

FLOOD PROTECTION DEVICE FOR BUILDING

(a) Technical Field of the Invention

The present invention generally relates to a flood protection device for building, and more particularly to a combination of two side posts and a
5 plurality of gate panels to form a watertight water barrier for flood protection.

(b) Description of the Prior Art

A building is provided with a door to serve as an entrance. For a building exceeding a predetermined height, a basement is often provided. The basement also has an entrance. Generally, both the door or the basement
10 entrance is provided with a door panel to prevent unauthorized entrance or trespassers. Although the door panel is effective for security purposes, but it cannot prevent water penetration in a flood, which often leads to loss of property and casualty. An electrically-driven gate is available in the market for flood protection by being lowered down in case of flood to form a water
15 barrier that stops inflow of water. However, such a flood protection gate is expensive and may not be affordable by the building owners, making it uneconomic. Another way of stopping flood is piling up sandbags, but it is time-consuming and labor-consuming and shows only limited performance in stopping inflow of water. Thus, it is desired to provide a flood protection
20 device that may effectively blocks inflow of flood and is easily to install.

SUMMARY OF THE INVENTION

The primary objective of the present invention is to provide a flood protection device for building. The flood protection device comprises at least two side posts and a plurality of gate panels. The side posts are removably
5 attached to mounting bars respectively mounted to walls of the building.

Each of the side posts forms a coupling slot, inside which a waterproof strip and a retention member are arranged. The gate panels are received in the coupling slot of each side post and located between the waterproof strip and the retention member. The plurality of gate panels is stacked between the
10 two side posts in such a way that joint projections and the recesses formed in the gate panels are fit to each other to form a wall barrier of a predetermined height with the gate panels in tight mutual-engagement between each other to thereby provide a water barrier of excellent water tightness and ensuring no water invasion.

15 The foregoing objectives and summary provide only a brief introduction to the present invention. To fully appreciate these and other objects of the present invention as well as the invention itself, all of which will become apparent to those skilled in the art, the following detailed description of the invention and the claims should be read in conjunction with the accompanying

drawings. Throughout the specification and drawings identical reference numerals refer to identical or similar parts.

Many other advantages and features of the present invention will become manifest to those versed in the art upon making reference to the detailed
5 description and the accompanying sheets of drawings in which a preferred structural embodiment incorporating the principles of the present invention is shown by way of illustrative example.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an exploded view showing a flood protection device according to the present invention.

FIG. 2 is an assembled view of the flood protection device according to
5 the present invention.

FIGS. 3-6 are top plan views demonstrating various ways of installing the flood protection device according to the present invention at a building entrance.

FIG. 7 is a schematic view demonstrating coupling of a side post to a
10 mounting bar according to the present invention.

FIG. 8 is an exploded view showing a center post according to the present invention.

FIG. 9 is a partial cross-sectional view of the center post according to the present invention.

FIG. 10 is an exploded view of a back support assembly according to the
15 present invention.

FIG. 11 is a side elevational view of the back support assembly according to the present invention.

FIG. 12 is a schematic view demonstrating coupling the back support
20 assembly to gate panels according to the present invention.

FIG. 13 is a schematic view illustrating another embodiment of the back support assembly according to the present invention.

FIG. 14 is a schematic view illustrating a further embodiment of the back support assembly according to the present invention.

5 FIG. 15 is a schematic view illustrating a further embodiment of the back support assembly according to the present invention.

FIG. 16 is an exploded view of a base seat and a fastening member of a flood protection device according to the present invention.

FIG. 17 is an assembled view of FIG. 16.

10 FIG. 18 is a perspective view showing a flood protection device according to another embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The following descriptions are exemplary embodiments only, and are not intended to limit the scope, applicability or configuration of the invention in any way. Rather, the following description provides a convenient illustration
5 for implementing exemplary embodiments of the invention. Various changes to the described embodiments may be made in the function and arrangement of the elements described without departing from the scope of the invention as set forth in the appended claims.

Referring to FIGS. 1 and 2, the present invention provides a flood
10 protection device 1 for building, comprising at least two side posts 2 and a plurality of gate panels 3.

The side posts 2 are fixed to walls of a building. Each of the side posts 2 forms a coupling slot 21 which has an opening and defines a hollow channel. The coupling slot 21 comprises a waterproof strip 22 and a retention member
15 23 arranged therein. The side post 2 has an inner surface to which a plurality of spaced locking seats 24 is mounted. Each locking seat 24 forms a threaded hole 241 extending to and communicating the coupling slot 21. Each threaded hole 241 receives a locking bar 25 in threading engagement therewith. The locking bar 25 is coupled to the retention member 23,
20 whereby rotating the locking bar 25 causes the retention member 23 to move

with respect to the side post 2. The side posts 2 has an opposite side surface forming a fitting slot 26. The fitting slot 26 receives therein a waterproof pad 27 fixed therein. The fitting slot 26 is fit over and coupled to a mounting bar 28. The mounting bar 28 has an outside surface to which a waterproof pad 29. The waterproof pad 29 may be formed of silica gel to improve mechanical strength resisting water pressure. The mounting bar 28 and the waterproof pad 29 may be attached by threaded fasteners to a wall or a pillar of each side of a building entrance. The arrangement of the waterproof pad 29 ensures tight engagement between the mounting bar 28 and the wall to effectively prevent invasion or penetration of water. The mounting bar 28 is also coverable by a cover 20 to provide aesthetics for non-use condition. The waterproof strip 22 of each side post 2 forms sawtooth like or corrugated water securing lines 221, whereby when the waterproof strip 22 is compressed, the water securing line 221 undergoes elastic deformation to ensure improved watertightness.

Each of the gate panel 3 comprises a board, which is preferably made of a light-weight material for easy carrying and conveyance. The gate panel 3 has a bottom forming an upward concave recess 31, and the gate panel 3 has a top forming a raised joint projection 32, whereby multiple gate panels 3 may joint each other through mating engagement between the recess 31 and the

joint projection 32 so as to form a water barrier of a desired height. The gate panel 3 may be provided with waterproof pads 33 on opposite sides of the recess 31 to ensure improved watertightness between jointed gate panels 3.

The gate panels 3 that form the water barrier is further provided with a

5 waterproof strip 34 fit to the recess 31 of the lowermost one of the gate panels.

The entrance of the building is provided, on the ground thereof, with a base 35, which has a flat surface and corresponds in position to the lowermost gate panels 3 of the water barrier, whereby the waterproof strip 34 of the lowermost gate panel 3 of the water barrier may form a tight engagement with the flat

10 surface of the base 35. The waterproof strip 34 forms sawtooth like or corrugated water securing lines 341, and the water securing lines 341 are provided so that when the gate panels 3 are set against the base 35, the water securing lines 341 undergo compression and elastic deformation to ensure improved watertightness. Further, each of the gate panels 3 has opposite

15 sides each receiving a covering member 36 fit thereto. The covering members 36 seal the sides of the gate panel 3 to protect the gate panel 3 from invasion of dusts and insects when the gate panel 3 is not in use and stored.

Referring to FIG. 3, the present invention can be installed between inner wall surfaces W1 of opposite walls W of the building entrance, and located
20 outside a shutter door F (the hollow arrow shown in this drawing indicating

the direction of water pressure). Alternatively, as shown in FIG. 4, the present invention may be arranged inside the shutter door F to accord with the arrangement of the shutter roller door F of the building. Alternatively, as shown in FIG. 5, the present invention can be installed between outer wall surfaces W2 of opposite walls W of a building entrance. Alternatively, as shown in FIG. 6, to accord with the outside configuration, the present invention may be mounted at one side to an inner wall surface W1 and at other side to an outer wall surface W2. To install, as shown in FIG. 7, the side posts 2 are first attached to the mounting bars 28, and afterwards, opposite side edges of each of the gate panels 3 are respectively fit through opposing openings of the two side posts 2 into the coupling slots 21, so that the plurality of gate panels 3 is stacked between the waterproof strip 22 and the retention member 23 at each side, and thus the gate panels 3 so stacked form a water barrier. The locking bars 25 are then rotated to forcibly push the retention member 23 of each side post to depress and displace the gate panels 3, making the gate panels 3 tightly engaging the waterproof strip 22, whereby a sealed and watertight arrangement is formed between the gate panels 3 and the side posts 2.

Referring to FIG. 7, to couple the side post 2 to the mounting bar 28 according to the present invention, the mounting bar 28 is first fixed to a wall

W, and then a barb strip 261 formed at one side of the fitting slot 26 of the side post 2 is put into engagement with a flange 281 formed on the corresponding side of the mounting bar 28. The fitting slot 26 has two barb strips 261 that are spaced from each other by a distance greater than the distance between two
5 opposite flanges 281 of the mounting bar 28. This allows the barb strip 261 formed on the other side of the fitting slot 26 to be easily fit over the flange 281 on the other side of the mounting bar 28. Afterwards, threaded fasteners S are fit into and engage aligned threaded holes 262, 282 of the fitting slot 26 and the flanges 281 to secure the fitting slot 26 to the flange 281, whereby an
10 improved mechanical support is realized for the gate panels 3 undergoing water pressures.

Referring to FIG. 8, when a building entrance is of a great width, the flood protection device 1 may further comprise one or more center post 4 to be installed at a midway location. The center post 4 comprises a hollow tube
15 like frame 41 having opposite side surfaces each being extended to define a coupling slot 42, which receives therein a waterproof strip 43 and a retention member 44 fit therein. The center post 4 has an inner surface to which a plurality of spaced locking seats 45 is mounted. Each of the locking seats 45 forms a threaded hole 451 extending to and communicating the respective
20 coupling slots 42. The threaded hole 451 receives a locking bar 452 in

threading engagement therewith. The locking bar 452 is coupled to the respective retention member 44, whereby rotating the locking bar 452 causes the retention member 44 to move with respect to the center post. A mount board 46 is mounted to the ground at a location corresponding to the center post 4. The mount board 46 comprises a positioning mechanism 461 arranged at a central portion thereof. The positioning mechanism 461 comprises an elastic element 4611 and a movable plate 4612. The center post 4 has a coupling base 411 of which an underside forms a positioning block 412, which corresponds in position to and is located above the movable plate 4612 of the positioning mechanism 461. As such, when the center post 4 is positioned above the mount board 46 and moved downward, the positioning block 412 depresses the movable plate 4612 downward to realize easy positioning and coupling, as shown in FIG. 9.

Referring to FIGS. 10 and 11, to ensure tightness of engagement between stacked gate panels 3, a back support assembly 5 is additionally provided to apply a movement of downward depression on a top end of the stacked gate panels 3. The back support assembly 5 comprises a primary tube 51 having an inner surface from which a telescopic bracket tube 52 extends. The primary tube 51 comprises a depression unit 53 slidably fit thereto. The depression unit 53 comprises a frame 531 that is slidably fit over an outer

circumference of the primary tube 51 to allow sliding movement of the depression unit 53 along the primary tube 51. A threaded fastener 532 is selectively set in threading engagement with one of threaded holes 511 defined in a corresponding surface of the primary tube 51 for positioning the depression unit. The frame 531 comprises a fixing plate 533 extending therefrom. The fixing plate 533 has two opposite end portions each carrying, in threading engagement, a locking bar 534. Lower ends of the two locking bars 534 are coupled to a depression bar 535, which has a bottom that is of a recessed configuration corresponding to the raised top end of the stacked gate panels 3. A mount seat 54 is mounted to the ground at a location corresponding to the primary tube 51. The mount seat 54 forms in a central portion thereof a fitting hole 541, and the fitting hole 541 forms therein a barb 542. The mount seat 54 is selectively covered by a cover 543 positionable on a surface thereof. The cover 543 has a central portion from which a fitting block 544 extends downward. The fitting block 544 is receivable in the fitting hole 541 to properly position the cover 543 on the mount seat 54 and secured there by a threaded fastener 547. The cover 543 forms at one end thereof a lifting section 545, which corresponds in position to a cavity 546 formed in the mount seat 54 to allow for easy gripping for lifting and removing the cover 543. Further, the mount seat 54 may selectively receive

a joint frame 55 formed on a lower end of the primary tube 51 to fit therein for positioning and coupling. The joint frame 55 has a lower portion on which an engaging piece 551 is mounted. The engaging piece 551 is controlled by a depressible rod 553 that is biased by a spring 552 and received in the joint

5 frame 55 for rotary movement. The joint frame 55 is configured to fit into the fitting hole 541 of the mount seat 54 to allow the engaging piece 551 on the lower portion of the joint frame 55 to engage the barb 542 of the mount seat 54, thereby improving secured mounting of the primary tube 51. To remove the primary tube, a force is applied to a portion of the depressible rod

10 553 that exposed outside the joint frame 55 for depression to cause deformation of the spring 552 thereby allowing the engaging piece 551 to backward retract, making the engaging piece 551 disengaging from the barb 542, so that the primary tube 51 is released and may be removed from the mount seat 54. Further, a bracket tube seat 56 is provided and fixed on the

15 ground. The bracket tube seat 56 forms a triangular positioning trough 561, and an end of the bracket tube 52 forms a joint projection 521 corresponding to the positioning trough 561. By fitting the joint projection 521 into the triangular positioning trough 561, stable support of the back support assembly

5 can be realized. The joint projection 521 comprises a mount board 522

20 extending therefrom. The mount board 522 forms a screw hole 523, through

which a threaded fastener 524 is received. The bracket tube seat 56 forms a threaded hole 562 for engaging the threaded fastener 524. The bracket tube seat 56, when not in use, may be shielded by a cover 563. The cover 563 forms a fitting block 564 extending downward. The cover 563 has one end forming a fitting slot 565 and an opposite end forming a lifting section 566. The fitting slot 565 corresponds in position to a positioning block 567 formed on the bracket tube seat 56, and the lifting section 566 corresponds in position to a cavity 568 formed in the bracket tube seat 56. As such, when the cover 563 is positioned on and covers the positioning trough 561 and is secured by a threaded fastener 569, the fitting block 564 is received in the positioning trough 561 to ensure stable positioning of the cover 563 and eliminating potential noise.

Referring to FIG. 12, to use the back support assembly 5, the back support assembly 5 is first positioned and mounted, and then the depression unit 53 is set to a desired height through adjustment to have the depression bar 535 thereof positioned against the top end of the uppermost one of the gate panels 3. The locking bars 534 are then rotated to move the depression bar 535 downward, thereby more tightly depress the stacked gate panels 3 toward each other and making the lowermost gate panel 3 tightly engaging the base 35 that are mounted on the ground, so as to ensure effective watertightness of

the water barrier formed by the plurality of stacked gate panels 3 and eliminating any potential risk of water invasion and penetration. Further, since the back support assembly 5 is positioned against the inner surface of the gate panels 3, an improved support to the gate panels 3 is made, and resistance the gate panels 3 in a lateral direction is raised to support large pressures and impact of a floating object and protect the water barrier from collapsing. As shown in FIG. 13, in addition to the primary tube 51, the back support assembly 5 may be provided with a secondary bracket tube 52a. The arrangement of the secondary bracket tube 52a helps improving the supporting force provided by the back support assembly 5.

Referring to FIG. 14, the back support assembly 5 may be alternatively embodied by replacing the bracket tube 52 with a steel cable 57. The steel cable 57 has an end fixed to an upper end of the primary tube 51 and an opposite end provided with a steel cable adjustment knob 571. The steel cable adjustment knob 571 can be fastened to the ground at a location outside the gate panels 3. Through rotation of the steel cable adjustment knob 571, the tightness of the steel cable 57 can be adjusted. When flood induces a force acting on the gate panels 3, the steel cable 57 provides a counteracting force to protect the gate panels 3 from be flushed by the flood into the building.

Referring to FIG. 15, in an alternative form embodying the back support assembly 5 according to the present invention, an extension tube 58 is arranged above and telescopically received in the primary tube 51. The extension tube 58 has an upper end forming a protrusion 581, which is fit to and engages a positioning board 59 mounted to a ceiling F so as to improve the mounting strength of the back support assembly 5.

Referring to FIG. 16, in an alternative form embodying the flood protection device 1 according to the present invention, downward depression may be made on the gate panels 3 at two lateral ends of the uppermost gate panel 3, which is realized through an arrangement comprising a base seat 6 and a fastening member 7. The base seat 6 comprises a rectangular body, which is secured by threaded fasteners 61 to an upper end of the respective side post 2. The base seat 6 forms, in a central portion thereof, a rail channel 62, which is of a width sufficient to allow the gate panels 3 to pass therethrough. The rail channel 62 has two side walls each forming a slope 63 to facilitate insertion and passage of the gate panels 3. A shielding plate 64 is formed above each slope 63 and the shielding plate 64 forms in an underside of a front portion thereof an upward concave positioning trough 65. The fastening member 7 is rotatably coupled to a depression plate 72 that is located under a base plate 71. The base plate 71 has a front, raised tip, which is

coupled to an adjustment bolt 73 through threading engagement. The raised front tip of the base plate 71 is provided with a nut 711 fixed thereto. A locking plate 712 extends a front side of the nut 711 and forms a hole. The depression plate 72 is rotatably coupled by a pivot pin 721 to a frame 713
5 formed on the bottom of the base plate 71. The frame 713 has two side extensions each forming a wing plate 714. The wing plate 714 forms a raised rim 715 at a front end thereof. The depression plate 72 forms, in a front end thereof, an elongate slot 722 corresponding to the nut 711. The slot 722 has a configuration that is narrow in an upper side portion and wide in a
10 lower side portion. The adjustment bolt 73 has a shank 731 to which a ring 732 is circumferentially mounted. The ring 732 forms circumferentially spaced holes 7321. The shank 731 is in threading engagement and received through the nut 711. The shank 731 has a lower portion forming a diameter-reduced threaded rod 733. The threaded rod 733 is insertable
15 through the wide lower side portion of the slot 722 of the depression plate 72 to engage a nut 734 so as to prevent the adjustment bolt 73 from separating from the depression plate 72.

The base seat 6 is normally set on the upper end of the side post 2 in advance. When a flood occurs, the plurality of gate panels 3 is sequentially
20 stacked to form a water barrier, and then the fastening member 7 is installed

by having each wing plate 714 of the base plate 71 fit into the space between the slope 63 and the shielding plate 64 of the base seat 6 with the rim 715 received in and engaging the positioning trough 65 to thereby properly positioning the fastening member 7. Afterwards, the adjustment bolt 73 is

5 rotated to force the depression plate 72 downward, and the depression plate 72 then applies a depression force to the gate panels 3 located therebelow to thereby securely hold the gate panels 3 in tight engagement with each other and forming a closed water barrier, as shown in FIG. 17. The downward depression force is substantially proportional to the length of the shank of the

10 adjustment bolt 73. Thus, the length of the adjustment bolt 73 can be selected according to the width of the gate panels 3 to ensure watertightness of the water barrier. Further, since a locking plate 712 is provided in front of the nut 711 and the shank 731 of the adjustment bolt 73 is provided with a ring 732, and further since the locking plate 712 and the ring 732 form therein

15 holes 7321, a lock (not shown) may be used to secure them together for protection against theft or unauthorized removal.

Finally, referring to FIG. 18, when the building entrance is of a great width, the flood protection device 1 may further comprise one or more center posts 4 to be installed at a midway location. The base seat 6 may be set on

20 an end of the center post 4 in advance in order to cooperate with a fastening

member 7 to depress the gate panels 3 downward for improving the flood protection performance of the gate panels 3.

It will be understood that each of the elements described above, or two or more together may also find a useful application in other types of methods
5 differing from the type described above.

While certain novel features of this invention have been shown and described and are pointed out in the annexed claim, it is not intended to be limited to the details above, since it will be understood that various omissions, modifications, substitutions and changes in the forms and details of the device
10 illustrated and in its operation can be made by those skilled in the art without departing in any way from the spirit of the present invention.

I CLAIM:

1. A flood protection device for building, the flood protection device comprising at least:

5 two posts, each of which has a side surface forming a coupling slot, the coupling slot receiving therein a waterproof strip and a retention member, each of the side posts having an inner surface forming a plurality of threaded holes extending to and communicating the coupling slot, each of the threaded holes receiving a locking bar therein in threading engagement therewith, and

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a plurality of gate panels, which are fit in the coupling slot of each of the side posts and located between the waterproof strip and the retention member, each of the gate panels having a top forming a raised joint projection and a bottom forming a recess;

15 whereby the plurality of gate panels is stackable between the two side posts in such a way that the joint projections and the recesses of the gate panels are of mating engagement with each other to form a water barrier of a desired height, the locking bars being rotatable to force the retention member to depress the gate panels for establishing tight engagement of each of the gate panels

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with the waterproof strip, so as to ensure watertightness between the gate panels and the side posts.

2. The flood protection device according to claim 1, wherein the waterproof strip between the side posts and the gate panels forms
5 sawtooth like water securing lines.
3. The flood protection device according to claim 1, wherein the gate panels comprise two waterproof pads mounted to opposite sides of the recess thereof.
4. The flood protection device according to claim 1, wherein the gate
10 panels comprise a waterproof strip fit to the recess formed in the bottom thereof.
5. The flood protection device according to claim 4, wherein the waterproof strip that is fit to the bottom recess of the gate panels forms sawtooth like water securing lines.
- 15 6. The flood protection device according to claim 1, wherein the side post has an opposite side surface forming a fitting slot, the fitting slot being coupleable with a mounting bar, the mounting bar being fixed to a wall of the building.

7. The flood protection device according to claim 1, wherein a waterproof pad is set between the mounting bar and the building wall.
8. The flood protection device according to claim 7, wherein the waterproof pad between the mounting bar and the building wall is formed of silica gel.
9. The flood protection device according to claim 1 further comprising at least one center post arranged between the two side posts.
10. The flood protection device according to claim 9 further comprising a mount board adopted to be mounted to ground at a location corresponding to the center post, the mount board comprising a positioning mechanism arranged at a central portion thereof, the center post having a coupling base of which an underside forms a positioning block, which corresponds in position to and is located above a movable plate of the positioning mechanism, whereby when the center post is positioned above the mount board and moved downward, the positioning block depresses the movable plate downward to realize positioning.

11. The flood protection device according to claim 1, wherein the positioning mechanism comprises an elastic element and the movable plate.
12. The flood protection device according to claim 1 further comprising
5 a back support assembly arranged at an inner side the gate panels.
13. The flood protection device according to claim 11, wherein the back support assembly comprises a primary tube and a bracket tube, the primary tube comprising a fastening element, and a mount seat adapted to mount to ground at a location corresponding to the
10 primary tube, the mount seat receiving therein a positioning piece mounted to a lower end of the primary tube for positioning, a bracket tube seat being adapted to mount to ground and forming a positioning trough, the bracket tube having an end forming a joint projection corresponding to the positioning trough.
14. The flood protection device according to claim 13, wherein the
15 positioning trough is triangular.
15. The flood protection device according to claim 13, wherein the mount seat is coverable by a cover positionable thereon.
16. The flood protection device according to claim 13, wherein the
20 bracket tube seat comprises a cover positionable thereon.

17. The flood protection device according to claim 1, wherein each of the two side posts has an upper end to which a base seat is mounted for cooperating a fastening member to downward depress the gate panels.
- 5 18. The flood protection device according to claim 17, wherein the base seat forms a rail channel through which the gate panels are movable, the rail channel having two side walls each forming a slope, a shielding plate being formed above each of the slopes, the shielding plate forming in an underside of a front portion thereof an upward
- 10 concave positioning trough, the fastening member comprising a base plate, the base plate having a bottom forming a frame, the frame having two side extensions each forming a wing plate, the wing plates being receivable between the slopes and the shielding plates of the base seat, a depression plate being arranged below the
- 15 base plate and forming a slot, the base plate having a front raised tip coupled to an adjustment bolt through threading engagement, the adjustment bolt having a shank having a lower portion forming a diameter-reduced threaded rod, the threaded rod being insertable through the slot of the depression plate and threadingly engageable
- 20 with a nut, whereby rotating the adjustment bolt causes the

depression plate to apply a depression force to the gate panels to have the gate panels tightly engaging each other.

- 5 19. The flood protection device according to claim 18, wherein the raised front tip of the base plate is coupled to a nut, the nut comprising a locking plate fixed thereto, the shank of the adjustment bolt comprising a ring that forms holes mounted thereto, so that a lock is applicable for security purposes.
- 10 20. The flood protection device according to claim 1, wherein each of the gate panels has two sides each receiving a covering member fit thereto for sealing.
- 15 21. The flood protection device according to claim 1 further comprising a base that has a flat surface, the base being adapt to mount to ground of a building entrance at a location corresponding to a lowermost one of the gate panels.