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(54) **IMPROVED, VERTICALLY-SLIDABLE WINDOW**

(57) A window or glass door is described for stopping up a span (P) present in a structure, e.g. present in the facade of a ship, comprising
a perimeter frame (30) mountable within the span,
a first fixed panel (20), integral with the frame, to stop up the lower part of the span,
a second panel (10) mounted on the frame for sliding vertically parallel (Y) to the first panel up to a position in which it stops up the top of the span.

To give good performances of water-tightness and air-tightness, there are means (78) for joining two surfaces which are comprised, respectively, in the second panel (10) and the frame (30) and which are facing each other in said position, so that the second panel and the frame adhere to each other in a hermetically sealed manner.

The described window has also constructive ease.

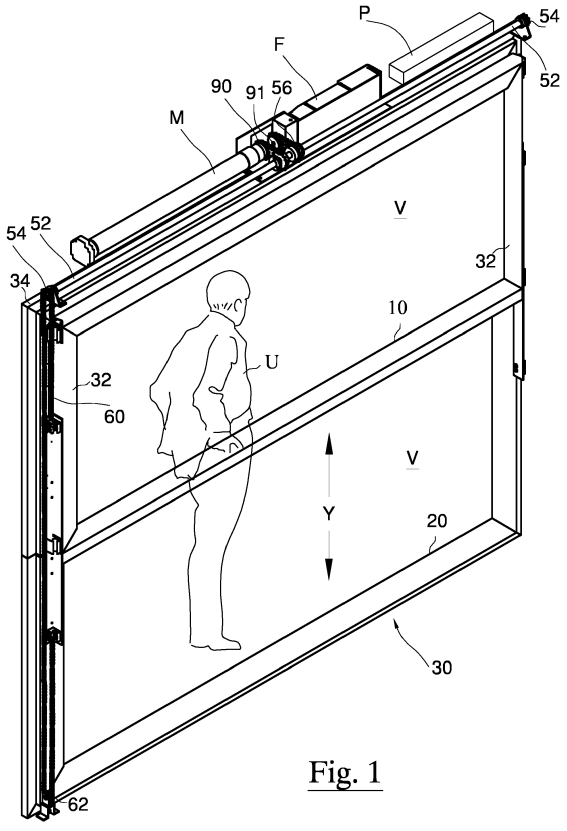

Fig. 1

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Description

[0001] The invention relates to a vertically-sliding window to be mounted on a building or to complete a cabin positioned along a façade of a ship, e.g. a cruise ship chosen here as an example.

[0002] Traditionally, from a cabin of a cruise ship often you can go outside on a balcony or an outdoor terrace, which protrudes from the profile of the hull. The exit door traditionally has a hinged door or a horizontally-sliding door.

[0003] A new architectural trend would enlarge the cabin by incorporating in it the space of the terrace, with obvious advantages for the passengers. To implement the project a window should be mounted on the outer edges of the terrace, building a sort of veranda extending the existing cabin. The window must be capable of opening somehow, because it is necessary to ventilate the cabin, or simply because the passenger wants to breathe fresh air or look out to enjoy the view. Therefore there is absolute need for a window or an openable glass door which has good performance in terms of resistance to water seepage given the exceptional weather disturbances the ship can be subjected to when offshore. Furthermore, the window must have outstanding qualities in eliminating drafts and protecting from external noise. That's the only way to ensure and maintain a high level of comfort which - however - the current windows for ship cabins, if set in this new application, are unsuitable to provide.

[0004] There is therefore the problem of constructing a window that meets such requirements.

[0005] To overcome this problem is the main object of the invention, which is defined in the appended claims, wherein the dependent ones define advantageous variants. One particular object of the invention is producing a window of the above type with good watertightness, good sound insulation and free from drafts.

[0006] A window or glass door is proposed for stopping up a span present in a structure, e.g. present in the facade of a ship or a building, comprising

a perimeter frame mountable within the span,

a first fixed panel, integral with the frame, to stop up the lower part of the span,

a second panel mounted on the frame for sliding vertically parallel to the first panel up to a position in which it stops up the top of the span,

means for joining two surfaces which are comprised, respectively, in the second panel and the frame and which are facing each other in said position, so that the second panel and the frame adhere to each other in a hermetically sealed manner.

[0007] Relative terms as *horizontal, upper, vertical,* etc. are referred here to parts or concepts of the invention as in use.

[0008] It is noted that said means solve the problem of eliminating a perimetral air gap which inevitably form between the second panel and the frame as a result of the sliding of the first parallelly with respect to the second. The result is a hermetic gasket that blocks the infiltration of water, drafts and provides good insulation from outside noise.

[0009] The perimetral frame facilitates the assembly on the opening of the structure or on the skeleton of the ship, while the first panel can serve as a balustrade when the second panel leaves said position and lowers, arranging itself parallel and laterally to the first panel (preferably on the side of the first panel which faces the outside of the ship or the building).

[0010] Said means comprise means for horizontally bringing (i.e. along a direction orthogonal to the previous one of relative sliding) the second panel closer towards the frame so as to make them adhere in a hermetically sealed manner on each other (best by inserting a flexible gasket). This requires a sophisticated mechanism for moving the second panel along two perpendicular axes.

[0011] An alternative embodiment, cheaper and simpler, envisages that said means for bringing comprise or are constituted by an expandable, in particular inflatable, gasket. The gasket is mounted on/in the upper part of the frame and preferably forms a rectangle or a "C" of dimensions slightly smaller than those of the edges of the second panel, so that when the gasket expands it can contact the outer edges of the second panel and gasket the cabin from the external environment. This solution also allows that the second panel moves only linearly with respect to the first panel or to the frame, with great simplification for the displacement mechanism.

[0012] Preferably, the first panel and the second panel have width substantially equal to each other and/or equal to the frame's width. In particular the width of the frame corresponds to the width of the span to be stopped up on the facade. One could also mount two or more windows side by side for a single span to be stopped up.

[0013] Preferably, the window comprises a device for inflating, and preferably deflating, the gasket like e.g. a pump or a compressor. This device not only allows inflating the gasket by injecting fluid in it, but via a flow diverter or a device for the reversal of flow or other means, is able preferably to aspirate fluid from the gasket, too. The advantage is to prevent the accidental sliding of the second panel against the little-deflated gasket, which could generate friction on the former and/or tear the latter. Preferably the pressure in the gasket is reduced to a pressure level lower than the atmospheric one. The advantage is to ensure the deflation of the gasket, which withdraws in certain and quick way thereby avoiding friction and tearing risks, as may occur in the event of natural and incomplete deflation of the gasket.

[0014] To move the second panel, preferably the window comprises motor means. In particular, the frame comprises

a horizontal upper upright which comprises a cavity or a housing in which an electric motor is housed, and

two lateral uprights which comprise linear guides for the second panel,

a filiform element, like e.g. a chain or wire, which can be driven by the motor and has two free ends connected to the second panel for pulling it (vertically) in opposite directions.

[0015] The above configuration of the filiform element allows not only applying a force to lift the second panel toward the closing position, but also lowering it. With time or wear the gravity force might not be enough.

[0016] To achieve easily the loop path of the filiform element, a lateral upright of the frame houses in the lower zone a return pulley for a segment of such element, so as to reverse its traction direction. Preferably, the pulley is connected to a tensioning device, to maintain the filiform element always taut.

[0017] Preferably, the motor is equipped with an auxiliary input by which to apply externally rotary motion and transfer it to the filiform element. This averts the stall of the window when the power supply is missing or helps its drive through manual intervention. In particular said auxiliary input may be connected to a maneuver rod or crank, provided outside the frame so that the user, by rotating it, can move the second panel.

[0018] Preferably, the window comprises an auxiliary brake for the motor, the brake being external to the motor and preferably connected to motion transmission members between the motor and the filiform element. Thus one can equip a motor that is without it or add a level of security to the window. In particular, to operate the filiform element the motor is connected to a shaft, and the shaft preferably extends across all the width of the frame, from one upright to the other, and is connected to a brake external to the motor. The external brake gives a second security level if, in case of failure, the motor was not powered and/or allowed the second panel to descend by gravity.

[0019] Preferably the frame and/or a or each panel has the form of a quadrilateral, e.g. a rectangle or a square.

[0020] Preferably a or each panel comprises a central glass plate.

[0021] To prevent the second panel from crushing hands of a person upon moving, the window preferably comprises presence or proximity sensors, e.g. photocells. Preferably a sensor is arranged to detect the presence

of a foreign object along or above the top edge of the first panel, and/or

of a foreign object along or below the lower edge of the upper horizontal upright.

[0022] The sensor may e.g. emit a sound alarm, or preferably is connected to an electronic control unit, remote or comprised in the window, which drives the motor. The control unit preferably stops the motor and/or reverses the rotation direction thereof if it detects a foreign object via one of the sensors.

[0023] To automatically lift the second panel, and thus close the window during bad weather, preferably the window comprises a rain sensor connected to the control unit, so that the latter operates the motor and lift the second panel as soon as the first drops are detected.

[0024] To automatically stop the motor in correspondence of two end-of-travel positions for the second panel (e.g.,in correspondence of the two complete opening and complete closing positions of the second sliding panel), the window preferably comprises two proximity sensors mounted to detect the arrival of the second panel to two different heights. E.g. the proximity sensors may be mounted externally (e.g. micro switches), or integrated in the motor M.

[0025] Preferably, the proximity sensors are connected to the control unit, so that the latter stops the motor when the second panel reaches an end-of-travel limit.

[0026] Preferably, as a further safety, the window comprises an amperometric sensor, e.g. placed inside of an electronic control unit, able to detect a current increase in the motor in case the panel closes against an obstacle (for example the arm of the user U resting on the handrail 74, see below).

[0027] The control unit preferably comprises a programmable microprocessor, e.g. in order to program the behavior and/or the functions of the electrical components installed in the window and/or the brake and/or the device for inflating and deflating the gasket.

[0028] Another aspect of the invention is a ship comprising a window or glass door as defined herein (in all its variants) and mounted inside a span of the hull to stop up an external wall of a cabin.

[0029] Another aspect of the invention is a building comprising a window or glass door as defined herein (in all its variants) and mounted inside a span of a building facade to stop up an outer wall of the facade.

[0030] The advantages of the invention will be more apparent from the following description of a preferred embodiment of a window, making reference to the attached drawing in which

- Fig. 1 shows an isometric view of the window;
- Fig. 2 and Fig. 3 show a cross-sectional side view of the window in two different configurations;
- Fig. 4 shows a cross-sectional top view of the window with various magnifications.

[0031] In the figures identical numbers indicate identical or conceptually similar parts.

[0032] The window is to be mounted in the span L of a ship cabin (not shown) where a passenger U is hostable. The window comprises a perimeter frame 30, a fixed bottom panel 20 integral with the frame 30 and a panel sliding vertically (vertical arrow Y). The frame 30 is composed of two lateral uprights 32 and a horizontal crosspiece 34. In the top panels 10, 20 a central glass V is mounted.

[0033] The panel 10 is movable along the Y direction relative to the frame 30 thanks to a motor M mounted above the crosspiece 34. The motor M has an output pinion 90 connected via a chain to a toothed wheel 91 keyed on a horizontal shaft 52 which is equipped with

two end pinions 54 and a central pinion 56, in turn connected via gear and chain to the shaft of a brake F external to the motor M. The brake F represents a safety device to brake the panel 10 if the motor M is faulty. In particular, the brake F, e.g. hydraulic, is a fall protection device: it can take over in case of failure of the electrobrake normally aboard the motor M.

[0034] Near the brake F there is mounted a compressor P or a pneumatic system with compressor P.

[0035] Figs. 2 and 3 show in detail for the panel 10 the motion mechanism, which has same and mirrored structure inside the two uprights 32. The panel 10 in the closed position is located in front of an equal-sized, fixed frame 32, where the sealing gasket is.

[0036] On the pinions 54 engages a chain 60 which forms an open loop arranged within the uprights 32 and inferiorly returned by a pulley 62 mounted at the feet of the uprights 32. The pulley 62 advantageously may be pre-stretched vertically by a spring to maintain the chain 60 always taut.

[0037] The chain 60 therefore has two free ends which are connected respectively at two different points PI, P2 of the panel 10: at the upper edge and at the lower edge. The motor M rotates in opposite directions the shaft 52, to which there always corresponds a traction force on the chain 60 in one of the points PI or P2; therefore, the panel 10 is tractioned whether it is raised or it is lowered. Fig. 2 shows the panel 10 raised and in the closed position, Fig. 3 shows it in intermediate position, during a lowering or lifting phase.

[0038] The linear trajectory of the panel 10 with respect to the frame 30 is ensured by a guiding system, in particular by a skid 80, mounted on the panel 10, which engages a vertical linear guide 82 fixed inside the upright 32 (Fig. 4). Therefore, between the facing surfaces of the raised panel 10 and the frame 30 there is formed by geometry a gap W, which would let drafts and outside noise pass. To avoid this, on said facing surface of the upright 32 there is provided an inflatable gasket 78 connected to the pneumatic system P. When the panel 10 is raised and has arrived at the upper end position (Fig. 2), the pneumatic system P is activated and inflates the gasket 78 (Fig. 4c) so that by expanding it touches the opposite facing surface of the panel 10 and adheres tightly thereto. When one wants the panel 10 to be lowered (fig. 3), the pneumatic system P is activated and deflates the gasket 78 (Fig. 4d) so that the latter withdraws and moves away from the panel 10, which then is moved towards the lower end-of-travel limit by activating the motor M. Since the gasket 78 is not permitted to deflate naturally, one is sure that it does not rub against the panel 10.

[0039] FIG. 4 shows, in the lower left, magnifications (Fig. 4c and Fig. 4d) with the two configurations described for the gasket 78.

[0040] The upper edge of the panel 20 is a support for the user, then it is equipped with a support railing or handrail 74. On the inner sides of the uprights 32 there are mounted photocells 72, 76 to detect the presence of a hand, which might be injured if the panel 10 is moving nearby. Safety and security is ensured by stopping the motor M when the photocells 72, 76 detect an obstacle.

[0041] Aboard the window, or in a remote position, there is preferably present an electronic control unit (not shown) capable of

acquiring a command of a user U and then, as a function of this command, managing and synchronizing with the correct timing the start and stop of the motor M,

controlling the compressor P to inflate or deflate the gasket 78 based on the position of the panel 10 and the state of the motor M,

interrogating the photocells 72, 76 and stopping the motor M if needed.

[0042] It can be noted that the described window has the advantage of constructive simplicity, has good sealing performance to water and air; ensures good security for the user (e.g. through the adoption of a low voltage motor M, e.g. 24V instead of 230V).

Claims

1. Window or glass door for stopping up a span (P) present in a structure, e.g. present in the facade of a ship, comprising
   a perimeter frame (30) mountable within the span,
   a first fixed panel (20), integral with the frame, to stop up the lower part of the span,
   a second panel (10) mounted on the frame for sliding vertically parallel (Y) to the first panel up to a position in which it stops up the top of the span,
   means (78) for joining two surfaces which are comprised, respectively, in the second panel (10) and the frame (30) and which are facing each other in said position, so that the second panel and the frame adhere to each other in a hermetically sealed manner,
   wherein said means comprise means for horizontally bringing the second panel closer towards the frame so as to make them adhere in a hermetically sealed manner on each other.

2. Window or glass door according to claim 1, wherein said means comprise or are constituted by an expandable, in particular inflatable, gasket (78).

3. Window or glass door according to claim 2, wherein the gasket is mounted on/in the upper part of the frame and forms a rectangle or a "C" of dimensions slightly smaller than those of the edges of the second panel.

4. Window or glass door according to claim 2 or 3, comprising a device (P) for inflating the gasket.

5. Window or glass door according to claim 4, wherein the device for inflating and deflating the gasket is

able to suck fluid from the gasket and to reduce the pressure in the gasket to a pressure level lower than the atmospheric one.

6. Window or glass door according to any one of the preceding claims 2 to 5, wherein the frame comprises
a horizontal upper upright (54) which comprises a cavity or a housing in which an electric motor (M) is housed, and
two lateral uprights (32) which comprise linear guides (82) for the second panel, and
a filiform element (60) which can be driven by the motor and has two free ends (PI; P2) connected to the second panel for pulling it in opposite directions.

7. Window or glass door according to claim 6, wherein the motor (M) is equipped with an auxiliary input by which to apply externally rotary motion and transfer it to the filiform element.

8. Window or glass door according to claim 6 or 7, wherein an upright of the lateral frame houses in the lower area a return pulley for a segment of the filiform element, so as to reverse its traction direction.

9. Window or glass door according to claim 6 or 7 or 8, comprising an auxiliary brake (F) for the motor (M), the brake being external to the motor (M) and connected to motion transmission members (52) between the motor and the filiform element.

10. Window or glass door according to any one of the preceding claims, wherein the first panel and the second panel have a width which is substantially equal and equal to the width of the frame.

11. Window or glass door according to any one of the previous claims, comprising presence or proximity sensors arranged for detecting the presence
of a foreign object along or above the top edge of the first panel, and/or
of a foreign object along or below the lower edge of the upper horizontal upright.

12. Window or glass door according to any one of previous claims, comprising an amperometric sensor capable of detecting a current increase in the motor in the event of closure of the movable panel against an obstacle.

13. Ship comprising
a hull and
a window or glass door as in one of the preceding claims, the window or glass door being mounted inside a span of the hull to stop up an outer wall of a cabin.

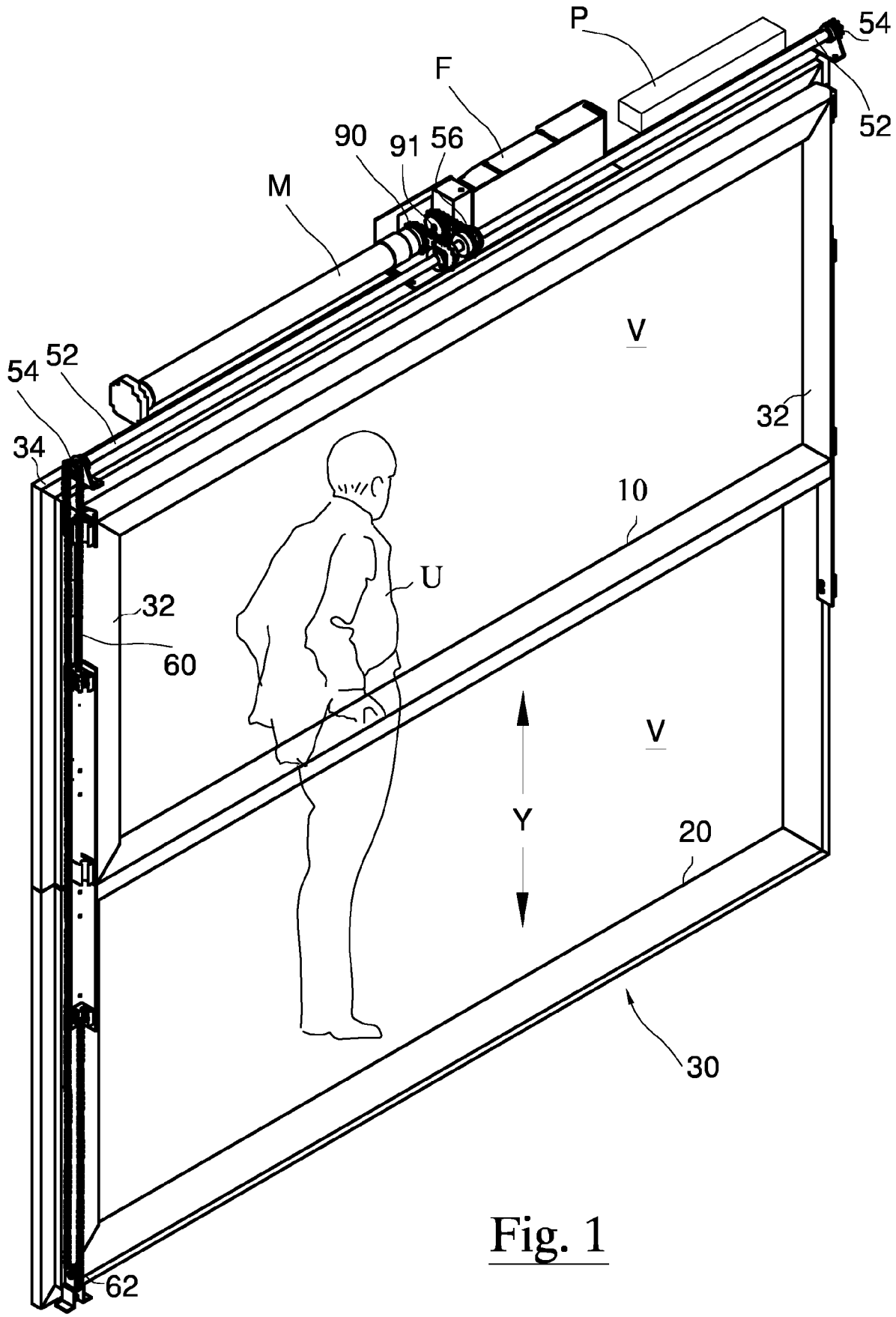
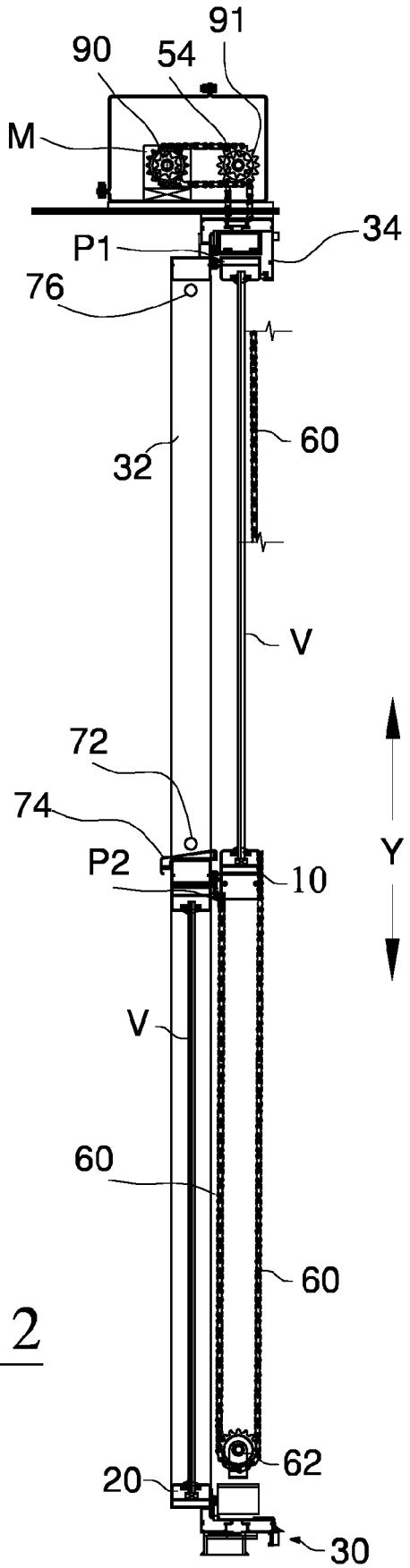


Fig. 1


91
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54
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34
P1
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V
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P2
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Fig. 2

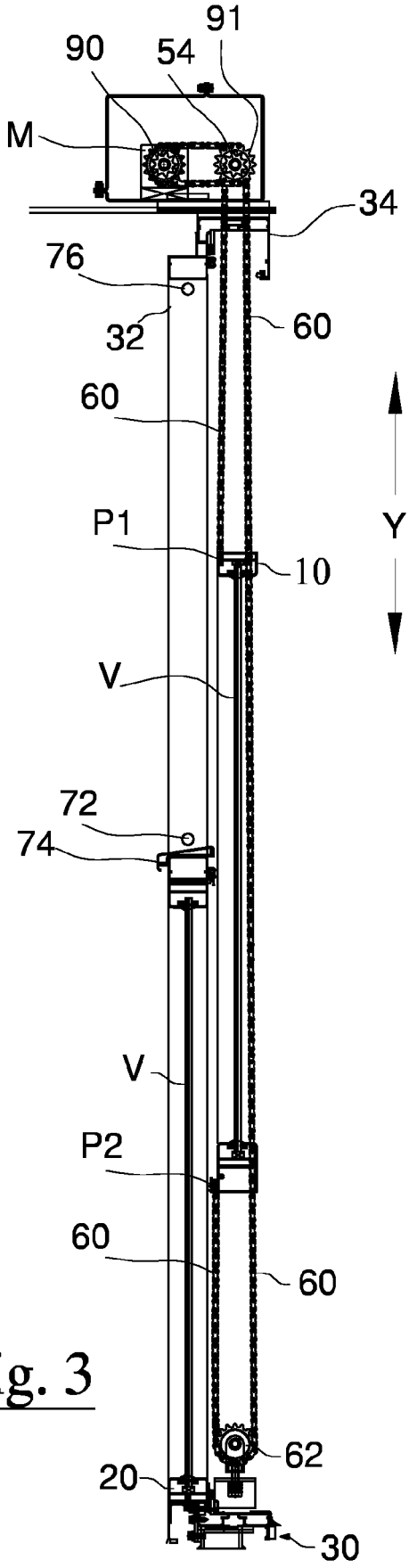
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Fig. 3

Fig. 4

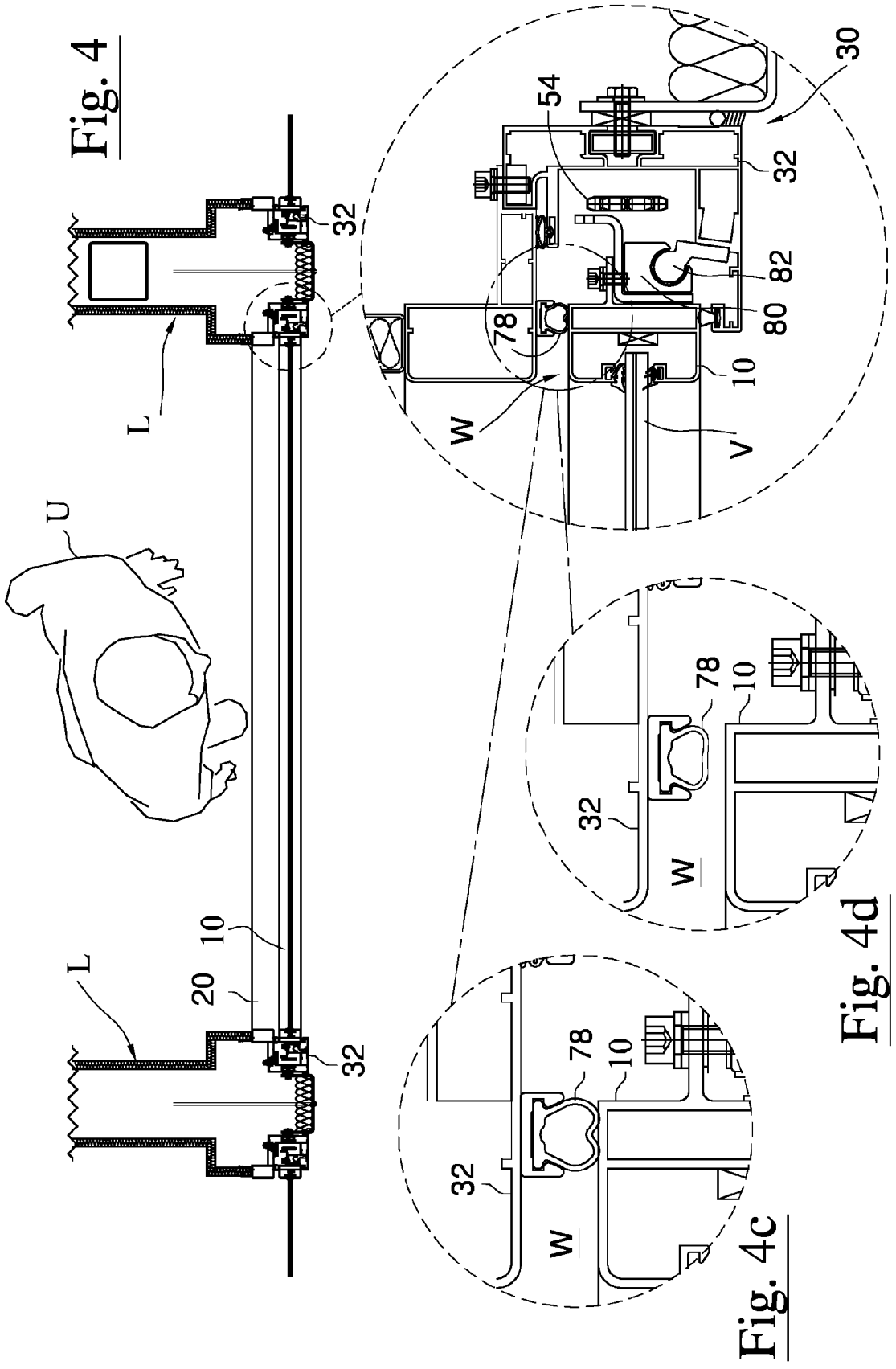

Fig. 4d

Fig. 4c

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EUROPEAN SEARCH REPORT

Application Number
EP 17 20 2469

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	US 2007/277454 A1 (BOX NEIL K [US]) 6 December 2007 (2007-12-06) * paragraph [0033] - paragraph [0037]; figure 4 * * paragraph [0040]; figure 5 *	1,10,13	INV. E06B3/44 E06B7/23
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A	CA 2 376 498 A1 (BATTERS TIM [CA]) 14 September 2003 (2003-09-14) * figure 3 *	2-5	
A	DE 101 42 083 A1 (EXACTA FENSTER BAU GMBH [DE]) 29 August 2002 (2002-08-29) * paragraph [0012] * * paragraph [0038] - paragraph [0040]; claims 10-13 * * paragraph [0057] - paragraph [0060]; claim 7 * * paragraph [0062] *	6-9,11, 12	

TECHNICAL FIELDS SEARCHED (IPC)

E06B
E05D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	11 January 2018	Crespo Vallejo, D

CATEGORY OF CITED DOCUMENTS

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