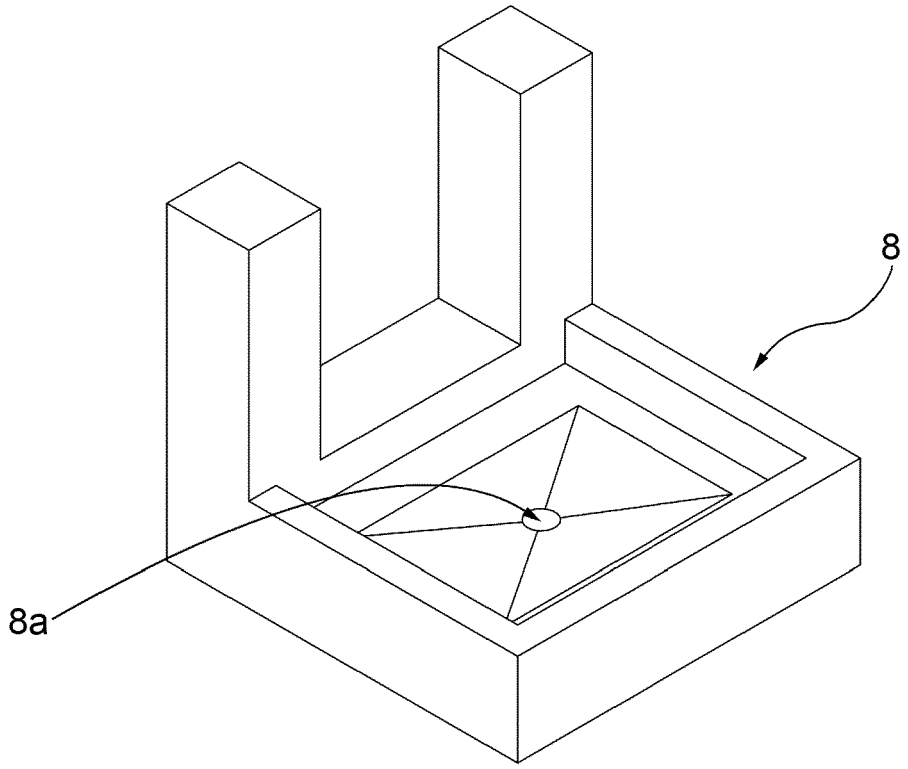


FIG.1

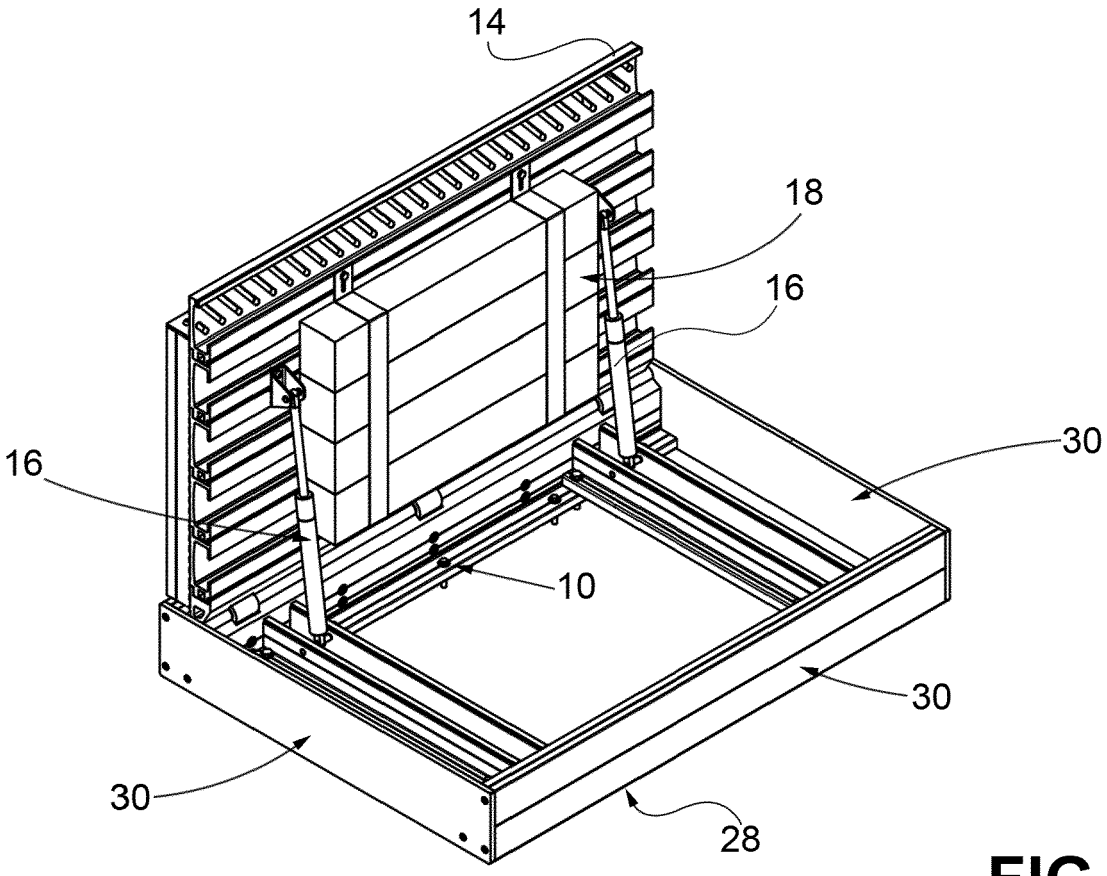


FIG.2

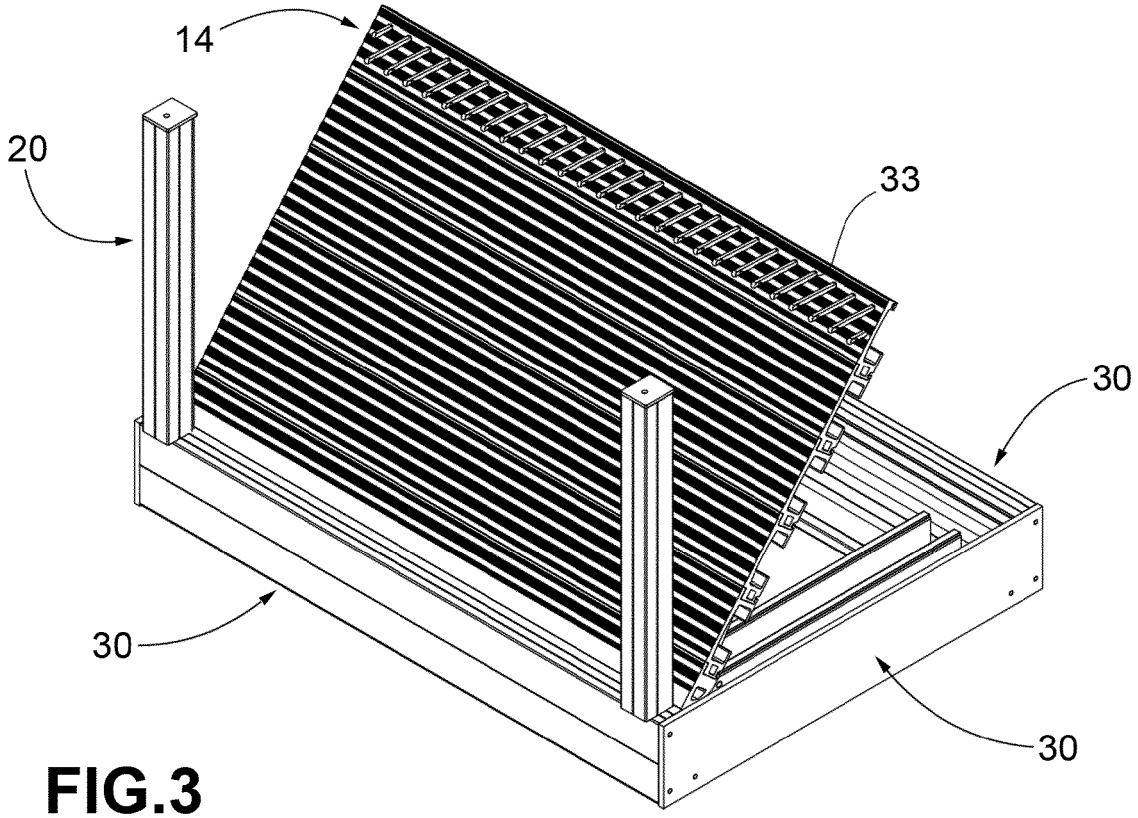


FIG.3

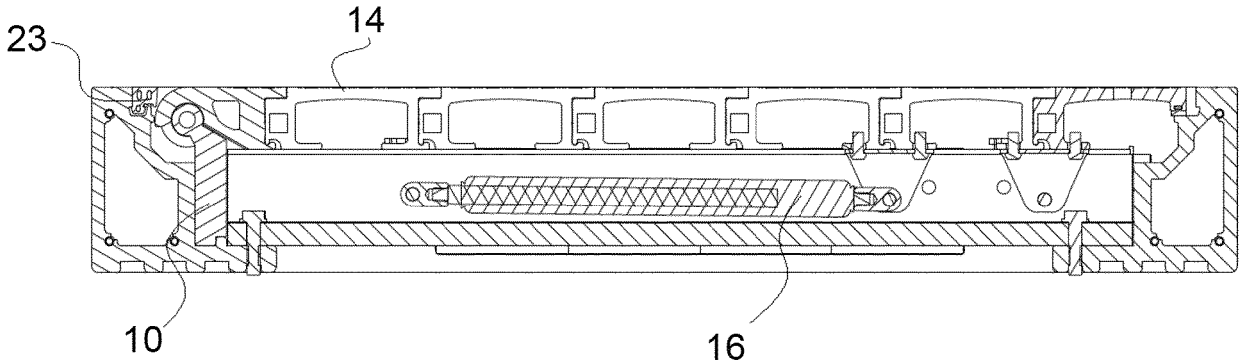


FIG.4

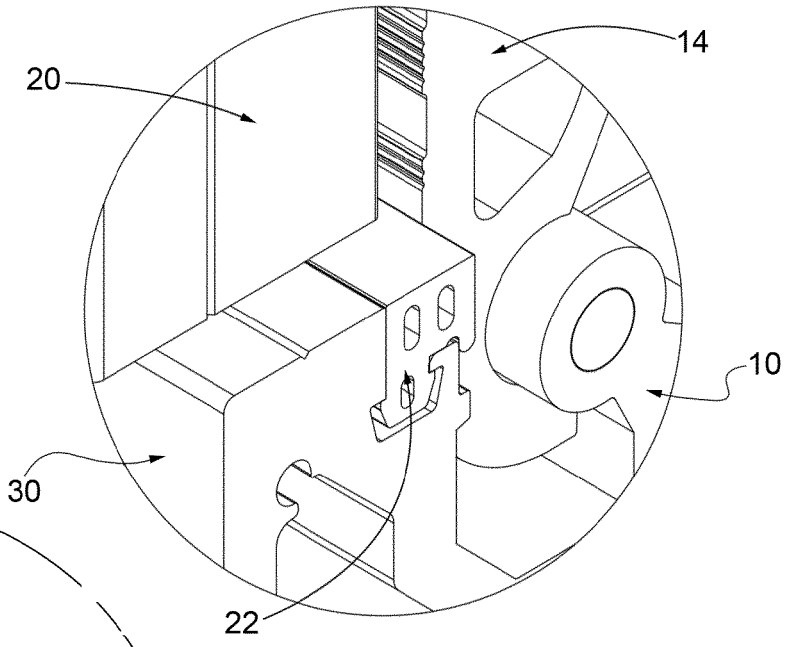


FIG.5a

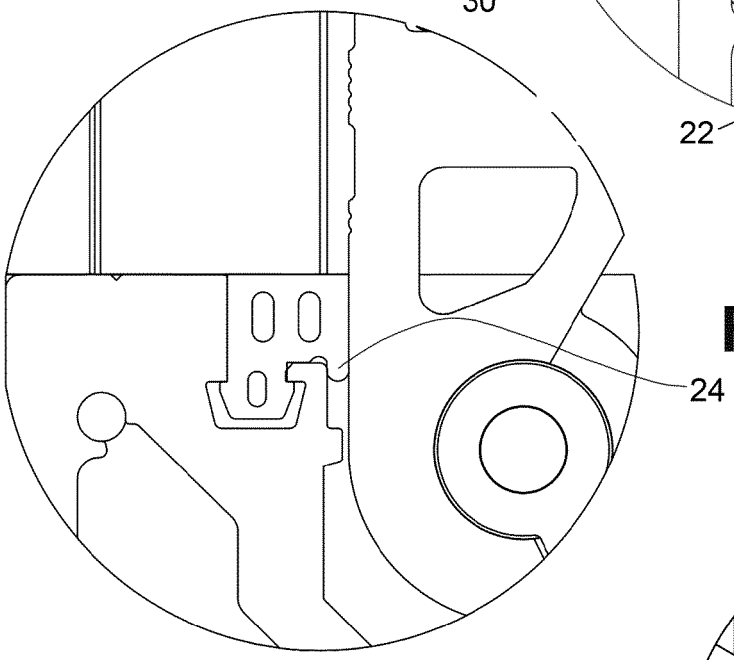


FIG.5b

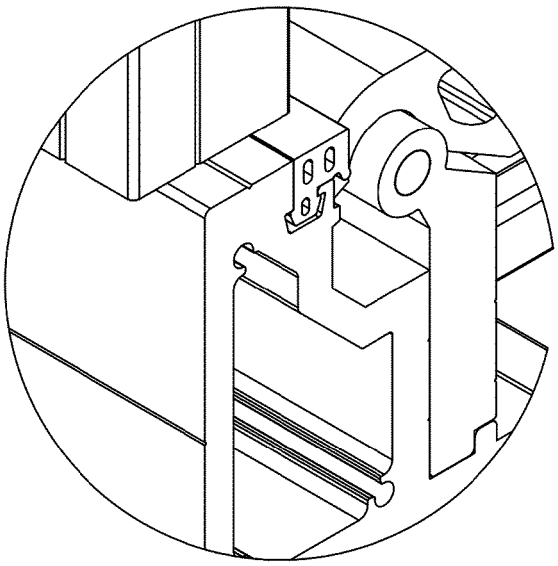


FIG.5c

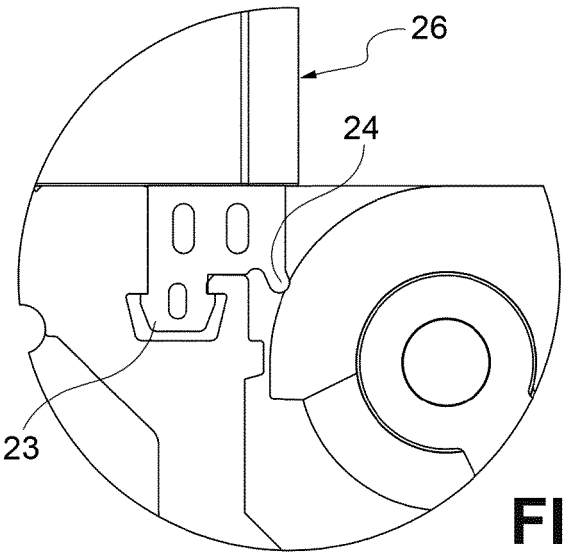


FIG.5d

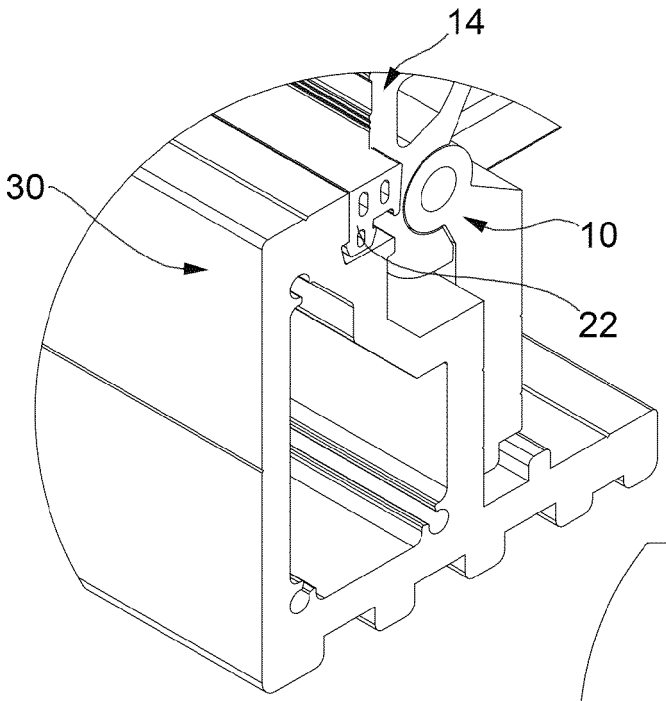


FIG.6a

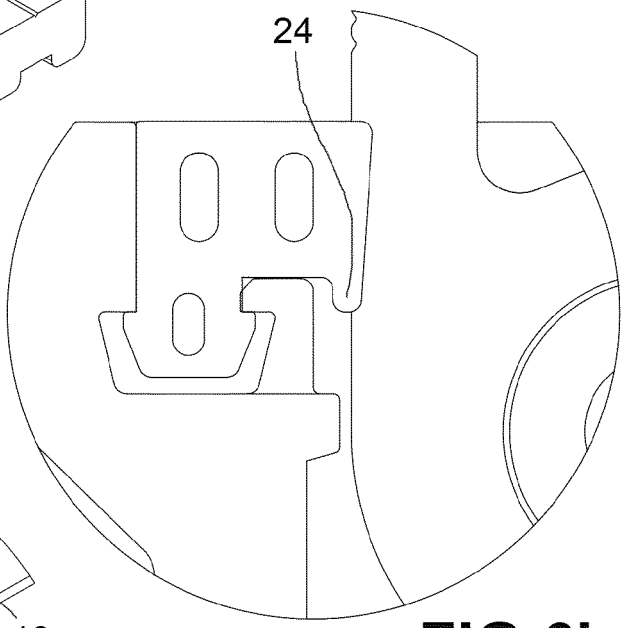


FIG.6b

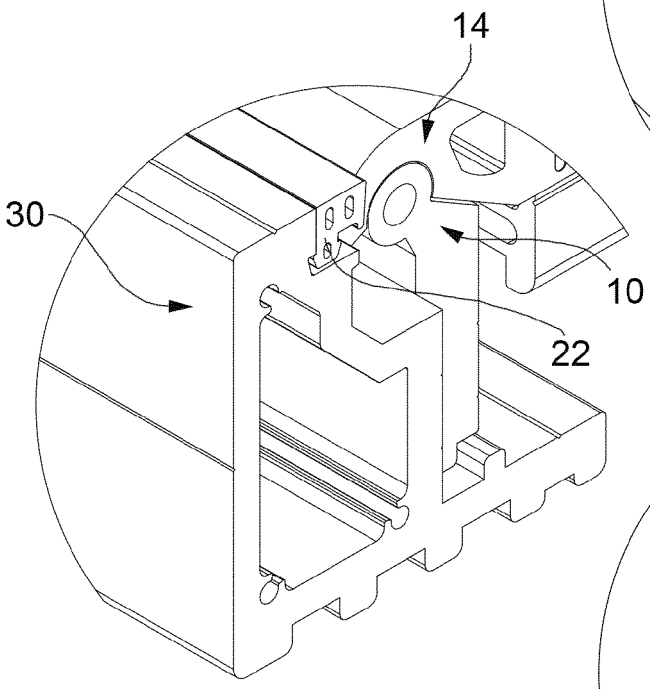


FIG.6c

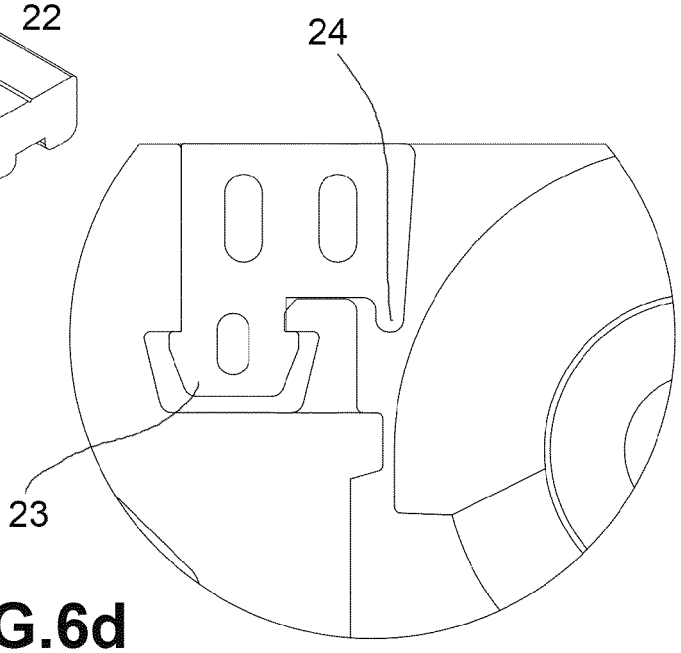


FIG.6d

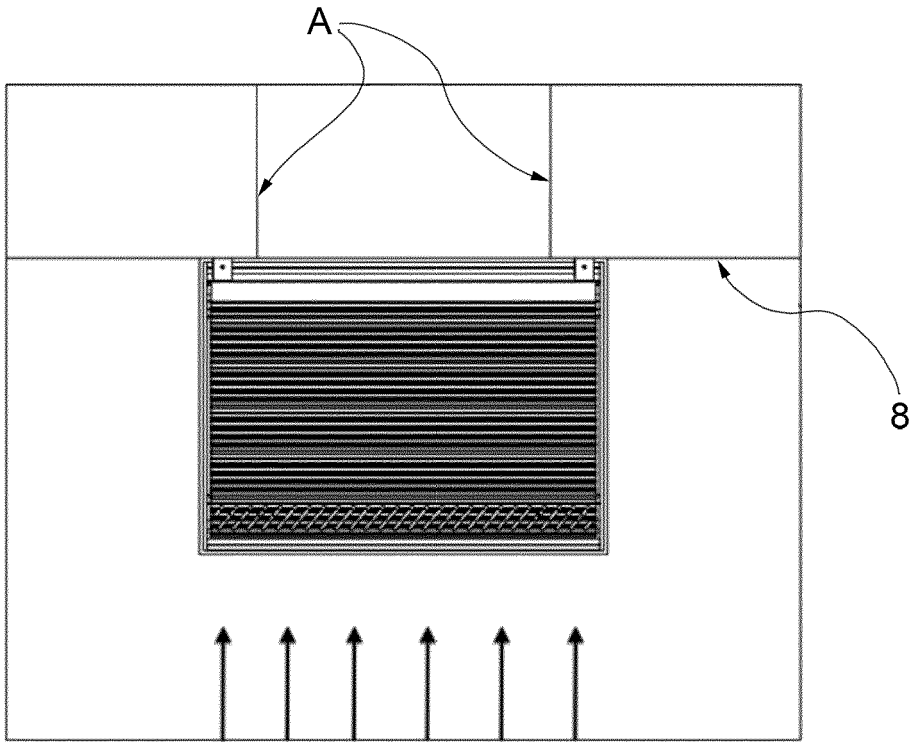


FIG.7

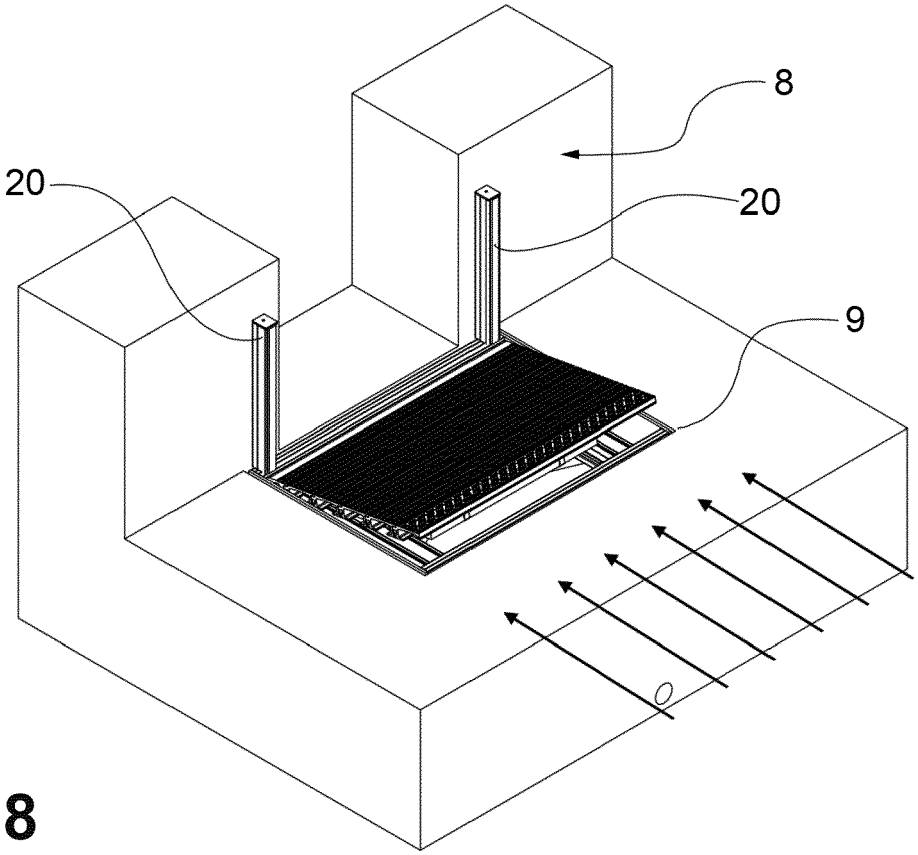


FIG.8

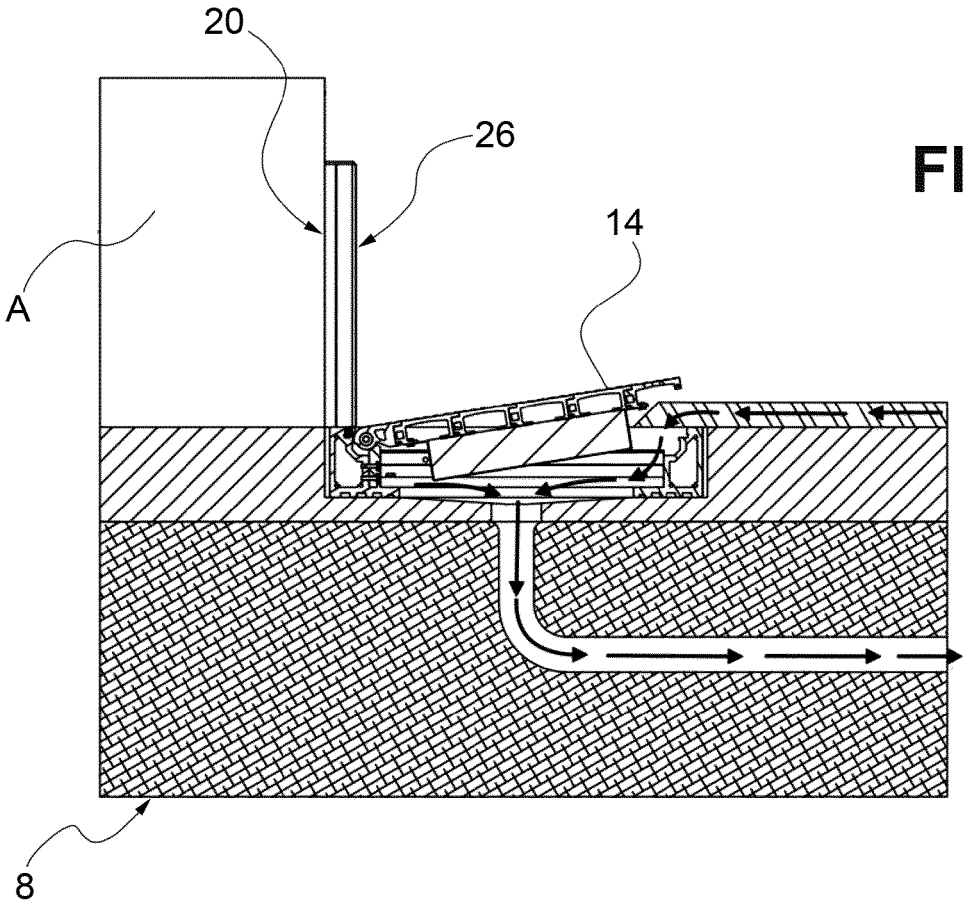
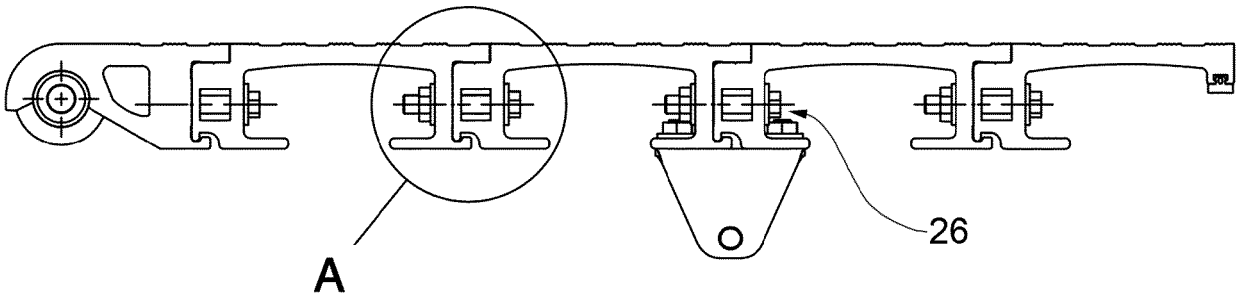


FIG.9



Det. A

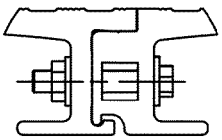


FIG.10

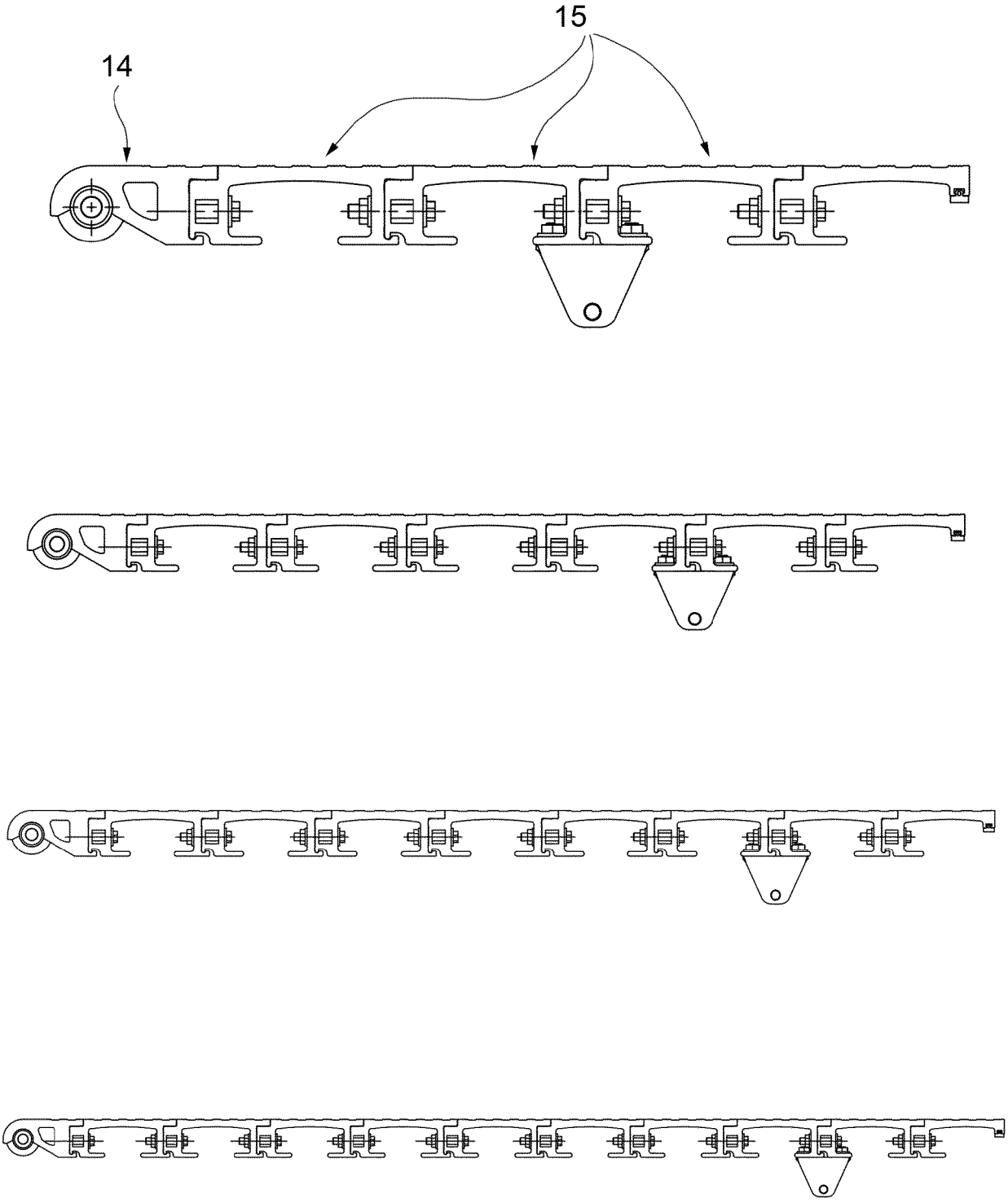


FIG.11

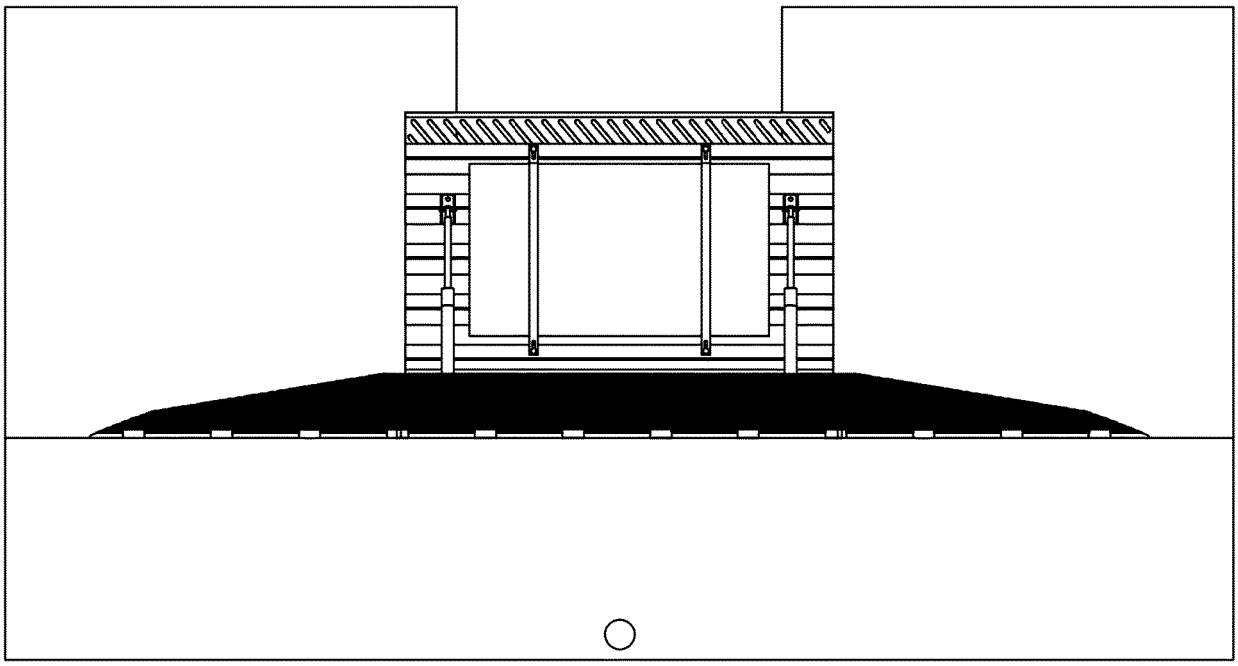


FIG.12a

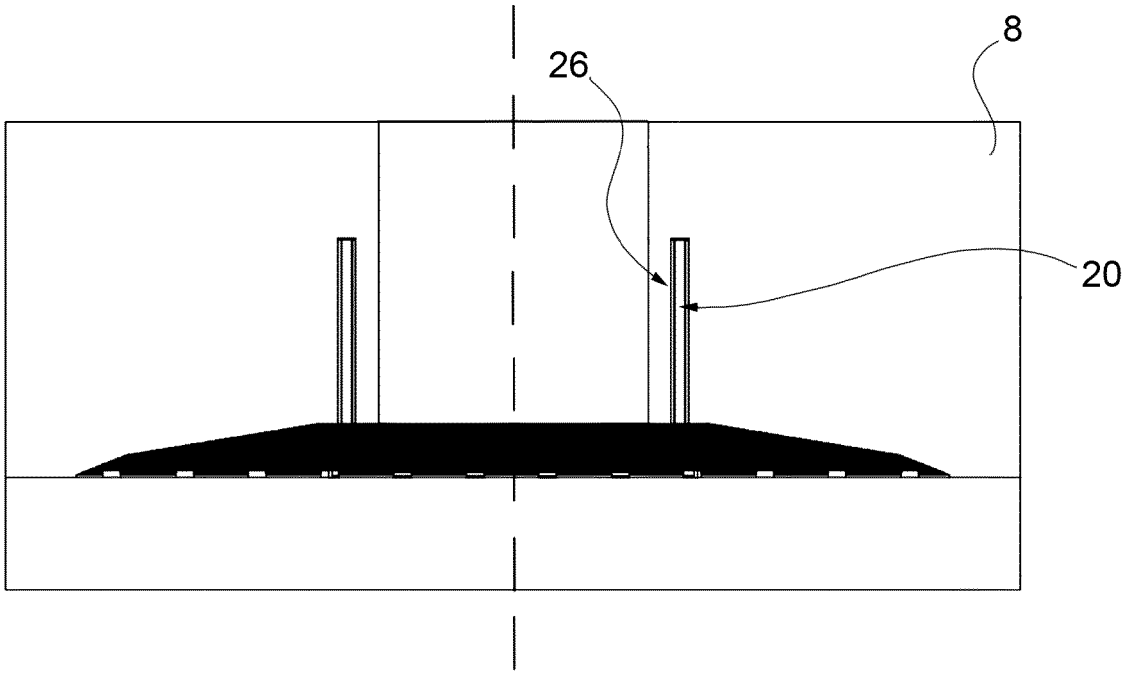


FIG.12b

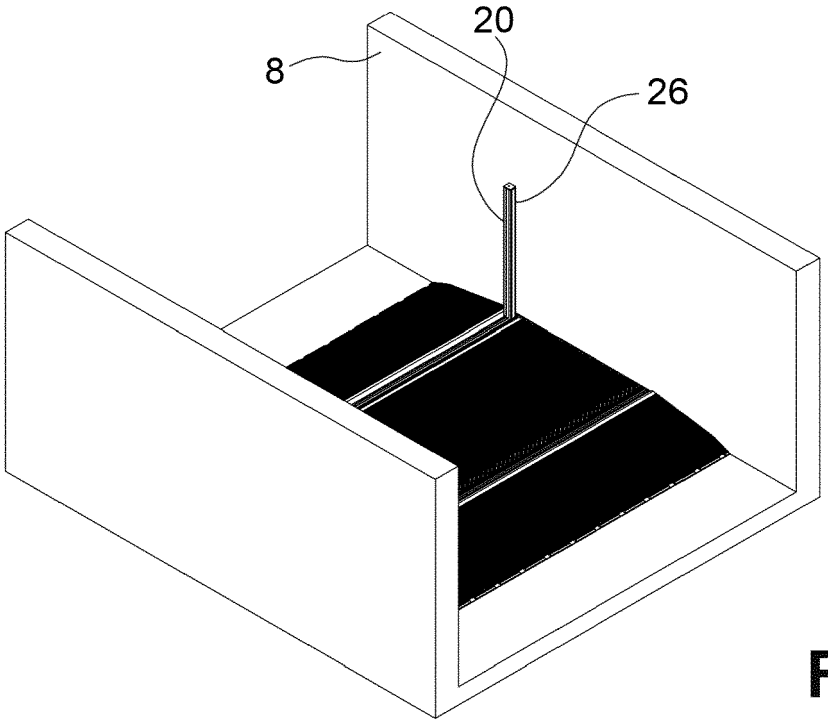


FIG.13

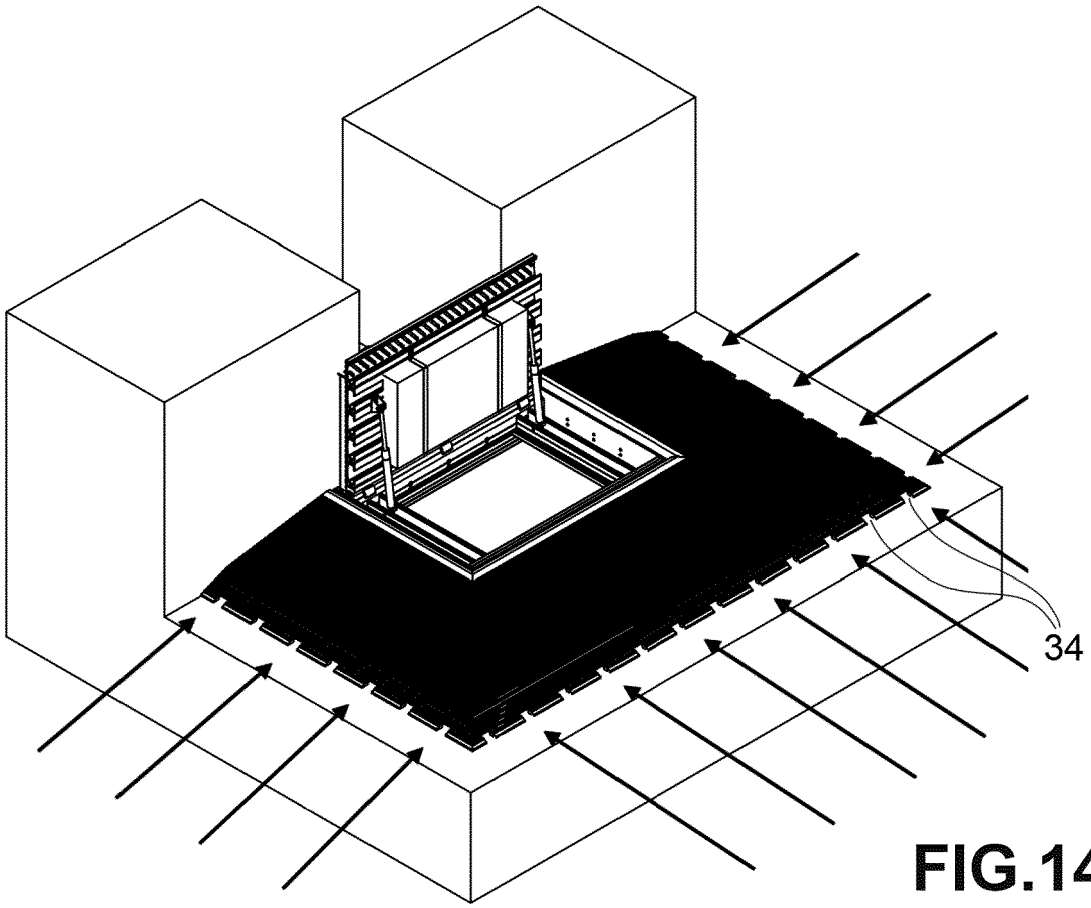


FIG.14

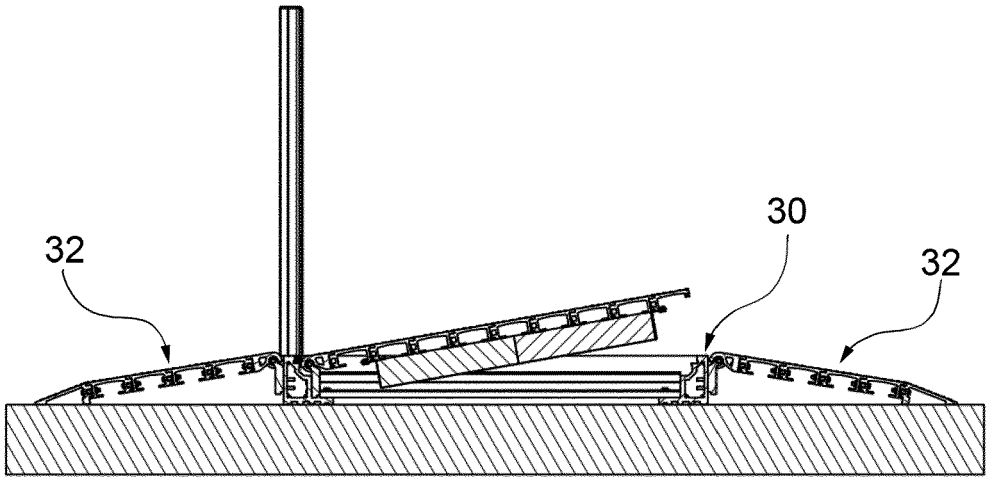


FIG.15

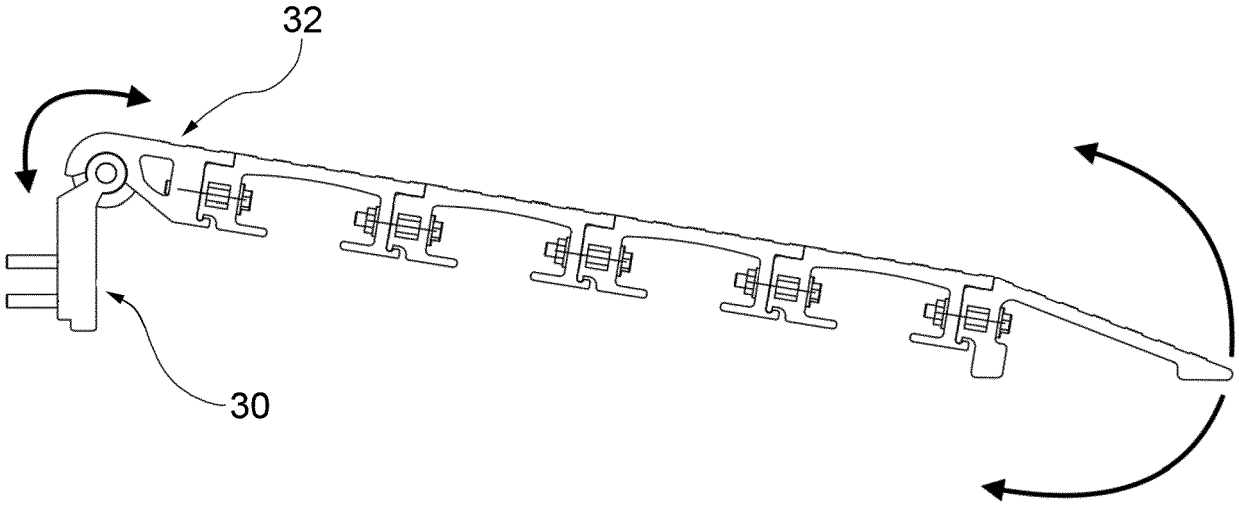


FIG.16

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 21 17 8269

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X Y	CN 105 672 212 A (ZENG L) 15 June 2016 (2016-06-15) * the whole document *	1,3-5, 12,14 2,6-11, 13,15	INV. E02B3/10 E02B7/44 E02B7/50
Y A	KR 101 368 881 B1 (IL SUNG DAM INDUSTRY CO LTD [KR]) 3 March 2014 (2014-03-03) * claim 1; figure 5 *	2 1	
Y	GB 2 399 375 A (YOUNGMAN PHILIP [GB]) 15 September 2004 (2004-09-15) * claims; figures 2-4 *	6	
Y	CN 206 625 196 U (QUZHOU JIANGHUI FLAP GATE CO LTD) 10 November 2017 (2017-11-10) * claim 1; figures 1,2,7 *	7,8	
Y	DE 101 62 568 A1 (SEIDL & PARTNER GMBH GESAMTPLA [DE]) 17 July 2003 (2003-07-17) * paragraph [0030]; figures 1,2 *	9	
Y	GB 2 486 245 A (EVANS GEOFFERY THOMAS [GB]) 13 June 2012 (2012-06-13) * claim 1; figures *	10,11	TECHNICAL FIELDS SEARCHED (IPC) E02B E02C
Y	KR 101 060 610 B1 (S & AMP B HYDRO CO LTD [KR]) 31 August 2011 (2011-08-31) * claims 1,5; figures 6,7 *	13	
Y	CN 110 344 370 A (LIAONING ZHONGWANG ALUMINIUM ALLOY JINGSHEN PROC CO LTD) 18 October 2019 (2019-10-18) * claim 1; figures 1-5 *	15	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	14 October 2021	Fordham, Alan

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 21 17 8269

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

14-10-2021

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
CN 105672212 A	15-06-2016	CN 105672212 A	15-06-2016
		TW 201614124 A	16-04-2016
KR 101368881 B1	03-03-2014	NONE	
GB 2399375 A	15-09-2004	NONE	
CN 206625196 U	10-11-2017	NONE	
DE 10162568 A1	17-07-2003	NONE	
GB 2486245 A	13-06-2012	GB 2486245 A	13-06-2012
		WO 2012076855 A1	14-06-2012
KR 101060610 B1	31-08-2011	NONE	
CN 110344370 A	18-10-2019	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- IT 102016000108874 **[0006]**
- WO 2012076855 A1 **[0007]**
- CN 105672212 **[0009]**