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- (71) Applicant (for all designated States except US): **OTIS ELEVATOR COMPANY** [US/US]; Ten Farm Springs, Farmington, CT 06032-2568 (US).
- (72) Inventors; and
- (75) Inventors/Applicants (for US only): **DELACHATRE, Etienne** [FR/FR]; 55, route de Sully sur Loire, F-45730 Saint Benoît (FR). **MANZANAS, Juan, Antonio, Quiles** [ES/ES]; Plaza Castelao 6-2-B, E-28523 Rivasvacía Madrid (ES). **JIMENEZ-GONZALEZ, Agustin** [ES/ES]; Av Alcade Jose Aranda 23, 4A Alcoron, E-28923 Madrid

(ES). **URQUIJO, Antonio de Miguel** [ES/ES]; C/Comuneros de Castilla 6, E-28019 Madrid (ES).

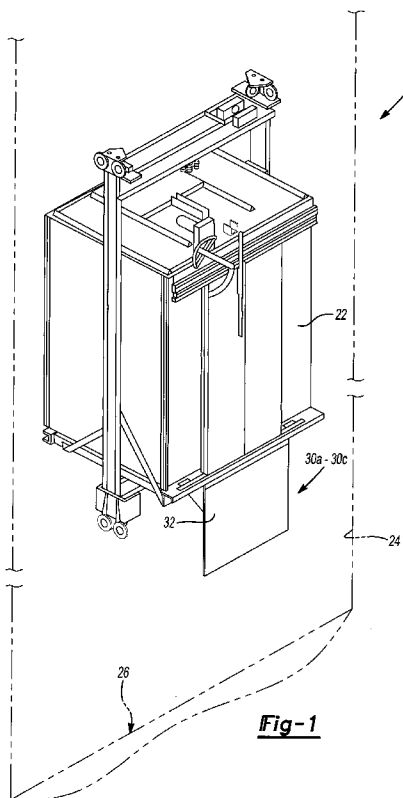
(74) Agents: **COUSIN, Geoffrey** et al.; Cabinet Plasseraud, 52 rue de la Victoire, 75440 Paris Cedex 09 (FR).

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(54) Title: TOE GUARD ASSEMBLY FOR AN ELEVATOR SYSTEM



(57) Abstract: An exemplary elevator assembly includes an elevator car having a frame member. At least one toe guard panel is moveable between a first position and a second position. In the first position the toe guard panel is situated to provide a vertical surface beneath the elevator car and the toe guard panel has an end spaced a first distance from the elevator car. In the second position the toe guard panel is situated with a second, shorter distance between the end and the elevator car. A moving mechanism coupled with the toe guard panel selectively moves the toe guard panel from the first position into the second position. An instigator member situated in a selected vertical position interacts with the moving mechanism to begin movement of the toe guard panel from the first position when the frame member of the elevator car is approximately at the selected vertical position.



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TOE GUARD ASSEMBLY FOR AN ELEVATOR SYSTEM

BACKGROUND

5 **[0001]** Elevator cars typically include a toe guard situated beneath the elevator car. The toe guard is typically rigid and up to two meters in length. A significant amount of clearance beneath the elevator car is therefore required to avoid bumping the toe guard against the bottom of the shaft when the elevator car is situated at a lowest landing.

10 **[0002]** Elevator systems have included a pit at the bottom of the hoistway, in part, to provide sufficient clearance between the bottom of the elevator car and the bottom of the hoistway. Typical pit configurations provide a sufficient clearance for typical toe guards. More recently, however, elevator pits have been eliminated or reduced in size. Conventional toe guards do not allow for elevator cars in such systems to travel as low as necessary.

15 **[0003]** One suggestion for addressing such a situation is shown in United States Patent No. 6,095,288. That document includes a toe guard panel that is moveable from a position where the toe guard extends vertically downward from the elevator car into a position where the toe guard is tucked beneath the elevator car in a nearly horizontal orientation.

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SUMMARY

25 **[0004]** An exemplary elevator assembly includes a hoistway having a bottom surface and an elevator car, which is configured to move in the hoistway and which has a frame member. At least one toe guard panel is moveable between a first position and a second position. In the first position the toe guard panel is situated to provide a vertical surface beneath the elevator car and the toe guard panel has an end spaced a first distance from the elevator car. In the second position the toe guard panel is situated with a second, shorter distance between the end and the elevator car. A moving mechanism coupled with the toe guard panel selectively moves the toe guard panel from the first position into the second position. An instigator member, which is situated in a selected vertical position above the hoistway bottom, interacts with the moving mechanism to begin movement of the toe guard panel from the first

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position when the frame member of the elevator car is approximately at the selected vertical position.

[0005] In one example embodiment that includes the elements of the foregoing elevator assembly, the moving mechanism may comprise a cable that pulls
5 the toe guard panel toward the second position responsive to interaction with the instigator member.

[0006] In another example embodiment that includes the elements of any of the foregoing elevator assembly embodiments, the moving mechanism may comprise a hook near one end of the cable and the instigator member may comprise a catch
10 member that catches the hook as the elevator car frame member descends toward the selected vertical position. The hook may remain on the catch member as the elevator car frame member descends beneath the selected vertical position such that the cable continues to pull the toe guard panel away from the first position.

[0007] In another example embodiment that includes the elements of any of
15 the foregoing elevator assembly embodiments, the cable may be connected to the toe guard panel near an opposite end of the cable.

[0008] In another example embodiment that includes the elements of any of the foregoing elevator assembly embodiments, the moving mechanism may comprise a plurality of wheels supported beneath the elevator car and the cable may at least
20 partially wrap around the wheels.

[0009] In another example embodiment that includes the elements of any of the foregoing elevator assembly embodiments, the moving mechanism may comprise a hinge having a first arm between the elevator car and a pivot. A second arm may be between the pivot and the toe guard panel. The cable may urge the pivot in a
25 direction corresponding to the toe guard panel moving from the first position toward the second position.

[00010] In another example embodiment that includes the elements of any of the foregoing elevator assembly embodiments, the hinge may include a limit feature that limits an amount of movement of the toe guard panel away from the second
30 position to ensure a desired vertical orientation of the toe guard panel.

[00011] In another example embodiment that includes the elements of any of the foregoing elevator assembly embodiments, the moving mechanism may comprise a lever having a first end connected to the toe guard panel and a follower member near a second, opposite end of the lever. The instigator may comprise a cam that

guides the follower to cause the lever to move in a direction to urge the toe guard panel out of the first position. The cam may contact the follower at least when the frame member of the elevator car is at approximately the selected vertical position.

5 **[00012]** In another example embodiment that includes the elements of any of the foregoing elevator assembly embodiments, the follower may comprise a roller and the cam may comprise a surface at an oblique angle relative to a direction of movement of the elevator car.

10 **[00013]** In another example embodiment that includes the elements of any of the foregoing elevator assembly embodiments, the follower may have a first portion that contacts the cam and a second portion that is received in a groove on the elevator car frame. The groove may establish a path of movement for the follower corresponding to movement of the toe guard panel between the first and second positions.

15 **[00014]** In another example embodiment that includes the elements of any of the foregoing elevator assembly embodiments, one end of the groove may include a detent that the second portion of the follower is received against for preventing movement of the lever and for maintaining the toe guard panel in the first position. The instigator may cause the follower to be separated from the detent as the elevator car frame member descends to approximately the selected vertical position.

20 **[00015]** In another example embodiment that includes the elements of any of the foregoing elevator assembly embodiments, the cam may comprise a surface that the follower follows as the elevator car frame member moves downward from the selected vertical position.

25 **[00016]** In another example embodiment that includes the elements of any of the foregoing elevator assembly embodiments, the moving mechanism may comprise a first roller and the instigator may comprise a first cam at the selected vertical position. The first roller may contact the first cam as the frame member of the elevator car approaches the selected vertical position.

30 **[00017]** In another example embodiment that includes the elements of any of the foregoing elevator assembly embodiments, the first roller may be near one end of the toe guard panel and the moving mechanism may comprise a second roller closer to another end of the toe guard panel. A second cam may interact with the second roller to urge the toe guard panel further toward the second position.

[00018] In another example embodiment that includes the elements of any of the foregoing elevator assembly embodiments, the second cam may be positioned vertically beneath the first cam and the second cam may be near a lowest possible position of the elevator car frame member.

5 **[00019]** In another example embodiment that includes the elements of any of the foregoing elevator assembly embodiments, the assembly may also include a third roller and a third cam. The second cam may have a surface that urges the second roller in a first direction as the elevator car frame member descends beneath the selected vertical position. The third cam may have a surface that urges the third roller
10 in a second direction that is generally opposite to the first direction.

[00020] In another example embodiment that includes the elements of any of the foregoing elevator assembly embodiments, the toe guard panel may comprise at least two panels that are foldable into the second position. The second roller and the second cam may urge one of the panels to move relative to another of the panels for
15 moving into the second position.

[00021] In another example embodiment that includes the elements of any of the foregoing elevator assembly embodiments, a locking member may maintain the toe guard panel in the first position. The first cam may cause movement of the first roller to unlock the locking member to allow the toe guard panel to begin to move
20 from the first position toward the second position.

[00022] In another example embodiment that includes the elements of any of the foregoing elevator assembly embodiments, the locking member may comprise a latch. Movement of the first roller along the first cam may cause rotation of the latch.

[00023] In another example embodiment that includes the elements of any of
25 the foregoing elevator assembly embodiments, a bracket may be configured to position the instigator in the selected vertical position and may be configured to be connected with a guide rail for establishing a desired horizontal position of the instigator member relative to a path of movement of the elevator car.

[00024] The various features and advantages of disclosed example
30 embodiments will become apparent to those skilled in the art from the following detailed description. The drawings that accompany the detailed description can be briefly described as follows.

BRIEF DESCRIPTION OF THE DRAWINGS

[00025] Figure 1 schematically illustrates selected portions of an example elevator system including a toe guard assembly designed according to various embodiments of this invention.

5 **[00026]** Figure 2 schematically illustrates an example toe guard assembly with a toe guard panel in a first position.

[00027] Figure 3 schematically illustrates the example of Figure 2 in another orientation.

10 **[00028]** Figure 4 schematically illustrates the example of Figure 2 with the toe guard panel in a second position.

[00029] Figure 5 schematically illustrates another example toe guard assembly with a toe guard panel in a first position.

[00030] Figure 6 schematically illustrates the example of Figure 5 in another orientation.

15 **[00031]** Figure 7 schematically illustrates the example of Figure 5 with a toe guard panel in a second position

[00032] Figure 8 schematically illustrates another example toe guard assembly with a toe guard panel in a first position.

20 **[00033]** Figure 9 schematically illustrates selected features of the example of Figure 8.

[00034] Figure 10 schematically illustrates the example of Figure 8 in another orientation.

[00035] Figure 11 schematically illustrates the example of Figure 8 with the toe guard panel in a second position.

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DETAILED DESCRIPTION

[00036] Figure 1 schematically shows selected portions of an elevator system 20. Only selected portions are illustrated. Those skilled in the art will realize that many other components are included in an elevator system. Such components are omitted from the illustration and this discussion for the sake of brevity and because 30 those skilled in the art are already aware of such components.

[00037] An elevator car 22 is moveable within a hoistway 24. A surface 26 near the bottom of the hoistway 24 may be the floor of the pit or a bottom hoistway surface in examples that do not include a pit at the bottom of the hoistway 24.

[00038] A toe guard assembly 30A, 30B, 30C is provided on the elevator car 22 to cover a space between a bottom of the elevator car 22 and a nearby landing in the unlikely event that a hoistway door (not illustrated) is open and the car 22 is not aligned with the landing. The presence of the toe guard assembly 30A, 30B, 30C has an impact on how low the elevator car 22 can descend. Each example toe guard assembly 30A, 30B, 30C is moveable from the first position shown in Figure 1 into a second position (shown in Figures 4, 7 and 11) that allows the elevator car 22 to descend closer to the surface 26 than it otherwise would be able to if the toe guard assembly 30A, 30B, 30C remained in the first position shown in Figure 1.

[00039] Figure 2 illustrates one example toe guard assembly 30A. This example includes a toe guard panel 32 shown in a first position in Figure 2. In this example, the first position includes the toe guard panel 32 being in a vertical position and extending downward beneath the elevator car. In this example, an elevator car frame member 34 corresponds to a plank or floor of the elevator car. The toe guard panel 32 is oriented perpendicular to the frame member 34 in the first position shown in Figure 2.

[00040] The example of Figure 2 includes a stationary toe guard portion 36, which remains in a fixed position relative to the frame member 34 and which may, for example, be part of a conventional door sill. The toe guard panel 32 is moveable between the first position shown in Figure 2 and a second position shown in Figure 4. In this example, the toe guard panel 32 is supported by a pivotal mounting 38 so that it is moveable relative to the stationary toe guard portion 36. The example of Figure 2 includes a moving mechanism 40 for moving the toe guard panel 32 from the first position to the second position.

[00041] The moving mechanism 40 includes a cable 42 connected with the toe guard panel 32 near a first end 44 of the cable 42. A hook 46 is connected with the cable 42 near an opposite end of the cable 42. A hook positioner 48 holds the hook 46 in a desired position relative to the elevator car frame member 34 when the panel 32 is in the first position.

[00042] The cable 42 extending between the connection with the toe guard panel 32 at 44 and the hook 46 follows a path that includes at least partially wrapping around wheels 50 and 52 that are supported on the elevator car. The cable 42 also is received against a pivot 54, which is part of a hinge 56 associated with the toe guard panel 32. In this example, the hinge 56 has a first arm 58 extending between the

elevator car frame member 34 and the pivot 54. A second arm 60 extends between the pivot 54 and the toe guard panel 32. The hinge 56 facilitates movement of the toe guard panel 32 about the pivotal mounting 38.

[00043] In this example, the hinge 56 includes a limit feature 62 that limits an amount of movement of the toe guard panel 32 to ensure a desired vertical orientation of the toe guard panel 32. In this example, the limit feature 62 is a portion of the arm 58 received against the arm 60 when the toe guard panel 32 is in the first position. The presence of the cable 42 received against the pivot 54 and the limit feature 62 cooperates to maintain the toe guard panel 32 in the first position in a suitably stable manner to provide a desired toe guard function during elevator system operation.

[00044] An instigator member 64 is situated at a selected vertical position along the hoistway 24. The instigator member 64 causes the moving mechanism 40 to move the toe guard panel 32 from the first position (shown in Figure 2) toward the second position (shown in Figure 4). In this example, the instigator member 64 comprises a catch that engages the hook 46 for pulling on the cable 42 as the car frame member 34 descends below the vertical position of the instigator member 64. As can be appreciated from Figure 3, the frame member 34 has descended below the vertical position of the instigator member 64. This causes relative, upward movement between the hook 46 and the hook positioner 48 because the hook 46 remains at the vertical position of the instigator member 64. Because the cable 42 has a fixed length, the toe guard panel 32 is urged out of the first position and pivots about the pivot mount 38 toward the second position as the frame member 34 continues to descend.

[00045] In addition to the cable pulling on the toe guard panel 32, the cable 42 in this example urges the pivot 54 toward the toe guard panel at the beginning of the movement of the toe guard panel 32 out of the first position. Figure 3 shows an intermediate point where the toe guard panel 32 is between the first position and the example second position of Figure 4.

[00046] Figure 4 shows the frame member 34 in a lowest possible position relative to the lower surface 26 of the pit at the bottom of the hoistway 24. At this point, the cable 42 has pulled the toe guard panel 32 all the way into the example second position, which includes the toe guard panel 32 being generally parallel to a floor of the elevator car. In this example, the lowest position of the frame member 34 corresponds to the floor of the elevator car being aligned with a surface of the lowest landing 68 that is serviced by the elevator car along the hoistway 24. As can be

appreciated from comparing Figures 2 and 4, if the toe guard panel 32 remained in the first position, it would be impossible for the frame member 34 to descend low enough for the floor of the elevator car to arrive at the lowest landing 68. This is because of the limited depth of the pit at the bottom of the hoistway 24. With the toe guard panel 32 moved into the second position, however, the desired elevator service to the lowest landing 68 becomes possible.

[00047] As the frame member 34 ascends through the hoistway 24 and approaches the instigator member 64, the hook positioner 48 removes the hook 46 from the catch so that the components of the moving mechanism 40 are once again in the configuration shown schematically in Figure 2. The weight of the toe guard panel 32 tends to urge it into the first position as the elevator car ascends from the lowest position shown in Figure 4. In some examples, the hinge 56 is spring loaded so that it is biased into the position shown in Figure 2, which facilitates returning the toe guard panel 32 to the first position from the second position.

[00048] Figures 5-7 schematically illustrate another example toe guard assembly 30B. In this example, the toe guard panel 32 includes a single moveable panel that pivots about a pivot mount 38 between a first position shown in Figure 5 and a second position shown in Figure 7. A moving mechanism 70 in this example includes a lever 72 that is connected with the toe guard panel 32 at 74 near a first end of the lever 72. In this example, the connection at 74 allows for pivotal movement between the lever 72 and the toe guard panel 32.

[00049] The moving mechanism 70 includes a follower 76 near an opposite end 73 of the lever 72. The follower 76 interacts with an instigator member 78 for moving the toe guard panel 32 out of the first position (shown in Figure 5) as the elevator car descends toward the surface 26. The instigator member 78 includes a cam surface 80 at a selected vertical position where the follower 76, which comprises a roller in this example, contacts the cam surface 80 to begin moving the toe guard panel 32 out of the first position.

[00050] As the elevator car descends and the car frame member 34 approaches approximately the selected vertical position of the cam surface 80 on the instigator member 78, the follower 76 contacts the cam surface and follows along it as the elevator car continues to descend. This can be appreciated by comparing Figures 5, 6 and 7, each of which shows the elevator car descending progressively lower. The instigator member 78 in this example includes the cam surface 80 oriented at an

oblique angle relative to the direction of travel of the elevator car. Another surface 82 in this example is vertically oriented because of the length of the lever 72 in this example. In this example, the selected vertical position may be at or near a vertically highest portion of the cam surface 80. The follower 76 follows along the instigator member 78 from the point of contacting it near the selected vertical position to a lowest point shown in Figure 7 when the toe guard panel 32 reaches the fullest extent of the second position.

[00051] In this example, the toe guard panel 32 is oriented vertically in the first position shown in Figure 5 in which the toe guard panel 32 is generally perpendicular to a floor of the elevator car. In the second position shown in Figure 7, the toe guard panel 32 is horizontal and generally parallel to a floor of the elevator car. In the illustrated example, the frame member 34 has one side at approximately the horizontal position of the elevator car floor.

[00052] One feature of this example is that the follower 76 includes a roller portion that rides along the surfaces 80 and 82 of the instigator member 78. Another follower portion, which is received within a groove 86 (which in this example is associated with the frame member 34), connects the roller portion to the opposite end 73 of the lever 72. With this construction, the lever 72 and the roller portion of the follower 76 are provided on opposite sides of the car frame 34 whereas the connecting portion of the follower 76 extends through the car frame 32. The groove 86 guides movement of the follower relative to the frame member 34 as the follower 76 moves along the surfaces 80 and 82.

[00053] The example groove 86 includes a detent 88 (Figures 6 and 7) against which the follower 76 is received when the toe guard panel 32 is in the first position shown in Figure 5. In this example, the detent 88 includes a recess near one end of the groove 86 into which the connecting portion of the follower 76 is received whenever the follower 76 is not interacting with the instigator member 78. In this example, the groove 86 is oriented at an angle so that as gravity pulls down on the toe guard panel 32, the lever 72, and the follower 76, the connecting portion of the follower 76 will automatically be received into the recess against the detent 88. When in the first position shown in Figure 5, the engagement of the connecting portion of the follower 76 against the detent 88 biases the toe guard panel 32 from moving out of the first position. In this example, as the elevator car descends and the frame member 34 reaches the selected vertical height of the instigator member 78, the connecting

portion of the follower 76 is urged upward out of the recess away from the detent 88 and then along a remainder of the groove 86 as the elevator car continues to descend and the rolling portion of the follower 76 rolls along the surfaces 80 and 82 of the instigator 78.

5 **[00054]** As can be appreciated from the drawings, if the toe guard panel 32 remained in the first position, the car frame member 34 would be unable to descend low enough to be at approximately the level of the surface of the lowest landing 68 because of the relatively shallow depth of the pit at the bottom of the hoistway 24. In other words, the distance from the lower surface 26 of the hoistway to the surface of
10 the lowest landing 68 is shorter than the vertical length of the toe guard panel 32 in the first position. The moving mechanism 70 and the moveable toe guard panel 32 allow for the elevator car 22 to descend low enough to enable the lowest landing 68 to be serviced by the car 22, for example.

[00055] Figures 8-11 show another example toe guard assembly 30C. In this
15 example, the toe guard panel 32C comprises a plurality of panel portions. A first panel portion 90 has a hinged connection 92 with a second panel portion 94. A plurality of stiffeners 96 are secured to the second panel portion 94 and they remain fixed relative to each other. The first panel portion 90 is moveable relative to the second panel portion 94.

20 **[00056]** Figure 8 shows the toe guard panel 32C in the first position in which the toe guard panel 32 is in a vertical position and generally perpendicular to the example frame member 34. The toe guard panel 32 is moveable from the first position shown in Figure 8 to the second position shown in Figure 11 when needed to allow the elevator car 22 to descend to the lowest landing 68 such that the distance
25 between the frame member 34 and the lower surface 26 is smaller than the vertical height of the toe guard panel 32C when it is in the first position.

[00057] A moving mechanism 100 facilitates moving the toe guard panel 32C between the first position (shown in Figure 8) and the second position (shown in Figure 11). In this example, the moving mechanism 100 includes a first roller 102, a
30 second roller 104 and a third roller 106. The second roller 104 and the third roller 106 are supported by brackets 108 that are secured to the first panel portion 90.

[00058] As the frame member 34 descends to approximately the vertical position of an instigator member 110, the moving mechanism 100 begins to move the toe guard panel 32 from the first position. In this example, the instigator member 110

includes a cam surface that the roller 102 engages as the frame member 34 descends to approximately the position of the instigator member 110.

[00059] In this example, the instigator member 110 is supported by a bracket member 112 that is associated with brackets 114, 116 and 118. The bracket members
5 112 and 118 can be secured to a guide rail 120 to maintain a desired position of the instigator member 110 relative to the lower surface 26 and the surface of the lowest landing 68, for example.

[00060] As can best be appreciated from Figure 9, the roller 102 is supported
10 on a lever bracket 130 near an edge of the stationary toe guard portion 36. The lever bracket 130 is associated with a rod 132 such that when the roller 102 engages the cam surface on the instigator member 110, the lever bracket 130 pivots and causes rotation of the rod 132. A plurality of latch locking members 134 are coupled with the rod 132. As the roller 102 engages the cam surface of the instigator member 110, the locking members 134 are rotated (generally counterclockwise according to Figure
15 9) so that the locking members 134 are released from posts 136 that are connected with the stiffeners 96. The locking members 134 maintain the toe guard panel 32 in the first position whenever they engage the posts 136. The instigator member 110 and the roller 102 cooperate to release the locking members 134 to allow the toe guard panel 32 to begin movement out of the first position.

[00061] As can be appreciated from Figure 8, the second roller 104 engages a
20 cam surface 140. In this example, the cam surface 140 urges the second roller 104 toward the landing surface side of the hoistway (to the left according to the drawing). This movement of the roller 104 tends to urge the lower end of the first panel portion 90 in one direction and causes the upper end of the first panel portion 90 near the
25 hinged connection 92 to move in an opposite direction. In the illustrated example, the lower end of the first panel portion 90 is urged to the left while the upper end of the first panel portion 90 is urged to the right (according to the drawing). This movement urges the toe guard panel 32 toward the second position.

[00062] As the elevator car and the frame member 34 continue to descend, the
30 second roller 104 eventually engages the surface 26 at the bottom of the hoistway. As can be appreciated from Figure 10, for example, the third roller 106 engages another cam surface 142. The position and orientation of the cam surface 142 causes the roller 106 to move in a direction that is opposite the direction that the cam surface 140 causes the second roller 104 to move, which occurs prior to the third roller 106

engaging the cam surface 142 in this example. The roller 106 movement along the cam surface 142 continues to urge the toe guard panel 32 toward the second position by facilitating further folding of the panel portions 90 and 94 relative to each other.

5 **[00063]** As the car frame member continues to descend from the position shown in Figure 10 to the position shown in Figure 11, the toe guard panel 32 continues to fold until the second position shown in Figure 11 is reached. In this example, the second position of the toe guard panel 32 corresponds to the frame member 34 being at a vertical position that aligns a floor of the elevator car with the surface of the lowest landing 68.

10 **[00064]** As the frame member 34 subsequently ascends to a higher vertical position, the weight of the toe guard panel assembly components tends to urge the toe guard panel 32 back into the first position.

[00065] Several example toe guard assemblies are shown that include a moving mechanism for facilitating movement of the toe guard panel from a first position
15 toward a second position to accommodate hoistway configurations that have a relatively shallow pit depth or no pit. Although various features are shown with each of the embodiments, they are not necessarily limited to only the embodiments that are shown. One or more features of one of the example embodiments may be incorporated with or combined with one or more features of another one of the
20 embodiments to meet the needs of a particular situation. Those skilled in the art who have the benefit of this description will realize which of the disclosed features will best suit their particular needs.

[00066] The preceding description is exemplary rather than limiting in nature. Variations and modifications to the disclosed examples may become apparent to those
25 skilled in the art that do not necessarily depart from the essence of this invention. The scope of legal protection given to this invention can only be determined by studying the following claims.

CLAIMS

We claim:

- 5 1. An elevator assembly, comprising:
a hoistway having a bottom surface;
an elevator car configured to move in the hoistway having a frame member;
at least one toe guard panel that is moveable between a first position and a
second position, in the first position the toe guard panel is situated to provide a
10 vertical surface beneath the elevator car and the toe guard panel has an end spaced a
first distance from the elevator car, in the second position the toe guard panel is
situated with a second, shorter distance between the end and the elevator car;
a moving mechanism coupled with the toe guard panel for selectively moving
the toe guard panel from the first position into the second position; and
15 an instigator member situated in a selected vertical position above the
hoistway bottom surface to interact with the moving mechanism to begin movement
of the toe guard panel from the first position when the frame member of the elevator
car is approximately at the selected vertical position.
- 20 2. The assembly of claim 1, wherein the moving mechanism comprises a cable
that pulls the toe guard panel toward the second position responsive to interaction
with the instigator member.
3. The assembly of claim 2, wherein the moving mechanism comprises a hook
25 near one end of the cable and the instigator member comprises a catch member that
catches the hook as the elevator car frame member descends toward the selected
vertical position, the hook remaining on the catch member as the elevator car frame
member descends beneath the selected vertical position such that the cable continues
to pull the toe guard panel away from the first position as the elevator car frame
30 member descends beneath the selected vertical position.
4. The assembly of claim 3, wherein the cable is connected to the toe guard panel
near an opposite end of the cable.

5. The assembly of claim 3, wherein the moving mechanism comprises a plurality of wheels supported beneath the elevator car and the cable at least partially wraps around the wheels.

5 6. The assembly of claim 3, wherein the moving mechanism comprises a hinge having a first arm between the elevator car and a pivot and a second arm between the pivot and the toe guard panel, the cable urging the pivot in a direction corresponding to the toe guard panel moving from the first position toward the second position.

10 7. The assembly of claim 6, wherein the hinge includes a limit feature that limits an amount of movement of the toe guard panel away from the second position to ensure a desired vertical orientation of the toe guard panel.

8. The assembly of claim 1, wherein
15 the moving mechanism comprises a lever having a first end connected to the toe guard panel and a follower member near a second, opposite end of the lever; and the instigator comprises a cam that guides the follower to cause the lever to move in a direction to urge the toe guard panel out of the first position, the cam contacting the follower at least when the frame member of the elevator car is at
20 approximately the selected vertical position.

9. The assembly of claim 8, wherein the follower comprises a roller and the cam comprises a surface at an oblique angle relative to a direction of movement of the elevator car.

25 10. The assembly of claim 8, wherein the follower has a first portion that contacts the cam and a second portion that is received in a groove on the elevator car frame, the groove establishing a path of movement for the follower corresponding to movement of the toe guard panel between the first and second positions.

30 11. The assembly of claim 10, wherein one end of the groove includes a detent that the second portion of the follower is received against for preventing movement of the lever and maintaining the toe guard panel in the first position, the instigator

causing the follower to be separated from the detent as the elevator car frame member descends to approximately the selected vertical position.

12. The assembly of claim 8, wherein the cam comprises a surface that the
5 follower follows as the elevator car frame member moves downward from the selected vertical position.

13. The assembly of claim 1, wherein the moving mechanism comprises a first
10 roller and the instigator comprises a first cam at the selected vertical position, the first roller contacting the first cam as the frame member of the elevator car approaches the selected vertical position.

14. The assembly of claim 13, wherein the first roller is near one end of the toe
15 guard panel and the moving mechanism comprises a second roller closer to another end of the toe guard panel, the assembly comprising a second cam that interacts with the second roller to urge the toe guard panel toward the second position.

15. The system of claim 14, wherein the second cam is positioned vertically
20 beneath the first cam and the second cam is near a lowest possible position of the elevator car frame member.

16. The system of claim 14, comprising a third roller and a third cam, the second
25 cam having a surface that urges the second roller in a first direction as the elevator car frame member descends beneath the selected vertical position, the third cam having a surface that urges the third roller in a second direction that is generally opposite to the first direction.

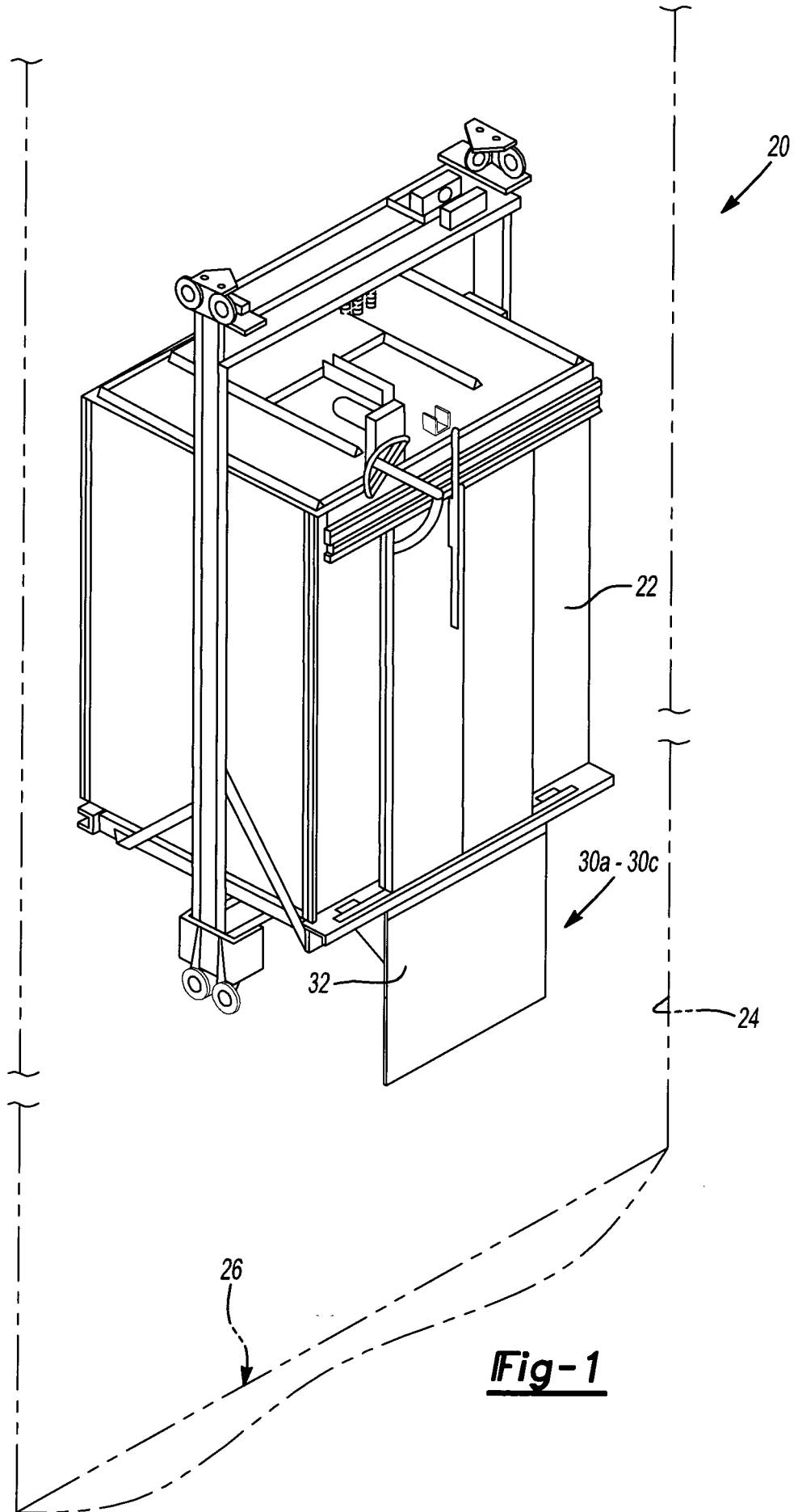
17. The system of claim 14, wherein the toe guard panel comprises at least two
30 panels that are foldable into the second position and wherein the second roller and the second cam urge one of the panels to move relative to another of the panels for moving into the second position.

18. The system of claim 13, comprising a locking member that maintains the toe guard panel in the first position and wherein the first cam causes movement of the first roller to unlock the locking member to allow the toe guard panel to begin to move from the first position toward the second position.

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19. The system of claim 18, wherein the locking member comprises a latch and movement of the first roller along the first cam causes rotation of the latch.

20. The system of claim 1, comprising a bracket configured to position the instigator in the selected vertical position, the bracket being configured to be
10 connected with a guide rail for establishing a desired horizontal position of the instigator member relative to a path of movement of the elevator car.



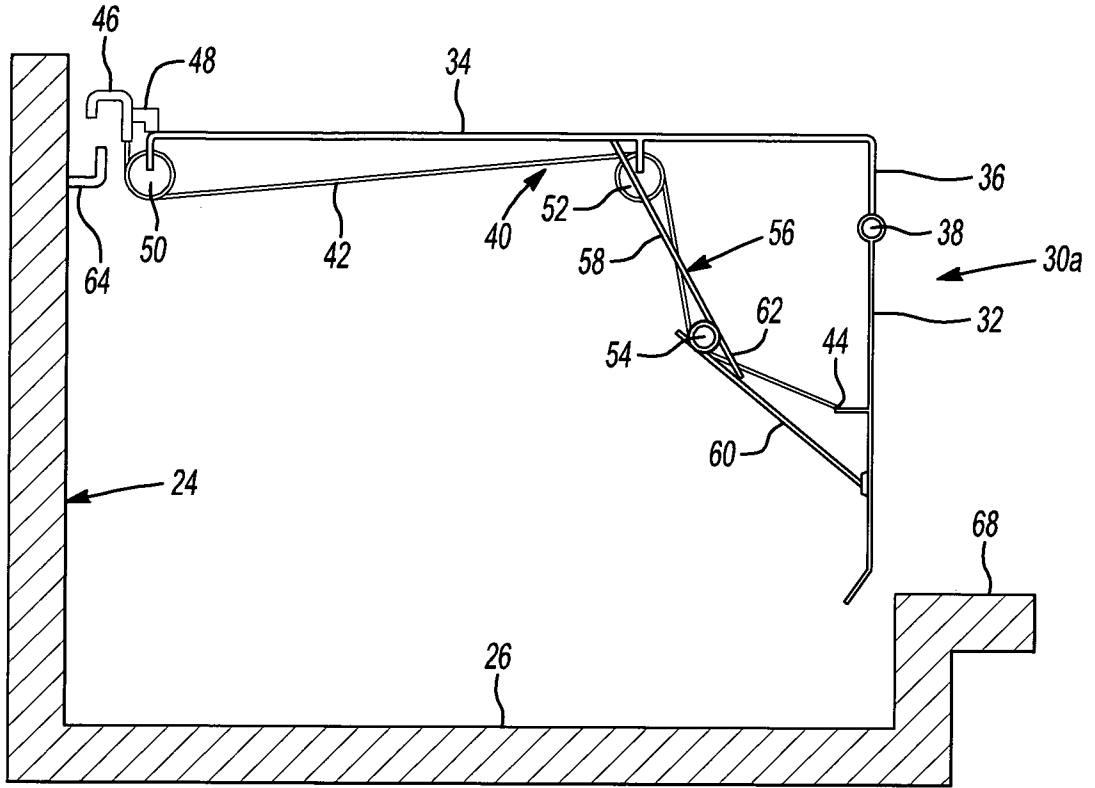


Fig-2

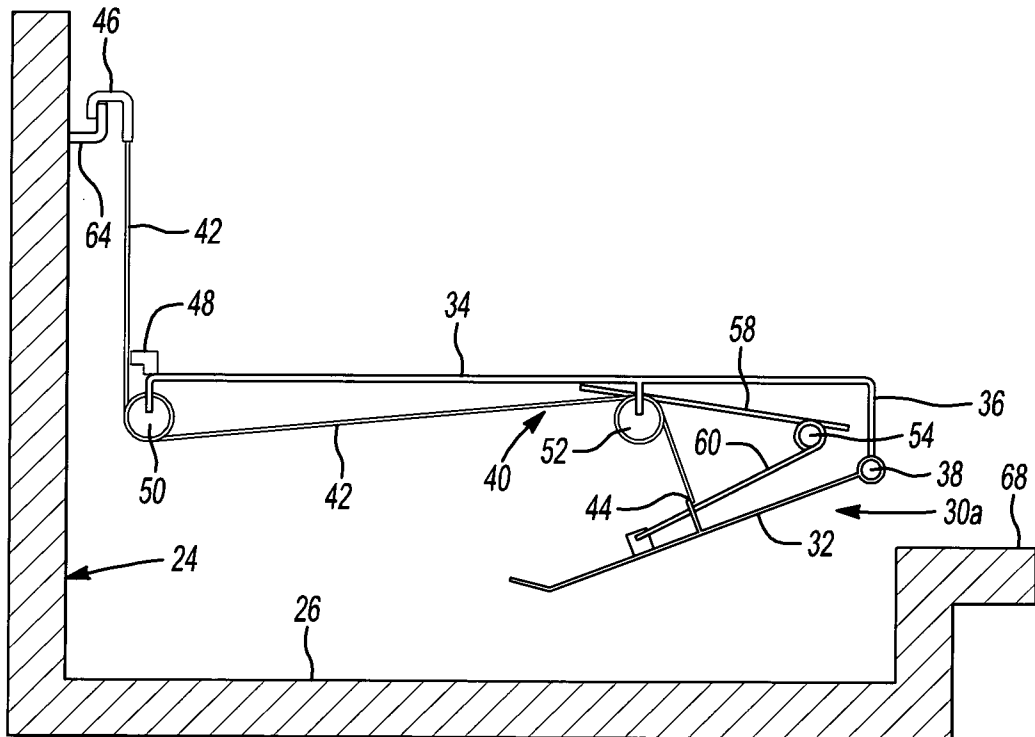


Fig-3

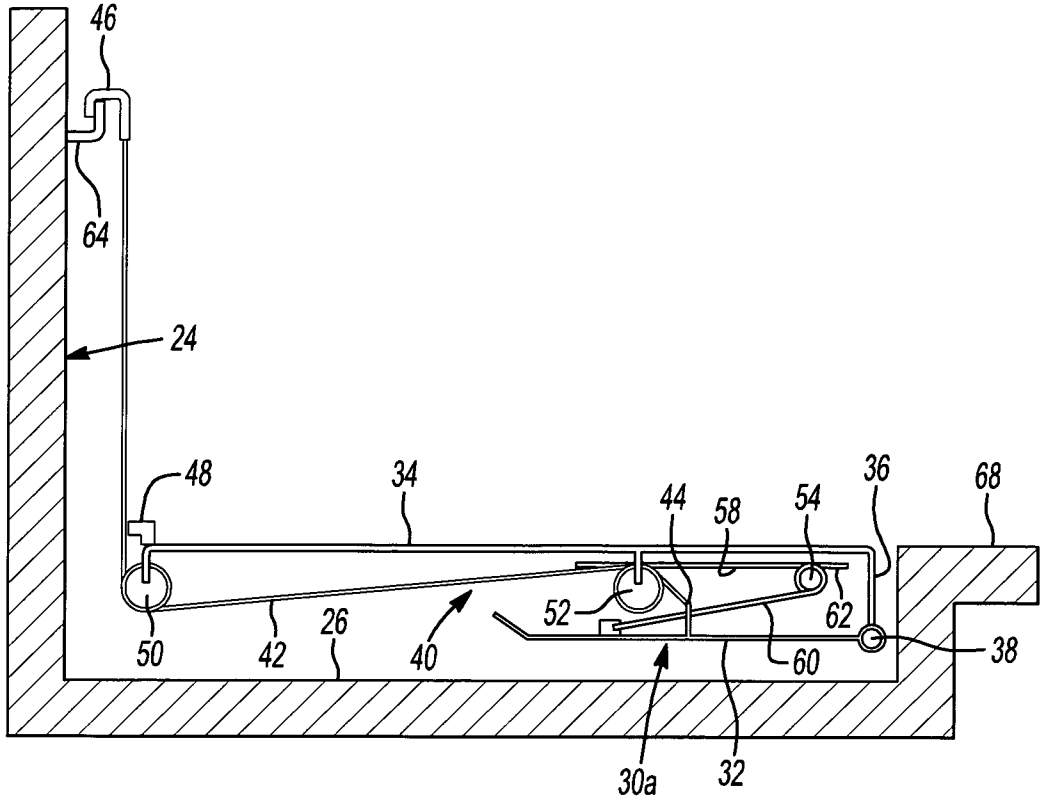


Fig-4

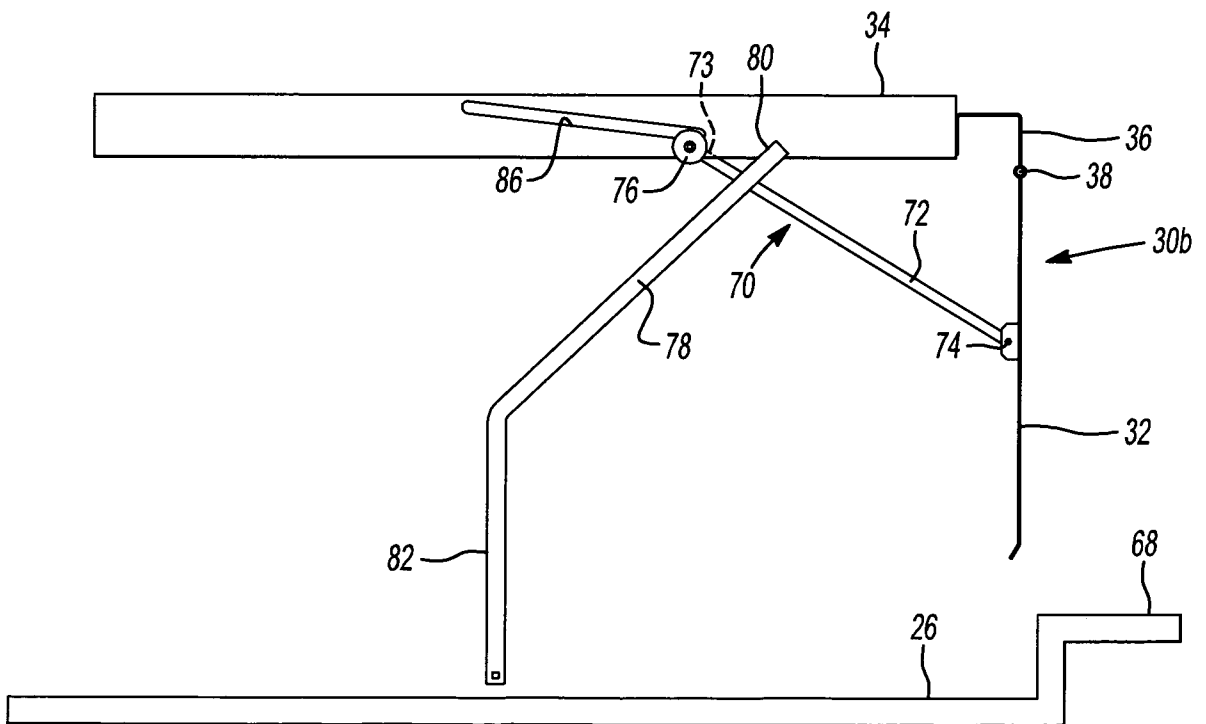
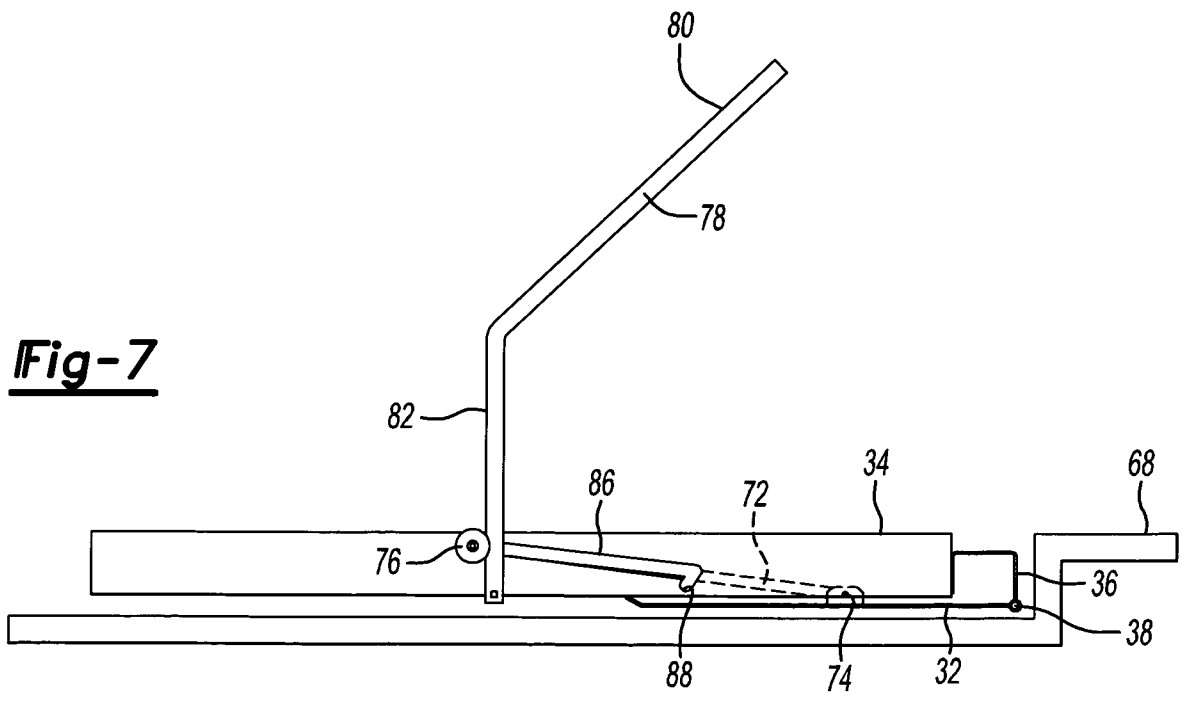
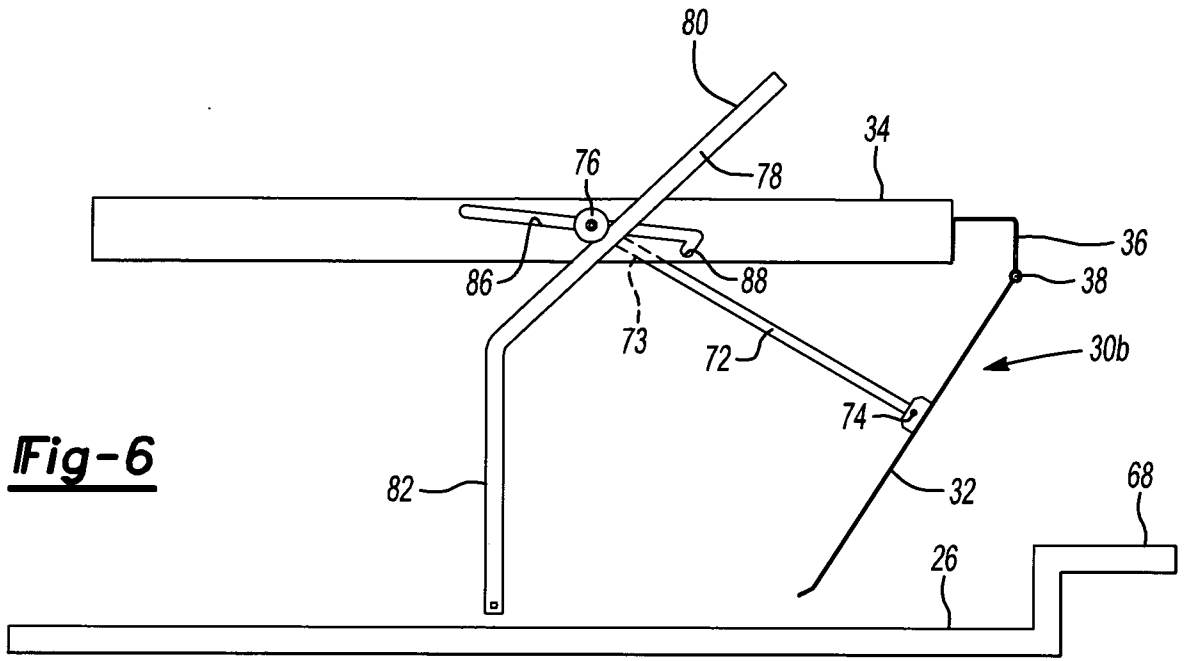


Fig-5



A. CLASSIFICATION OF SUBJECT MATTER***B66B 5/28(2006.01)i, B66B 11/02(2006.01)i***

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B66B 5/28; B66B 13/28; B66B 11/02; B66B 11/04

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean utility models and applications for utility models

Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS(KIPO internal) & Keywords:elevator, car, toe, guard, panel, hoistway

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 1524234 A1 (LM LIFTMATERIAL GMBH) 20 April 2005 See abstract, claims, figure 1-5	1-20
A	US 04457403A A (MICHAEL D.REAM) 03 July 1984 See abstract, claims, figure 1-6	1-20
A	WO 2008-074911 A1 (KONE CORPORATION) 26 June 2008 See abstract, claims, figure 1-10	1-20
A	JP 2008-063145 A (INVENTIO AKTIENGESELLSCHAFT) 21 March 2008 See abstract, claims, figure 1-2	1-20

 Further documents are listed in the continuation of Box C. See patent family annex.

* Special categories of cited documents:

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"&" document member of the same patent family

Date of the actual completion of the international search

22 DECEMBER 2011 (22.12.2011)

Date of mailing of the international search report

05 JANUARY 2012 (05.01.2012)

Name and mailing address of the ISA/KR

Korean Intellectual Property Office
Government Complex-Daejeon, 189 Cheongsu-ro,
Seo-gu, Daejeon 302-701, Republic of Korea

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Authorized officer

CHUNG, Sung Chan

Telephone No. 82-42-481-5980



INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

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