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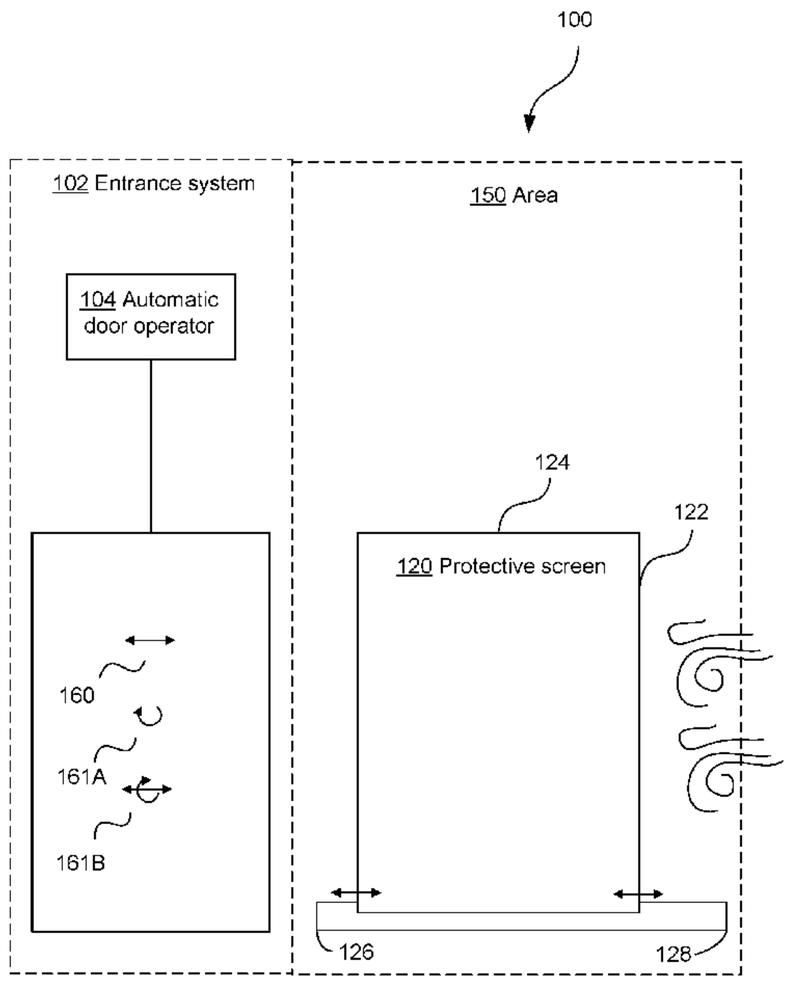


Figure 1

(57) Abstract: A protection arrangement (100) for protecting parts of an entrance system (102) is disclosed herein. The entrance system (102) having movable door members (162-167) arranged to be movable between a closed position and an open position, and the protection arrangement (100) comprises a protective screen (120) having both a vertical (122) and a horizontal (124) extension, wherein the protective screen (120) is configured to be movable along a movement path defined by a first end position (126) and a second end position (128), wherein at least one of the end positions (126, 128) is located in an area (150) extending at least partly in front of the entrance system (102), and a drive unit (130) configured to cause movement of the protective screen (120) between at least two positions arranged along said movement path.

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PROTECTION ARRANGEMENT, METHOD AND CONTROLLER FOR PROTECTING PARTS OF AN ENTRANCE SYSTEM HAVING MOVABLE DOOR MEMBERS

TECHNICAL FIELD

The present invention relates to the technical field of protecting parts of entrance systems having movable door members. More specifically, the present invention relates to a protection arrangement for protecting parts of an entrance system.

BACKGROUND

Entrance systems are frequently used for providing automatic opening and closing of movable door members to facilitate entrance and exit to buildings, rooms and other areas. The door members may be door members in, for instance, revolving door arrangements, sliding door arrangements, or any combination thereof.

Entrance systems are typically used in both private and public areas during long time periods and under various conditions in terms of time of day, time of week, time of year, passage frequencies, etc. The entrance systems need to remain long-term operational without malfunctions even during heavy traffic by persons or objects passing through the entrance systems. At certain locations where the prevailing weather conditions are windy, sandy or dirty, such as e.g. airports, near oceans, at high altitudes, deserts areas or other wind sensible locations, entrance systems are under constant impact by these conditions.

Due to the external impacts, parts of the entrance systems have a risk of being damaged potentially leading to hazardous situations. Damages include, for instance, uncontrollable opening and closing movements of the door members. The door members may also be accelerated or decelerated by the wind, which causes inconvenience, danger and sometimes also defeats the general purpose of having an entrance system installed in the first place. Additionally, parts may detach, disjoin or fall off from entrance system structures, and control units and

other electronics controlling the door member may be damaged directly from e.g. sand, wind or dirt.

Many entrance systems of today can only handle a certain amount of wind load specified differently for each type of entrance system before the aforementioned problems start appearing. Some entrance systems have the possibility of placing its door members in side positions or manually placing a wind cover in front of the passage while the door members are not in motion. This is of course a problem because people may experience inconvenience while having to wait for the cover to be removed. Moreover, sliding door arrangements have the problem of being opened at all times during heavy traffic so that for example wind, dirt and sand constantly are being blown into e.g. the building, which makes the door arrangement fruitless.

Hence, the present inventors have identified problems and shortcomings of weather conditions impacting entrance systems at different locations.

Accordingly, an object of the present invention is to overcome, or at least mitigate one or more of these problems.

SUMMARY

It is accordingly an object of the invention to eliminate or alleviate at least some of the problems or drawbacks referred to above.

One aspect of the present invention therefore is a protection arrangement for protecting parts of an entrance system having movable door members arranged to be movable between a closed position and an open position, wherein the protection arrangement comprises a protective screen having both a vertical and a horizontal extension, wherein the protective screen is configured to be movable along a movement path defined by a first end position and a second end position, wherein at least one of the end positions is located in an area extending at least partly in front of the entrance system, and a drive unit configured to cause movement of the protective screen between at least two positions arranged along said movement path.

A protection arrangement of the present invention is able to adapt the position of the protective screen depending on the incoming wind direction for protecting parts of the entrance system. This is particularly important in heavy wind conditions where the entrance system needs to be able to withstand heavy wind loads. The protective screen may be separately movable by a drive unit, thus having the benefit of not requiring to align with other door members. Hence, the technical provisions of the present invention for withstanding wind load is only reliant on dimensions of the drive unit moving the protective screen between positions.

In one embodiment of the invention, the protection arrangement further comprises at least one sensor being in operative communication with a controller, wherein the controller is configured to retrieve sensor data from the at least one sensor, and based on the retrieved sensor data, instruct the drive unit to move the protective screen between the at least two positions arranged along the movement path.

In another embodiment of the invention, the at least one sensor is in the form of a presence sensor configured to provide sensor data relating to presence detection of a person or object.

In another embodiment of the invention, the at least one sensor is in the form of a wind detection device configured to provide wind data relating to wind speed and/or wind direction.

In another embodiment of the invention, the controller is further configured to retrieve weather data from a weather forecasts provider, and based on the retrieved weather data, instruct the drive unit to move the protective screen between the at least two positions arranged along the movement path.

The controller of the protection arrangement provides the instructions to the drive unit instructing it to move the protective screen. The benefits of having a controller are multiple and include, for instance different parameters are being taken into consideration, the protective screen will not begin to move haphazardly without being assured of these parameters, and a control signal to the drive unit may be provided both automatically and manually. Consequently,

both safety and convenience for the persons using the entrance system as well as operational optimization of the entrance system may be achieved.

In one embodiment of the invention, the protection arrangement further comprises a guiding element configured to guide the protective screen along the movement path.

In another embodiment of the invention, the guiding element is arranged at ground level.

In another embodiment of the invention, the guiding element comprises one or more grooves, and one or more protrusions positioned along the one or more grooves, the one or more protrusions being configured to perpendicularly engage and disengage with an edge of the protective screen.

In another embodiment of the invention, the guiding element is arranged at a distance above ground level corresponding to approximately the height of the entrance system.

In another embodiment of the invention, the guiding element comprises a rail, one or more grooves, and one or more protrusions positioned along the one or more grooves, the one or more protrusions is configured to perpendicularly engage or disengage with an edge of the protective screen.

In another embodiment of the invention, the guiding element further comprises a penetrable brush for removing dirt or sand.

According to the above embodiments for guiding the protective screen by a guiding element, advantages include for instance seamless and reliable movement of the protective screen, safe locking mechanisms for keeping the protective screen still when it is not supposed to move, customized positioning at a large number of positions depending on wind direction, and adaptable arranging of the guiding element if for some reason the ground level or some arbitrary height above ground level is ineligible for having the guiding element arranged at. Hence, a combined technical effect of these advantages contributes to safety and a customizable movement of the protective screen.

In yet another embodiment of the invention, the protection arrangement further comprises at least one longitudinal element adapted to connect the

protective screen with the entrance system. The longitudinal element may advantageously be positioned so that it fits well into the prevailing door arrangement of the entrance system. A technical effect of the longitudinal element is related to stabilizing the protective screen so that unwanted tilting of the protective screen may be prevented.

In one embodiment of the invention, the protective screen is shaped with a suitable curvature for screening off wind, dirt and/or sand depending on the prevailing door arrangement of the entrance system. Protective screen curvature may be beneficial for different types of door arrangements. For instance, if the entrance system comprises a sliding door arrangement, the most efficient way to screen off sand or dirt may be to have a vertical protective screen aligned in parallel with the sliding door member. Similarly, a protective screen protecting a revolving door arrangement may more beneficially comprise a bow-shaped curvature.

In another embodiment of the invention, the protective screen comprises a transparent material. A transparent material of the protective screen may increase safety for the persons using the entrance system, since free sight of the entrance system may be assured even if they have not yet passed the protective screen.

In one embodiment of the invention, the protection arrangement further comprises a control signal for instructing the drive unit to move the protective screen along positions arranged along the movement path. The control signal is sent by automatic transmission or user initiated manual transmission from an external device.

By having a customized initiation for instructing the drive unit to move the protective screen, the protection arrangement may either rely on the sensor data and weather data to position the screen, or a user, such as personnel or staff instructing from an external device.

In yet another embodiment of the invention, the movable door members of the entrance system are movable door members in a sliding door arrangement, a revolving door arrangement or any combination thereof.

One aspect of the present invention is a method for protecting parts of an entrance system having movable door members arranged to be movable between a closed position and an open position, wherein the method involves configuring a protective screen having both a vertical and a horizontal extension to be movable along a movement path defined by a first end position and a second end position, wherein at least one of the end positions is located in an area extending at least partly in front of the entrance system, and configuring a drive unit to cause movement of the protective screen between at least two positions along said movement path.

One aspect of the present invention is a controller configured in a protection arrangement for protecting parts of an entrance system having movable door members arranged to be movable between a closed position and an open position, wherein the protection arrangement further comprises at least one sensor being in operative communication with the controller, wherein the controller is configured to retrieve sensor data from the at least one sensor, and based on the retrieved sensor data, instruct a drive unit to move a protective screen between the at least two positions arranged along the movement path.

The provision of a protection arrangement, method and controller for protecting parts of an entrance system as disclosed herein will solve or at least mitigate one or more of the problems or drawbacks identified in the background section of this document. These and other aspects, objectives, features and advantages of the invention and its disclosed embodiments will appear from the following detailed disclosure, from the attached dependent claims as well as from the drawings.

Generally, all terms used in the claims are to be interpreted according to their ordinary meaning in the technical field, unless explicitly defined otherwise herein. All references to "a/an/the [element, device, component, means, step, etc.]" are to be interpreted openly as referring to at least one instance of said element, device, component, means, step, etc., unless explicitly stated otherwise. The steps of any method disclosed herein do not have to be performed in the exact order disclosed unless explicitly stated. As used herein, the term

"comprising" and variations of this term are not intended to exclude other additives, components, integers or steps.

BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments of the invention will be described in the following; references being made to the appended diagrammatical drawings which illustrate non-limiting examples of how the inventive concept can be reduced into practice.

Figure 1 is a schematic block diagram of a protection arrangement generally according to the present invention.

Figures 2A-2C are illustrations of embodiments of protection arrangements comprising different door arrangements.

Figures 3A-3B are schematic block diagrams illustrating a controller configured for protecting parts of an entrance system generally according to the present invention.

Figures 4A-4B are schematic side views and front views, respectively, of guiding element at ground level according to embodiments of the invention.

Figures 5A-5B are schematic side views and front views, respectively, of guiding element at ground level according to embodiments of the invention.

Figures 5C-5D are schematic side views and front views, respectively, of guiding element at a distance from ground level according to embodiments of the invention.

Figure 6 is a schematic front view of a longitudinal element according to embodiments of the invention.

Figure 7 is a flowchart diagram illustrating a method of protecting parts of an entrance system generally according to the present invention.

Figure 8 is a flowchart diagram illustrating a controller configured for protecting parts of an entrance system generally according to the present invention.

DETAILED DESCRIPTION OF THE EMBODIMENTS

Embodiments of the invention will now be described with reference to the accompanying drawings. The invention may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein; rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art. The terminology used in the detailed description of the particular embodiments illustrated in the accompanying drawings is not intended to be limiting of the invention. In the drawings, like numbers refer to like elements.

Some entrance systems have the possibility of placing its door members in side positions or manually placing a wind cover in front of the passage while the door members are not in motion. This is of course a problem because people may experience inconvenience while having to wait for the cover to be removed.

References are now being made to Figure 1, which illustrates schematic block diagram of a protection arrangement 100 in which the inventive aspects of the present invention may be applied. The protection arrangement 100 is connected to an entrance system 102 which comprises an automatic door operator 104 and movable door members 162-167 arranged to be movable between a closed position and an open position. The automatic door operator 104 may be coupled with the door members 162-167 via a linkage, which takes part in their opening and closing movement.

The door arrangement 161B may be configured to provided customizable movement of the movable door members 162-167. For example, the door arrangement may be instructed to open/close the door members 162-167 differently based on the prevailing weather and traffic conditions.

The protection arrangement 100 comprises a protective screen 120 having both a vertical 122 and a horizontal 124 extension. In the embodiment shown in Figure 1, the protective screen 120 comprises two vertical 122 and two horizontal 124 extensions. The protective screen 120 of the embodiment shown in Figure 1 further comprises four corners, being adjoined by the extensions, thus

forming a rectangular-shaped protective screen 120. The height of the protective screen 120 corresponds to approximately the height of the entrance system. As will be described more with reference to Figures 2A-2C, the protective screen 120 may take other forms as well.

The protective screen 120 may be constructed or comprise a transparent material. The transparent material may for example be glass. This allows persons passing by the protection arrangement 100 to maintain free sight of the entrance system 102. Additionally or alternatively, the protective screen 120 may be arranged with text and/or images that informs and/or advertise something. The protective screen 120 may for example be constructed by a transparent material being arranged with a logotype of the building to which it is adjacent to.

The protective screen 120 is configured to be movable along a movement path. The movement path is defined as being a path arranged between a first end position 126 and a second end position 128. The movement path may be in the form of a straight line, a curved line, and any other type of path depending on the location of the first and second end positions 126, 128.

The protective screen 120 is configured to be movable between at least two positions being arranged along the movement path. The at least two positions may be the first and second end positions 126, 128. The number of positions along the movement path may be any suitable number, starting from two (being the first and second end position 126, 128) ranging up to any reasonable number of positions.

The positions may be a fixed number of positions, or be a dynamically number of positions. In one embodiment, the protective screen 120 is movable between four fixed positions; the first end position 126, a first intermediate position, a second intermediate position and a second end position 128. The first and second intermediate positions are arranged in between the first and second end positions 126, 128. In an alternative embodiment, the number of positions are dynamical in the sense that the protective screen can be moved incremental steps between the two end positions 126, 128 – hence any number of positions can be achieved.

At least one of the end positions 126, 128 are located in an area 150 arranged at least partly in front of the entrance system 102. In embodiments illustrated in Figure 1 and Figures 2A-2C, the area 150 covers a rectangular-shaped area in front of the entrance system 102. The area 150 in these embodiments may protect the entire entrance system 102 from all incoming wind angles. In other embodiments of the invention, the area 150 may cover any type of shaped area, such as circular, triangular, elliptical, etc., depending on the characteristics of the door arrangement. Additionally or alternatively, the area 150 only covers a small section of the entrance system 102. The small section may for instance be specifically related to protecting one or more electronic equipment of the entrance system 102 located at a distance above ground level. It may also be related to protecting a certain area of the entrance system 102 located at a distance around ground level.

The purpose of the protective screen 120 is to screen off e.g. wind, dirt or sand from the entrance system 102. Hence, as long as it serves its purpose, the area 150 may be located at a longitudinal or lateral distance from the entrance system 102. This is illustrated in Figures 2A-2C, wherein the area 150 is not directly adjacent to the entrance system 102.

The protection arrangement 100 further comprises a drive unit 130 (as illustrated in Figures 3A-3B) configured to cause movement of the protective screen 120 along positions on the movement path. The drive unit 130 may comprise for instance one or more electrical motors or mechanical units, such as springs, for causing movement of the protective screen 120. The drive unit 130 may be arranged at or near the protective screen 120, or in any position in or around the protection arrangement 100.

The protection arrangement 100 may be designed for installation in conjunction with a building to control access into said building. The protection arrangement 100 is arranged such that the protective screen 120 is arranged outside of said building. As will be shown more in detail with reference to Figures 2A-2C, wind is approaching the protection arrangement 100 from the outside towards the area 150 of the protection arrangement 100.

Figures 2A-2C illustrates schematic block diagram of a protection arrangement 100 according to different embodiments. As seen in Figures 2B-2C, the protective screen 120 of the protection arrangement 100 is shaped with a suitable curvature for screening off wind, dirt and/or sand. The curvature depends on the prevailing door arrangement 160, 161A, 161B of the entrance system 102.

In Figure 2A the movable door members 162, 163 of the entrance system 102 are movable door members in a sliding door arrangement 160. The movable door members 162, 163 are supported for sliding movements 182 and 183 in parallel with first and second wall portions 172, 173. The first and second wall portions 172 and 173 are spaced apart; in between them there is formed an opening which the sliding doors 162, 163 either blocks (when the sliding doors are in closed positions), or makes accessible for passage (when the sliding doors are in open positions). The entrance system 102 causes the movements 182, 183 of the sliding doors 162, 163 via an automatic door operator 104.

In the embodiment shown in Figure 2A, the area 150 is located at a distance from the entrance system 102. The protective screen 120 has been placed with both its end positions 126, 128 inside the area. Furthermore, the protective screen 120 is placed in parallel with the first and second wall portions 172, 173 of the sliding door arrangement 160. The protective screen 120 may further be controlled to move a distance inside or around the area 150, as long as one of its end position 126, 128 is still located inside the area 150.

In Figure 2B, the movable door members 164-167 are movable door members in a revolving door arrangement 161A. The movable door members 164-167 are being located in a cross configuration in an essentially cylindrical space between first and second curved wall portions 174, 175. In turn, the curved wall portions 174, 175 are spaced apart and located between third and fourth wall portions 176, 177. The revolving doors 164-167 are supported for rotational movement 190 in the cylindrical space between the first and second curved wall portions 174, 175. During the rotation of the revolving doors 164-167, they will alternatingly prevent and allow passage through the cylindrical space. The

entrance system 102 causes the movements 190 of the revolving doors 164-167 via an automatic door operator 104.

In the embodiment shown in Figure 2B, the area 150 is located at a distance from the entrance system 102. The protective screen 120 has been placed with both its end positions 126, 128 inside the area. Furthermore, the protective screen 120 comprises a curvature, so that the incoming wind from a plurality of wind directions may be screened off. The protective screen 120 may further be controlled to move a distance inside or around the area 150, as long as one of its end position 126, 128 is still located inside the area 150.

In Figure 2C a combined revolving and sliding door arrangement 161B is shown. The arrangement 161B may comprise the features of the revolving door arrangement 161A, but instead of having an intersection of the door members 164-167 in the center of the arrangement, the combined revolving and sliding door arrangement 161B instead comprises two movable door members 162, 163. The movable door members 162, 163 having the features of a sliding door arrangement 160. The embodiment shown in Figure 2C comprises a protective screen 120 with a similar curvature as the protective screen 120 from Figure 2B. Additionally or alternatively, the screen may be shaped similarly to the shape of the protective screen shown in Figure 2A. It may also comprise a completely different shape.

In the embodiments presented in relation to Figures 2A-2C, it should be noted that the door arrangements may comprise an arbitrary number of door members. Furthermore, given that at least one of its end positions 126, 128 is positioned inside the area 150, the protective screen 120 is not restricted to any specific shape, curvature or distance from the entrance system 102.

Figure 3A shows a schematic block diagram illustrating different parts of the protection arrangement 100. As previously been described with reference to Figures 1-2, the protection arrangement 100 comprises a drive unit 130. In one embodiment the protection arrangement 100 may further comprise at least one sensor 320, 322, 330.

It is integral of the protection arrangement 100 to guarantee safety and convenience for persons using the protection arrangement 100. Hence, it may be desired to have a plurality of presence sensors 320, 322 that detect presence of an object within an immediate area of the moving parts of the protection arrangement 100. This may prevent or at least mitigate the risk of a person getting stuck between the doors.

Such a presence sensor often uses infra-red radiation. The presence sensors 320, 322 may also be based on technologies including but not limited to LIDAR, RADAR, photocell sensors or magnetic guide sensors.

The presence sensors 320, 322 may be arranged to function as both a motion sensor and a presence sensor. This is to determine both when an object is approaching the protection arrangement 100, and when an object is present in the vicinity of an immediate area of the moving parts of the protection arrangement 100.

The protection arrangement may further comprise two side sensors (not shown) arranged near the endpoints of the protective screen 120. The side sensors may alternatively be arranged near the endpoints 126, 128 of the movement path. The side sensors are arranged to determine the presence of an object near the end portions of the protective screen so as to minimize the risk that an object, such as a person, is jammed between e.g. the protective screen 120 and the entrance system 102.

In order to be able to detect wind direction and wind speed, at least one wind detection device 330 may be provided in the protection arrangement 100. The wind detection device 330 may be a separate unit from the protective screen 120, and may be arranged somewhere in the vicinity of the protection arrangement 100. Alternatively or additionally, the wind detection device 330 is arranged on the protective screen 120, and positioned so that wind may be detected from any position of the protective screen 120. It is preferred if the wind detection device 330 is not blocked by any object or person in order to be able to correctly retrieve sensor data relating to the prevailing weather conditions.

The embodiments shown in Figure 3A-3B further comprise means for retrieving weather data from a weather forecast provider 340. A weather forecast provider 340 may be a meteorological institute as well as a reputable local or global news source. The weather data retrieved may be locally retrieved by the weather forecast provider 340 or be statistics from a global weather database.

The weather data may be helpful in certain situations when the sensor data from the wind detection device 330 is not reliable. For instance, if the wind detection device 330 has been damaged, the retrieved data may be inaccurate. Additionally, if there is an object present on the outside of the protection arrangement 100 blocking the wind from one direction, ambiguous data may be retrieved. instruct the drive unit 130 to move the protective screen along positions on the movement path.

Moreover, the weather data received from a weather forecast provider 340 may be used to predict upcoming wind conditions. This data may thus be used to move the protective screen 120 in an appropriate position, taking into account how the wind will be in the future.

In the embodiments shown in Figure 3A-3B, a controller 310 is provided in the protection arrangement 100. The controller 310 may be implemented in any known controller technology, including but not limited to microcontroller, processor (e.g. PLC, CPU, DSP), FPGA, ASIC or any other suitable digital and/or analog circuitry capable of performing the intended functionality.

The controller 310 may further be implemented using instructions that enable hardware functionality, for example, by using computer program instructions executable in a general-purpose or special-purpose processor that may be stored on a computer-readable storage medium (disk, memory, etc.) to be executed by such a processor.

The controller 310 is configured to read instructions from a memory and execute these instructions for instructing the drive unit 130 to move the protective screen 120 along positions on the movement path defined by the end positions 126, 128. The memory may be implemented in any known memory technology, including but not limited to ROM, RAM, SRAM, DRAM, CMOS,

FLASH, DDR, SDRAM or some other memory technology. In some embodiments, the memory may be integrated with or internal to the controller 310. The memory may store program instruction for execution by the controller 310, as well as temporary and permanent data used by the controller 310.

In embodiments shown in Figures 3A-3B, instructions stored in the memory of the controller 310 are related to retrieved sensor data and/or weather data. This data is subsequently sent as a control signal 330, 335 by automatic transmission 330 or user initiated manual transmission 335 from an external device (not shown).

The automatic transmission 330 is based on the sensor data and/or the weather data. For instance, consider Figure 2C again. In this example, the weather forecast provider 340 has predicted incoming wind from the northeast, the wind detection device 330 has observed wind incoming from the northeast, and the presence sensors 320, 322 have detected no surrounding objects or persons in vicinity of the protection arrangement 100. Consequently, the controller 310 has received the appropriate data in the form of both sensor data and weather data. Hence, the protective screen 120 will be moved to a position blocking the wind incoming from northeast by the controller 310 having automatically transmitted a control signal 330 for instructing the drive unit 130 to do so.

Manual control may be required at certain situations. Manually transmitting a control signal 335 may be executed by staff, an operator or hotel personnel, etc. The user performing the manual control preferably uses an external device. The external device used to send this control signal 335 may for instance be a mobile device such as a smartphone, laptop computer or tablet, or a stationary device such as a stationary computer. The external device may preferably use a computer or mobile application for sending the signal. Alternatively, a web service may be used.

Sending the control signal 335 via manual transmission may be done in a variety of different ways. In one embodiment, the user may have a set of predefined modes to choose from. The modes may be configured for customized

positions of the protective screen 120, based on e.g. prevailing door arrangement characteristics or common weather conditions in the affected area. Further, the modes may be set to an angle with respect to a longitudinal axis of the entrance system. As an example, 0° may be referring to a leftmost position of the protective screen 120, and 180° may be referring to a rightmost position of the protective screen 120. In an alternative mode setting, the predefined positions may comprise more user-friendly names such as “far left”, “left”, “middle”, “right” and “far right”, or any alternative name setting.

The modes may be selected from an application or web service on the external device. Alternatively or additionally, the modes may be selected via a separate control unit (not shown). The separate control unit may be arranged at or near the protection arrangement 100 or the entrance system 102.

The external device may be connected to the controller 310 via a communication interface. The interface may be configured as a transceiver based on known transceiver standards such as for example GBIC, SFP, SFP+, QSFP, XFP, XAUI, CXP or CFP.

All control signals 330, 335 being sent from the controller 310 to the drive unit 130 may further be hashed using any known hash function such as SHA-2, SHA-3, MD5, RIPEMD or BLAKE2.

The protection arrangement 100 may further comprise a guiding element 400; 500; 600 for guiding the protective screen 120 along the movement path. This is shown in Figures 4A-B and 5A-D where different embodiments of guiding elements 400; 500; 600 are illustrated.

Firstly, attention is turned towards Figures 4A-4B. In this embodiment, the guiding element 400 is arranged at ground level 450. If the protection arrangement 100 is arranged in a building or other indoor facility, ground level 450 is to be seen as the floor. If the protection arrangement 100 is arranged outside of a building, ground level 450 corresponds to the outdoor ground being for instance asphalt, cement, pavement, ground bricks. In both scenarios, the ground level 450 whereby the guiding element 400 is arranged at is approximately the same ground level as the entrance system 102.

The guiding element 400 in Figure 4A-4B comprises one or more grooves 420, 422, and one or more protrusions 424, 426, 428. The protrusions are positioned along the one or more grooves 420, 422, and they may be evenly or unevenly spaced out. The one or more protrusions 424, 426, 428 are configured to perpendicularly engage 424 and disengage 428 with an edge 430 of the protective screen 120. Engaging or disengaging in this regard is related to getting in or out of direct contact with the edge 430.

Figure 4A illustrates a side view of the guiding element 400. In this embodiment, two grooves 420, 422 have been routed down below ground level 450 so that two tracks are formed. The protective screen 120 has been placed above the grooves 420, 422 which are laterally extending between the edges of the guiding element 400. At least one of the end positions 126, 128 of the protective screen 120 are positioned in an area 150 in front of the entrance system 102. Hence, the at least one of the end positions of the guiding element 400 will be positioned in the same area 150. In between the grooves 420, 422 and the protective screen 120, means for guiding the protective screen 120 is provided along positions between the edges of the guiding element 400. Means for guiding include, but is not limited to one or more wheels or roller assemblies or any combination thereof. Means for guiding may also include frictionless gliding initiated by e.g. a separate drive unit, magnetic or electromagnetic forces.

In order to conceal the grooves 420, 422 so that no dangerous situations may occur, a structure (not shown) may be placed around the grooves 420, 422. The structure is to assure that no person or object gets stuck inside the grooves 420, 422, and still allowing movement of the protective screen 120. In different embodiments, this structure may be a rail, runner or a protective cover.

An alternative approach is to lift the guiding element 400 to a height above ground level 450, accessible by e.g. a small ramp. In this case the grooves 420, 422 are concealed under the ramp.

Figure 4B is a front view of the protective screen 120 and the guiding element 400 from Figure 4A. Figure 4B illustrates a positional movement by the protective screen 120 from a first position (dashed line in the figure) to a second

(normal line in the figure). The figure illustrates three protrusions. The middle protrusion is, in this particular movement, engaged 426 with the edge 430 of the protective screen 120 in both the first and the second positions. During the movement of the protective screen however, the middle protrusion is disengaged. The right protrusion is, in the first position, engaged 428 with the edge 430. Upon the drive unit 130 initiating the movement of the protective screen 120 to the second position, the right protrusion will disengage with the edge 400, thus allowing further movement of the protective screen 120. The left protrusion is, in the first position, disengaged 424 with the edge 430. Upon the drive unit 130 having caused the movement of the protective screen 120 to the second position, the left protrusion will engage 424 with the edge 430, thus restricting any further movement of the protective screen 120.

The embodiment shown in Figures 4A-4B comprises protrusions which are embodied in a variety of different embodiments in different protection arrangements 100. For instance, a protrusion may comprise a bolt, pin, flange or rod. The protrusion may also be one or more of the aforementioned operating in conjunction with respect to each other. The protrusion may be mounted atop or inside a groove 420, 422, so that it may freely and seamlessly engage 424 or disengage 428 with an edge 430 of the protective screen 120. The protrusion may also be mounted inside a pocket of the protective screen 120, and in a similar fashion engage 424 or disengage 428 with a groove 420, 422. The movement of the protrusions may be controlled by the position of the protective screen 120. For example, when the protective screen 120 has been moved to a position by the drive unit 130 instructed by the controller 310, the protrusions will engage 424 or disengage 428 accordingly.

Figures 5A-5B show a similar embodiment as Figures 4A-4B do. Herein, the guiding element 500 also comprises a rail 540. The essential difference between the embodiments of Figures 4A-4B and Figures 5A-5B is that in the embodiment shown in Figures 5A-5B the grooves 520, 522 are not routed down below ground level 550. In this embodiment, the rail 540 instead comprises the grooves 520, 522, and the rail is being arranged at ground level 550. The rail 540

laterally extends between the edges of the guiding element 500. Configuring the guiding element 500 may be simplified using a rail, since the rail may be arranged without modifying the current ground level 550. Moreover, the rail may be constructed preemptive to being at a protection arrangement 100 location. Hence, mass production of rails may be implemented without knowing the conditions of the protection arrangement 100 site.

The positional movement illustrated in Figure 4B and explained above may be similar to that of the positional movement illustrated in Figure 5B. The protective screen 120 may also travel along a different movement path. Herein, the protrusions will engage 524 and disengage 528 with the grooves 520, 522 that may have been preemptively routed to the rail 540. In embodiments of the invention, the grooves 520, 522 are located on any side of the rail 540. Furthermore, the grooves 520, 522 may be laterally extending over at least a short distance of the rail 540.

The embodiment shown in Figures 5A-5B comprises protrusions which are embodied in a variety of different embodiments in different protection arrangements 100. For instance, a protrusion may comprise a bolt, pin, flange or rod. The protrusion may also be one or more of the aforementioned operating in conjunction with respect to each other. The protrusion may be mounted atop or inside a groove 520, 522, so that it may freely and seamlessly engage 524 or disengage 528 with an edge 530 of the protective screen 120. The protrusion may also be mounted inside a pocket of the protective screen 120, and in a similar fashion engage 524 or disengage 528 with a groove 520, 522. The movement of the protrusions may be controlled by the position of the protective screen 120. For example, when the protective screen 120 has been moved to a position by the drive unit 130 instructed by the controller 310, the protrusions will engage 524 or disengage 528 accordingly.

In Figures 5C-5D, the guiding element 600 is being arranged at a distance d1 above ground level 550 at a level 560. The level 560 corresponds to approximately the height of the entrance system. As is readily understood by those skilled in the art, the term “approximately” the height of the entrance

system 102 may vary depending on the prevailing door arrangement. In this sense, it should be a distance d1 above ground level 550 high enough so that safety can be assured for persons using the protection arrangement 100. The distance d1 should also be high enough so that e.g. wind, sand or dirt is appropriately screened off from the entrance system 102. Moreover, it is clear that the distance d1 above ground level 550 cannot be unreasonably high. This would potentially bring complications regarding dimensions of the protection arrangement 100 in relation to e.g. the building to which the protection arrangement 100 is to be designed for.

The positional movement illustrated in Figure 5D may be similar to that of the positional movements illustrated in Figure 4B and 5B. The protective screen 120 may also travel along a different movement path. Herein, the protrusions will engage 524 and disengage 528 with the grooves 520, 522 that may have been preemptively routed to the rail 540. Configuring the guiding element 600 may be simplified using a rail, since the rail may be arranged without modifying the current level 560 at the distance d1 above ground level 550. Moreover, the rail may be constructed preemptive to being at a protection arrangement 100 location. Hence, mass production of rails may be implemented without knowing the conditions of the protection arrangement 100 site. In embodiments of the invention, the grooves 520, 522 are located on any side of the rail 540. Furthermore, the grooves 520, 522 may be laterally extending over at least a short distance of the rail 540. The rail 540 laterally extends between the edges of the guiding element 600.

The means for guiding may be arranged so that it does not fall off the guiding element 600. Therefore, one or more of e.g. wheels or roller assemblies or any combination thereof may be attached to the guiding element 600 via for instance the rail 540 or the grooves 520, 522. The means for guiding may be attached by for instance using an adhesive or a fastening arrangement with e.g. screws, bolts, hinges or knobs, etc. Additionally or alternatively, the means for guiding may also include frictionless gliding initiated by e.g. a separate drive unit, magnetic or electromagnetic forces. Herein, the magnetic or electromagnetic

forces may be of assistance for attaching the guiding means between the protective screen 120 and the guiding element 600.

The embodiment shown in Figures 5C-5D comprises protrusions which are embodied in a variety of different embodiments in different protection arrangements 100. For instance, a protrusion may comprise a bolt, pin, flange or rod. The protrusion may also be one or more of the aforementioned operating in conjunction with respect to each other. The protrusion may be mounted atop or inside a groove 520, 522, so that it may freely and seamlessly engage 524 or disengage 528 with an edge 530 of the protective screen 120. The protrusion may also be mounted inside a pocket of the protective screen 120, and in a similar fashion engage 524 or disengage 528 with a groove 520, 522. The movement of the protrusions is controlled by the position of the protective screen 120. For example, when the protective screen 120 has been moved to a position by the drive unit 130 instructed by the controller 310, the protrusions will engage 524 or disengage 528 accordingly.

As has been described in detail with regards to the different embodiments, the protrusions may be embodied in a variety of different embodiments in different protection arrangements 100. For instance, a protrusion may comprise a bolt, pin, flange or rod. The protrusion may also be one or more of the aforementioned operating in conjunction with respect to each other. The protrusion may be mounted atop or inside a groove 420, 422; 520, 522, so that it may freely and seamlessly engage 424; 524 or disengage 428; 528 with an edge 430; 530 of the protective screen 120. The protrusion may also be mounted inside a pocket of the protective screen 120, and in a similar fashion engage 424; 524 or disengage 428; 528 with a groove 420, 422; 520, 522. The movement of the protrusions is controlled by the position of the protective screen 120. For example, when the protective screen 120 has been moved to a position by the drive unit 130 instructed by the controller 310, the protrusions will engage 424; 524 or disengage 428; 528 accordingly.

In certain areas, such as airports, near oceans or in desert areas, dirt and sand may become an issue for the movement of the protective screen 120 if it

gets in its way. Therefore, the guiding element 400; 500; 600 may further comprise a penetrable brush (not shown) for removing dirt or sand. The brush may be arranged at, near, or surrounding an edge 430 of the protective screen. The brush may also be arranged inside or near the grooves 420, 422; 520, 522 in any of the embodiments shown in Figures 4A-4B and 5A-5D. Penetrable in this regard is referring to that it should not restrict the movement of the protective screen 120.

Figure 6 illustrates a schematic front view of a longitudinal element 610 according to embodiments of the invention. Herein, the protection arrangement 100 further comprises at least one longitudinal element 610 adapted to connect the protective screen 120 with the entrance system 102. The at least one longitudinal element 610 is not restricted to any particular form, shape, placement, material, or the like. It may be arranged in connection with any side or area of the protective screen 120, or with any side or area of the entrance system 102. For instance, the at least one longitudinal element 610 may be arranged along a height corresponding to a distance d1 above ground level 550 being approximately the height of the entrance system 102 or the protective screen 120. The at least one longitudinal element 610 may for instance comprise one or more rods, flanges, or shafts being arranged using e.g. one or more bolts, latches, screws, pins or hinges.

The longitudinal element 610 may be used to conceal parts of the protective arrangement 100 and/or parts of the entrance system 102. For example, the drive unit 130 may be arranged in the longitudinal element 610.

Figure 7 is a flowchart diagram illustrating a method 700 of protecting parts of an entrance system 102 having movable door members 162-167 arranged to be movable between a closed position and an open position. For instance, an installer or operator responsible for quality assurance of the protection arrangement 100 may perform the method 700.

The method 700 involves a step 710 of configuring a protective screen 120 to be movable along a movement path defined by a first end position 126 and a second end position 128. The method 700 further involves a step 720 of

configuring a drive unit 130 to cause movement of the protective screen 120 between at least two positions along said movement path.

The method of protecting movable door members 162-167 in an entrance system 102 further comprising the functionalities which have been described throughout the description. It is not necessary to perform the two steps 710, 720 sequentially. For example, the drive unit 130 may be configured at the same time as the protective screen 120.

Figure 8 is a flowchart diagram illustrating a controller 310 configured for protecting parts of an entrance system 102. The controller 310 is configured 810 to retrieve sensor data from at least one sensor 320, 322, 330. Based on the retrieved sensor data, the controller 310 will instruct 820 a drive unit 130 to move a protective screen 120 between the at least two positions arranged along the movement path.

Alternatively or additionally, the controller 310 is in an optional step 830, indicated by the dashed line, configured to retrieve weather data from a weather forecast provider 340. Based on the retrieved weather data, the controller 310 is further configured 840 to instruct the drive unit 130 to move the protective screen 120 between the at least two positions arranged along the movement path.

As shown in Figure 8, the controller 310 is configured to instruct the drive unit 130 in different states of operation. For instance, the drive unit 130 may be instructed if one of sensor data or weather data has not yet been retrieved. As a consequence, the steps 810, 820, 830, 840 are not necessarily executed sequentially.

The invention has been described above in detail with reference to embodiments thereof. However, as is readily understood by those skilled in the art, other embodiments are equally possible within the scope of the present invention, as defined by the appended claims.

CLAIMS

Main system claim

1. A protection arrangement (100) for protecting parts of an entrance system (102) having movable door members (162-167) arranged to be movable between a closed position and an open position, wherein the protection arrangement (100) comprises:

a protective screen (120) having both a vertical (122) and a horizontal (124) extension, wherein the protective screen (120) is configured to be movable along a movement path defined by a first end position (126) and a second end position (128), wherein at least one of the end positions (126, 128) is located in an area (150) extending at least partly in front of the entrance system (102), and

a drive unit (130) configured to cause movement of the protective screen (120) between at least two positions arranged along said movement path.

Controller: Sensor detection

2. The protection arrangement (100) according to claim 1, wherein the protection arrangement (100) further comprises at least one sensor (320, 322, 330) being in operative communication with a controller (310), wherein the controller (310) is configured to:

retrieve sensor data from the at least one sensor (320, 322, 330), and

based on said retrieved sensor data, instruct the drive unit (130) to move the protective screen (120) between the at least two positions arranged along the movement path.

Controller: Presence sensor

3. The protection arrangement (100) according to claim 2, wherein the at least one sensor (320, 322, 330) is in the form of a presence sensor (320, 322) configured to provide sensor data relating to presence detection of a person or object.

Controller: Wind data

4. The protection arrangement (100) according to any one of claims 1 to 3, wherein the at least one sensor (320, 322, 330) is in the form of a wind detection device (330) configured to provide sensor data relating to wind speed and/or wind direction.

Controller: Weather forecasts

5. The protection arrangement (100) according any one of claims 1 to 4, wherein the controller (310) is further configured to:

retrieve weather data from a weather forecasts provider (340), and

based on the retrieved weather data, instruct the drive unit (130) to move the protective screen (120) between the at least two positions arranged along the movement path.

Guiding element: Broad claim

6. The protection arrangement (100) according to any preceding claims, wherein the protection arrangement (100) further comprises a guiding element (400; 500; 600) configured to guide the protective screen (120) along the movement path.

Guiding element embodiment: Ground level

7. The protection arrangement (100) according to claim 6, wherein the guiding element (400; 500) is arranged at ground level (450; 550).

Guiding element embodiment: Grooves routed to the ground level

8. The protection arrangement (100) according to claim 7, wherein the guiding element (400; 500) comprises:

one or more grooves (420, 422), and

one or more protrusions (424, 426, 428) positioned along the one or more grooves (420, 422), the one or more protrusions (424, 426, 428) being configured

to perpendicularly engage (424) and disengage (428) with an edge (430) of the protective screen (120).

Guiding element embodiment: Ceiling level

9. The protection arrangement (100) according to claim 6, wherein the guiding element (600) is arranged at a distance (d1) above ground level (550) corresponding to approximately the height of the entrance system (102).

Guiding element embodiment: Rails at ground or ceiling

10. The protection arrangement (100) according to claims 7 or 9, wherein the guiding element (500; 600) comprises:

a rail (540);

one or more grooves (520, 522); and

one or more protrusions (524, 526, 528) positioned along the one or more grooves (520, 522), the one or more protrusions (524, 526, 528) being configured to perpendicularly engage (524) or disengage (528) with an edge (530) of the protective screen (120).

Brush in groove and rail to remove dirt and sand

11. The protection arrangement (100) according to any one of claims 5-10, wherein the guiding element (400; 500; 600) further comprises a penetrable brush for removing dirt or sand.

Connecting the protective screen with the entrance system

12. The protection arrangement (100) according to any preceding claims, wherein the protection arrangement (100) further comprises at least one longitudinal element (610) adapted to connect the protective screen (120) with the entrance system (102).

Protective screen curvature

13. The protection arrangement (100) according to any preceding claims, wherein the protective screen (120) is shaped with a suitable curvature for screening off wind, dirt and/or sand depending on the prevailing door arrangement (160; 161A; 161B) of the entrance system (102).

Protective screen comprises a transparent material

14. The protection arrangement (100) according to any preceding claims, wherein the protective screen (120) comprises a transparent material.

Entrance system: Door arrangement

15. The protection arrangement (100) according to any preceding claim, wherein the movable door members (162-167) of the entrance system (102) are movable door members in a sliding door arrangement (160), a revolving door arrangement (161A) or any combination thereof.

Independent method claims

16. A method for protecting parts of an entrance system (102) having movable door members (162-167) arranged to be movable between a closed position and an open position, wherein the method involves:

configuring a protective screen (120) having both a vertical (122) and a horizontal (124) extension to be movable along a movement path defined by a first end position (126) and a second end position (128), wherein at least one of the end positions (126, 128) is located in an area (150) extending at least partly in front of the entrance system (102), and

configuring a drive unit (130) to cause movement of the protective screen (120) between at least two positions along said movement path.

17. The method of protecting movable door members (162-167) in an entrance system (102) as defined in claim 16, further comprising the functionalities recited in any of claims 2-15.

Independent controller claims

18. A controller (310) configured to be arranged in a protection arrangement (100) for protecting parts of an entrance system (102) having movable door members (162-167) arranged to be movable between a closed position and an open position, wherein the protection arrangement (100) further comprises at least one sensor (320, 322, 330) being in operative communication with the controller (310), wherein the controller (310) is configured to:

retrieve sensor data from the at least one sensor (320, 322, 330), and

based on the retrieved sensor data, instruct a drive unit (130) to move a protective screen (120) between the at least two positions arranged along the movement path.

19. The controller (310) according to claim 18, wherein the controller (310) is further configured to:

retrieve weather data from a weather forecasts provider (340), and

based on the retrieved weather data, instruct the drive unit (130) to move the protective screen (120) between the at least two positions arranged along the movement path.

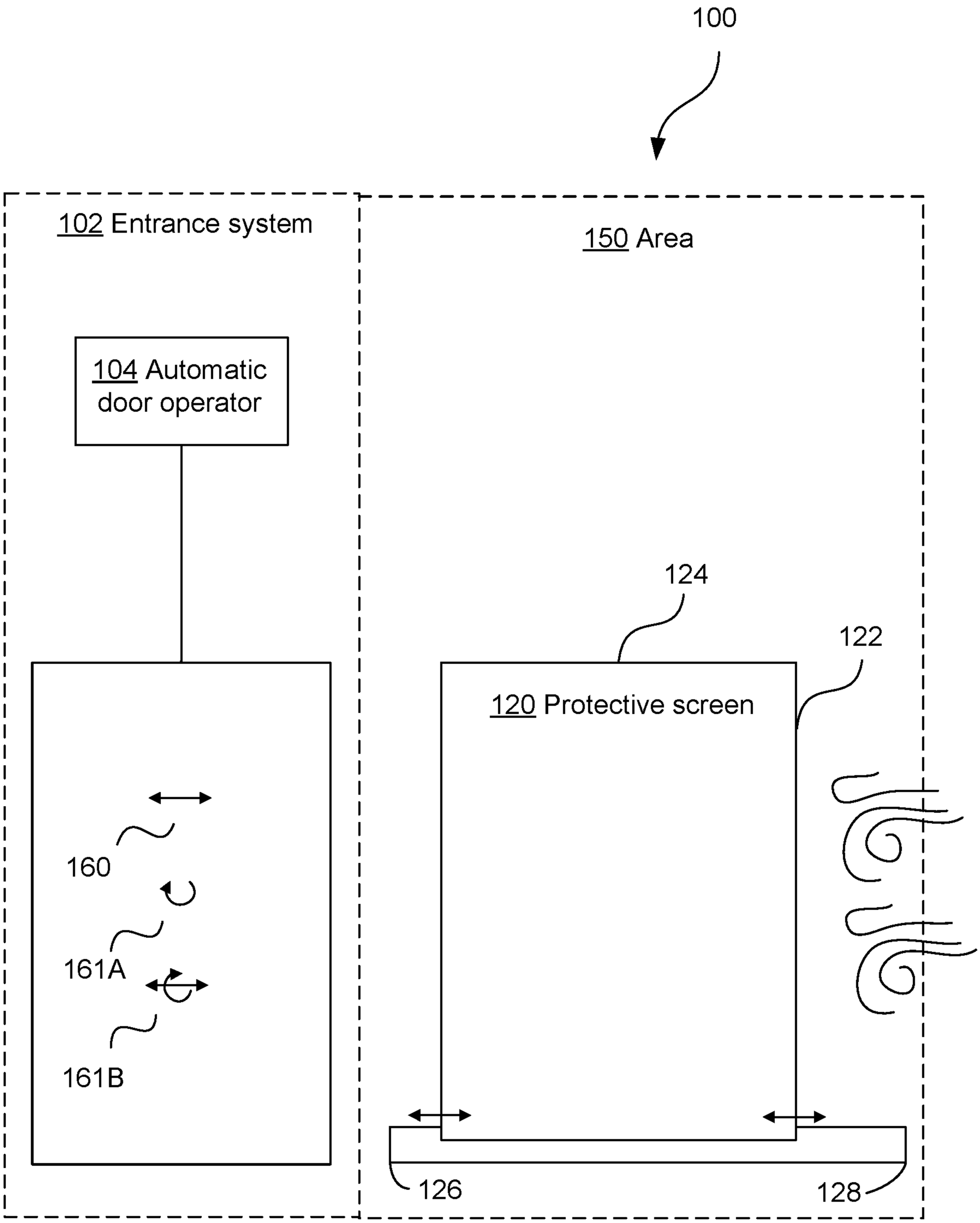

100
102 Entrance system
104 Automatic door operator
160
161A
161B
150 Area
124
122
120 Protective screen
126
128

Figure 1

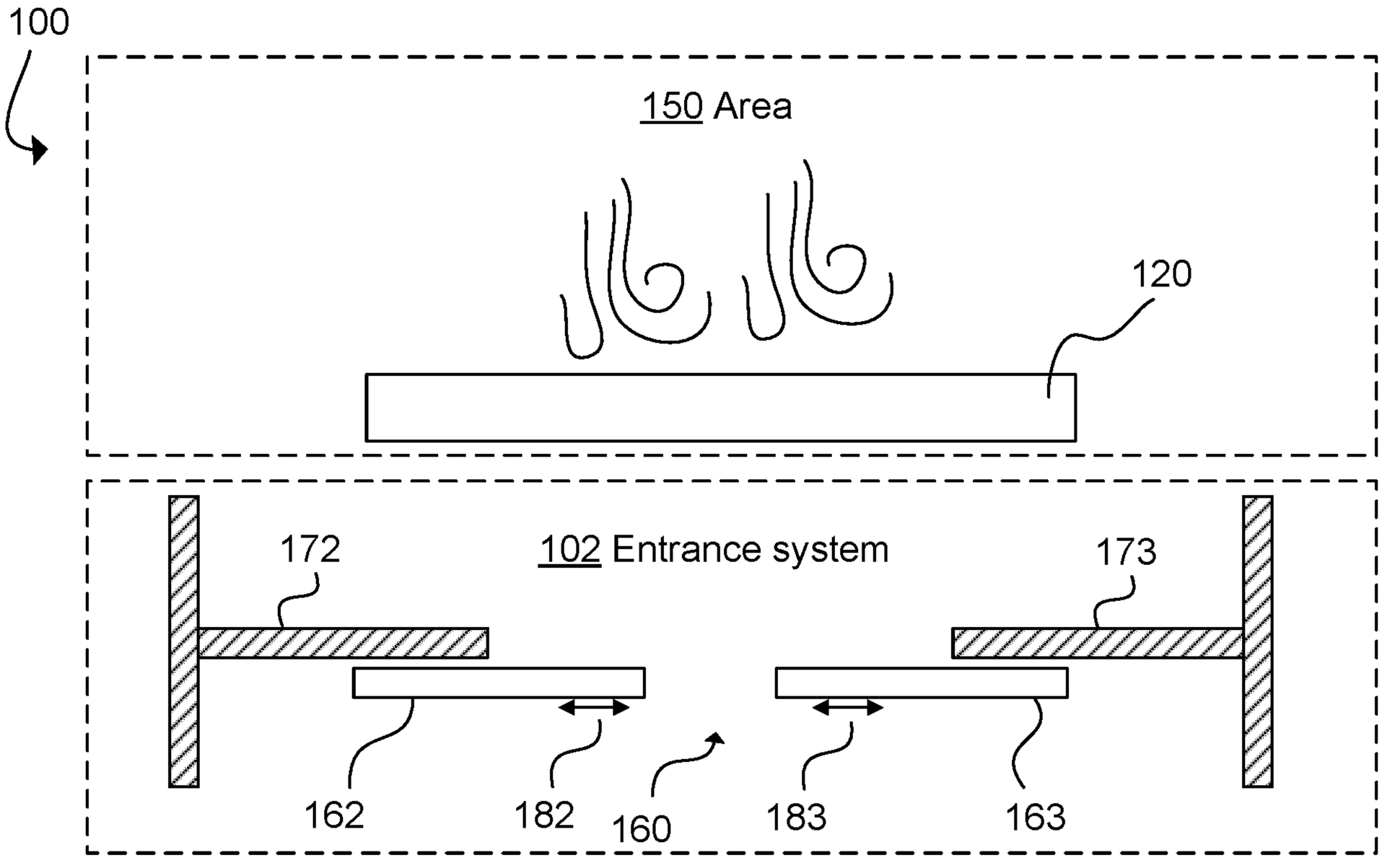


Figure 2A

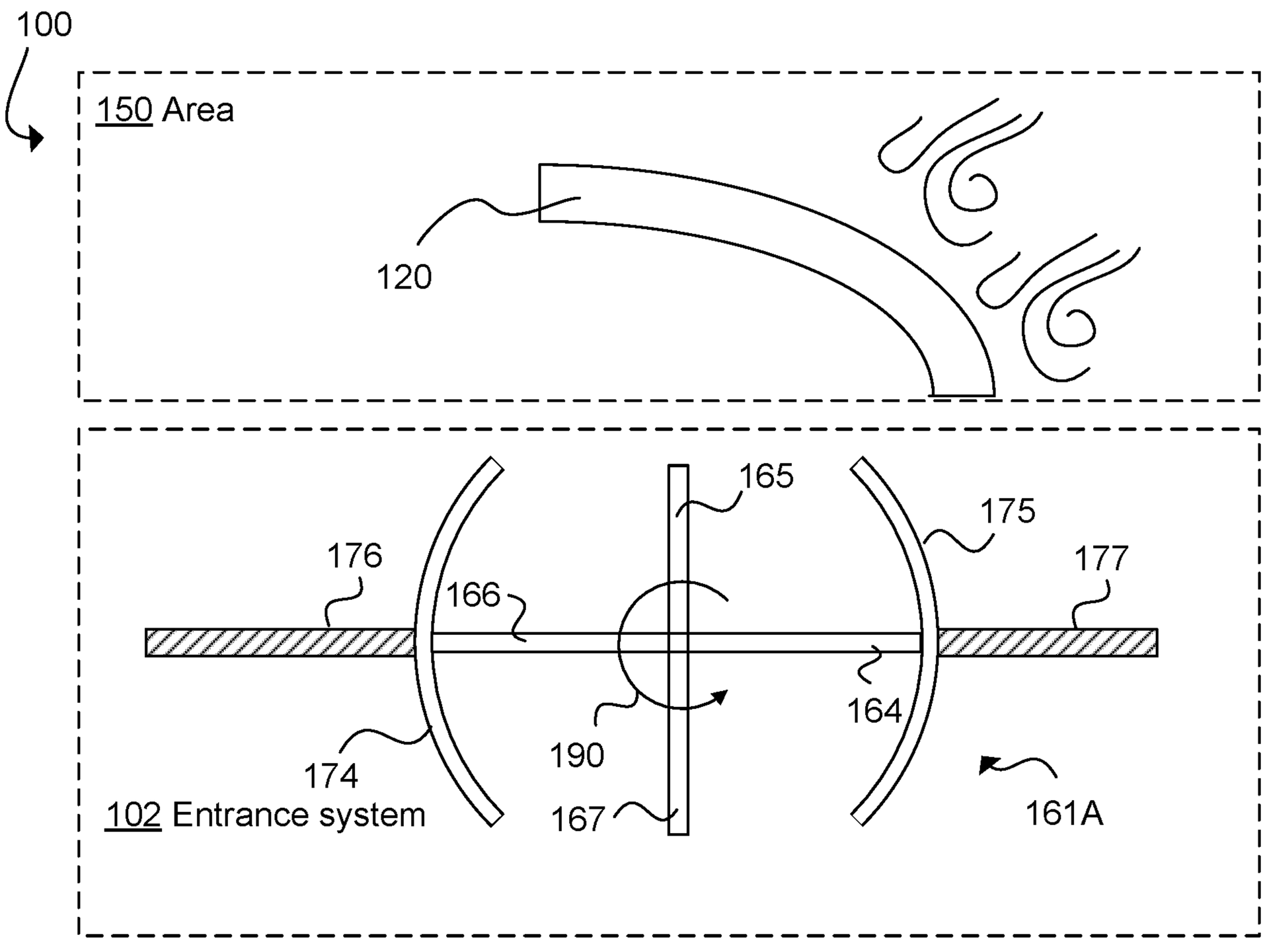


Figure 2B

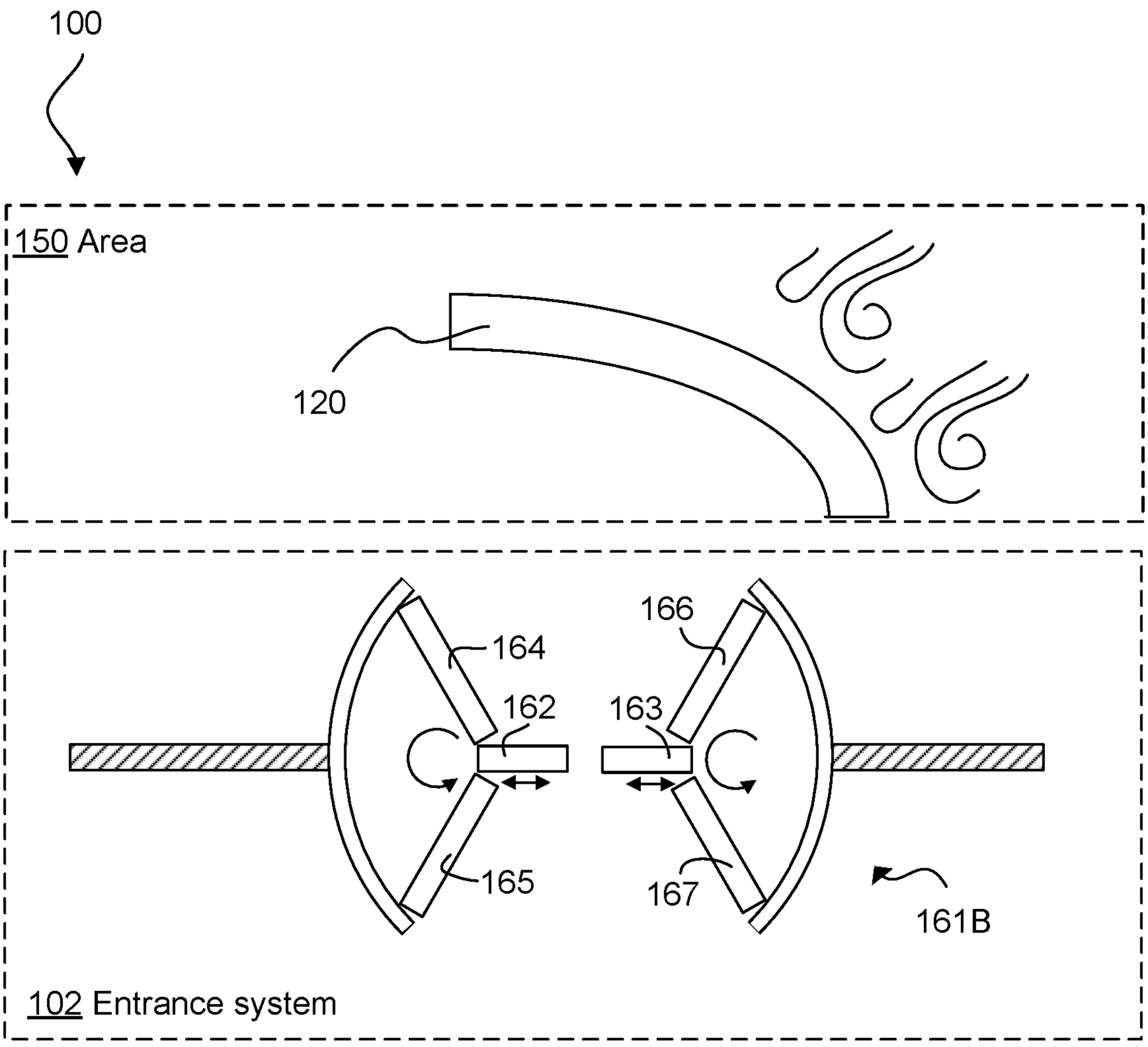

100
150 Area
120
166
164
162
163
165
167
161B
102 Entrance system

Figure 2C

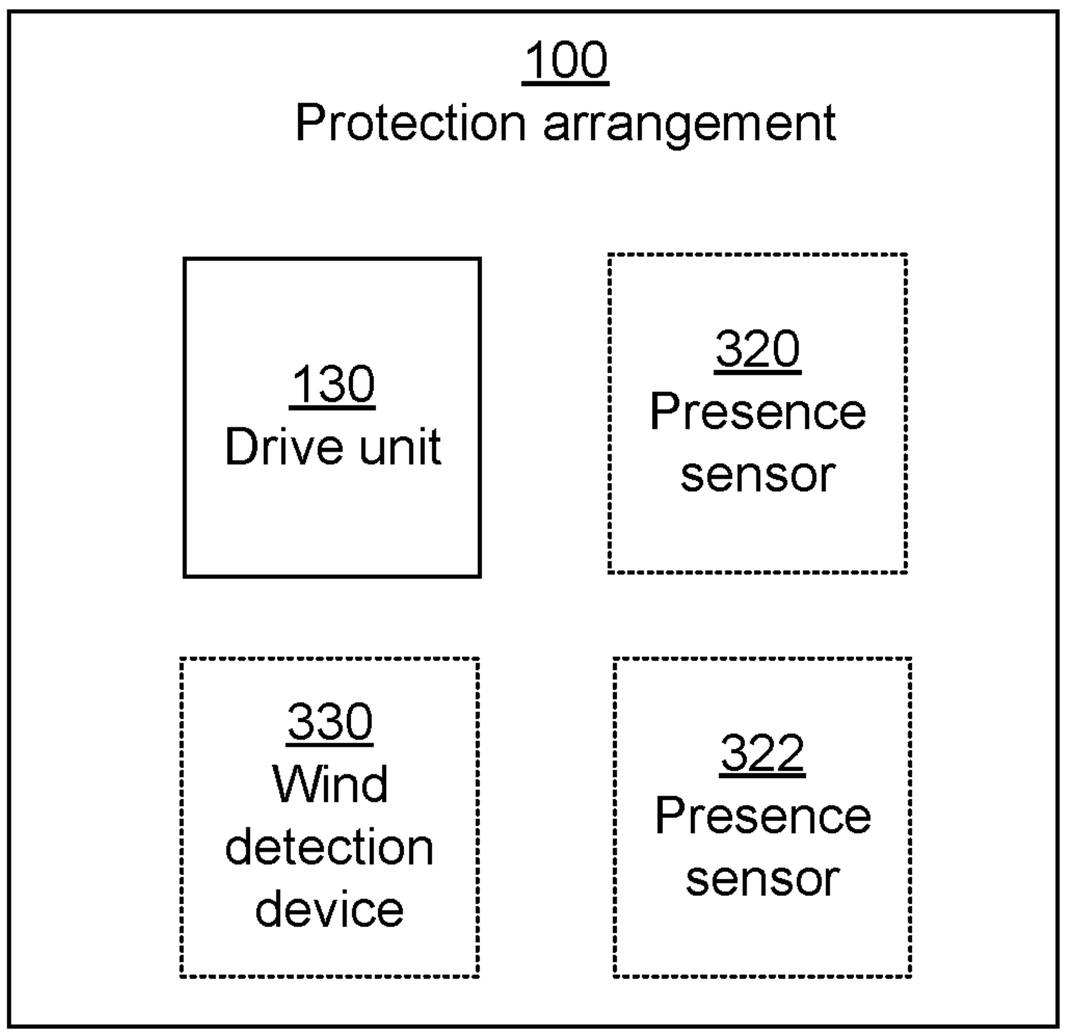


Figure 3A

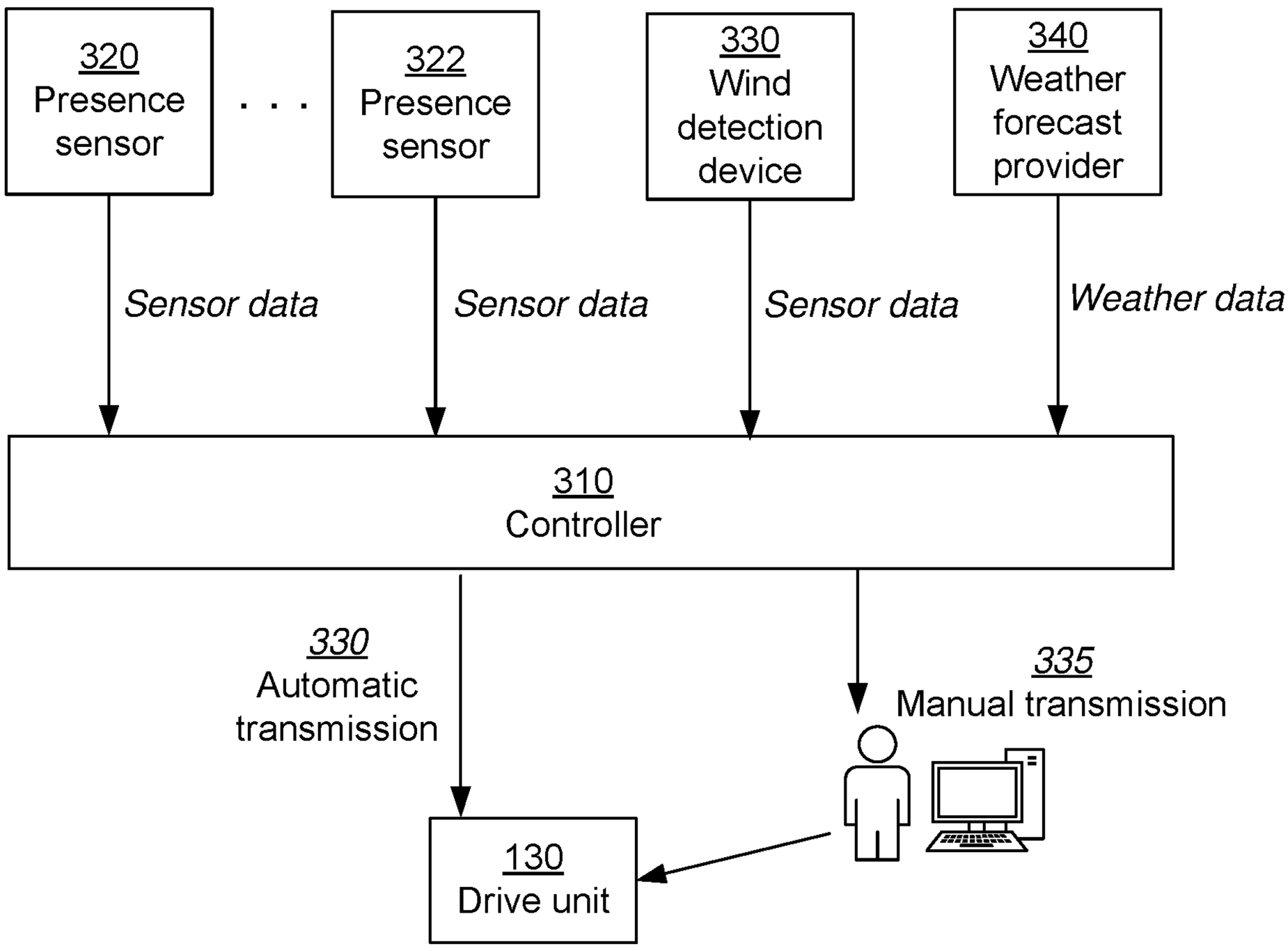


Figure 3B

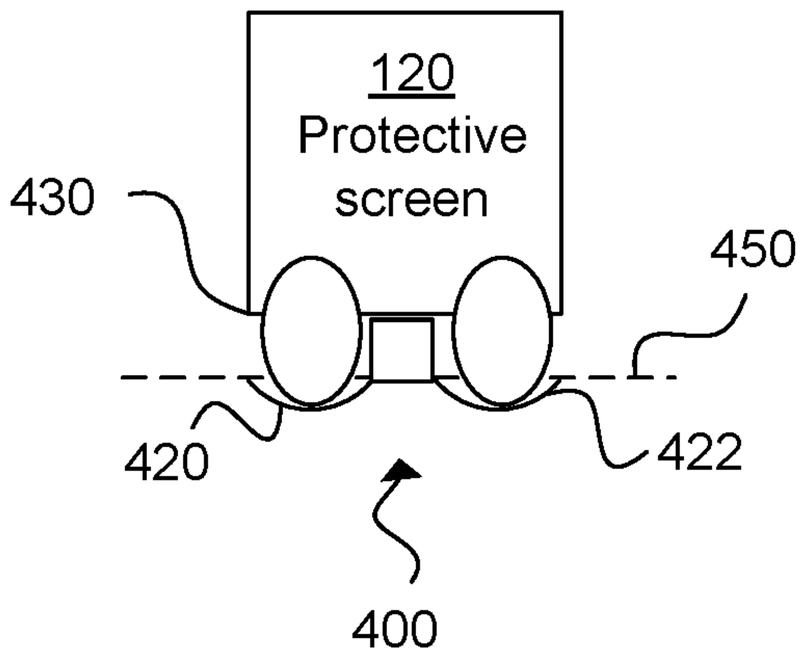


Figure 4A

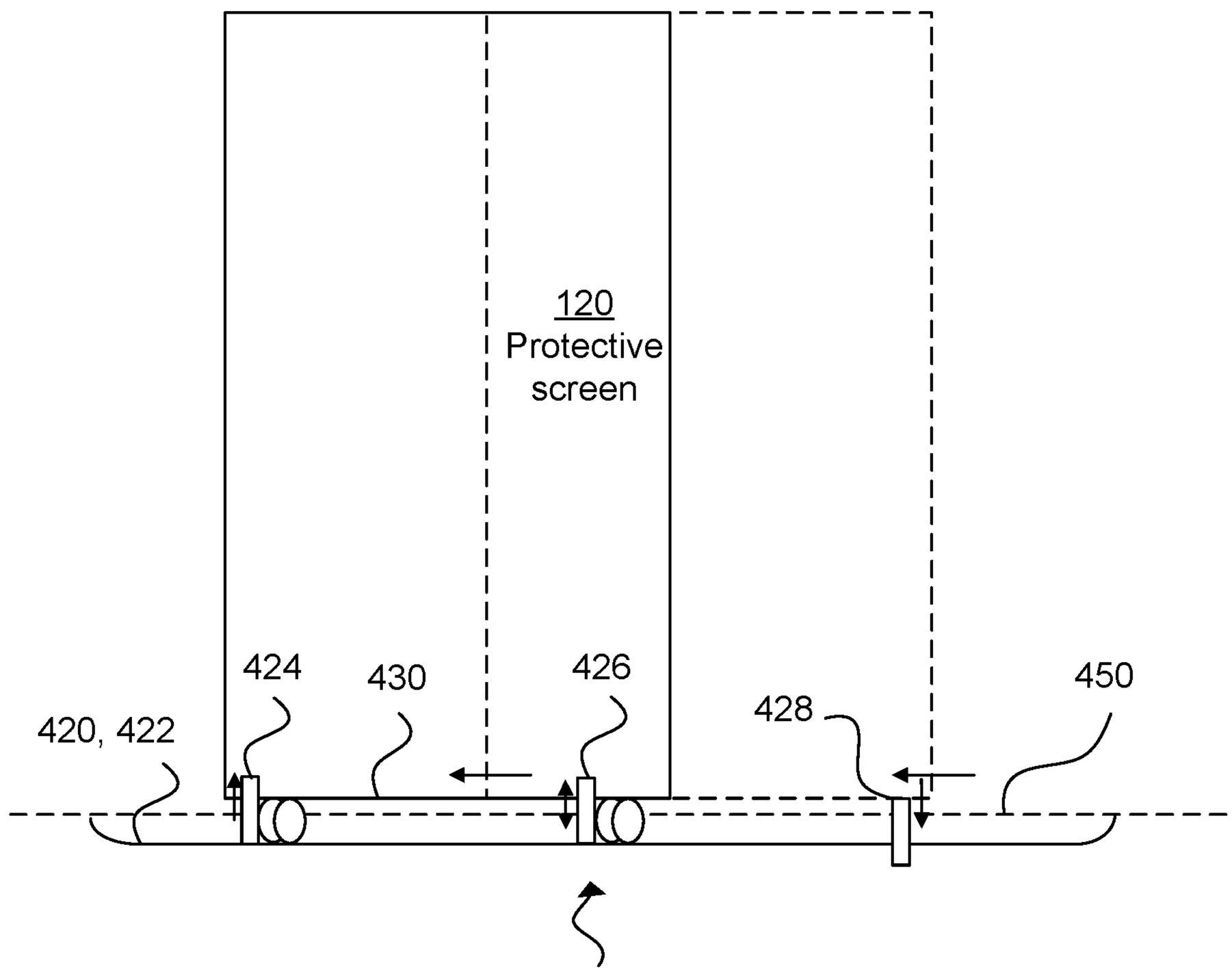


Figure 4B

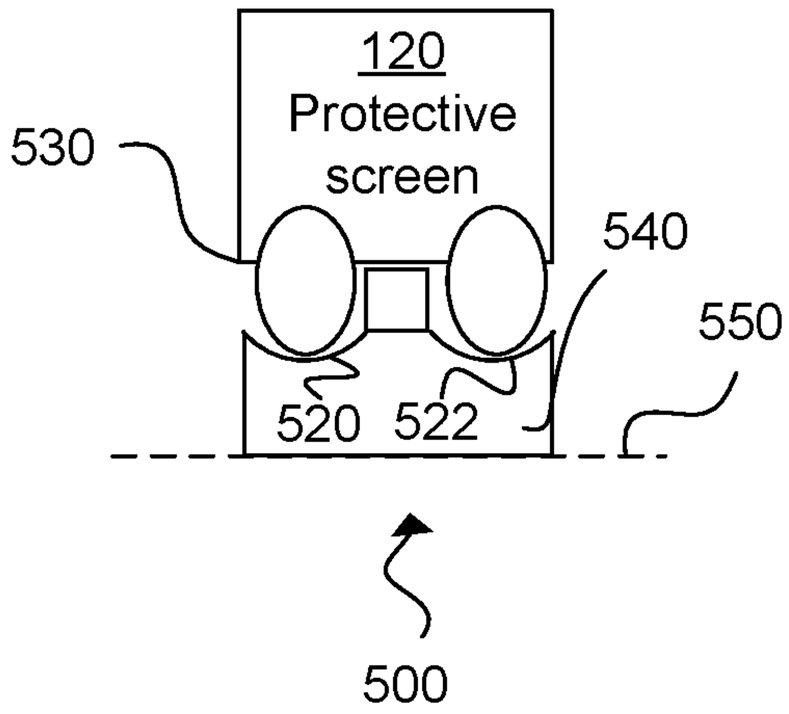


Figure 5A

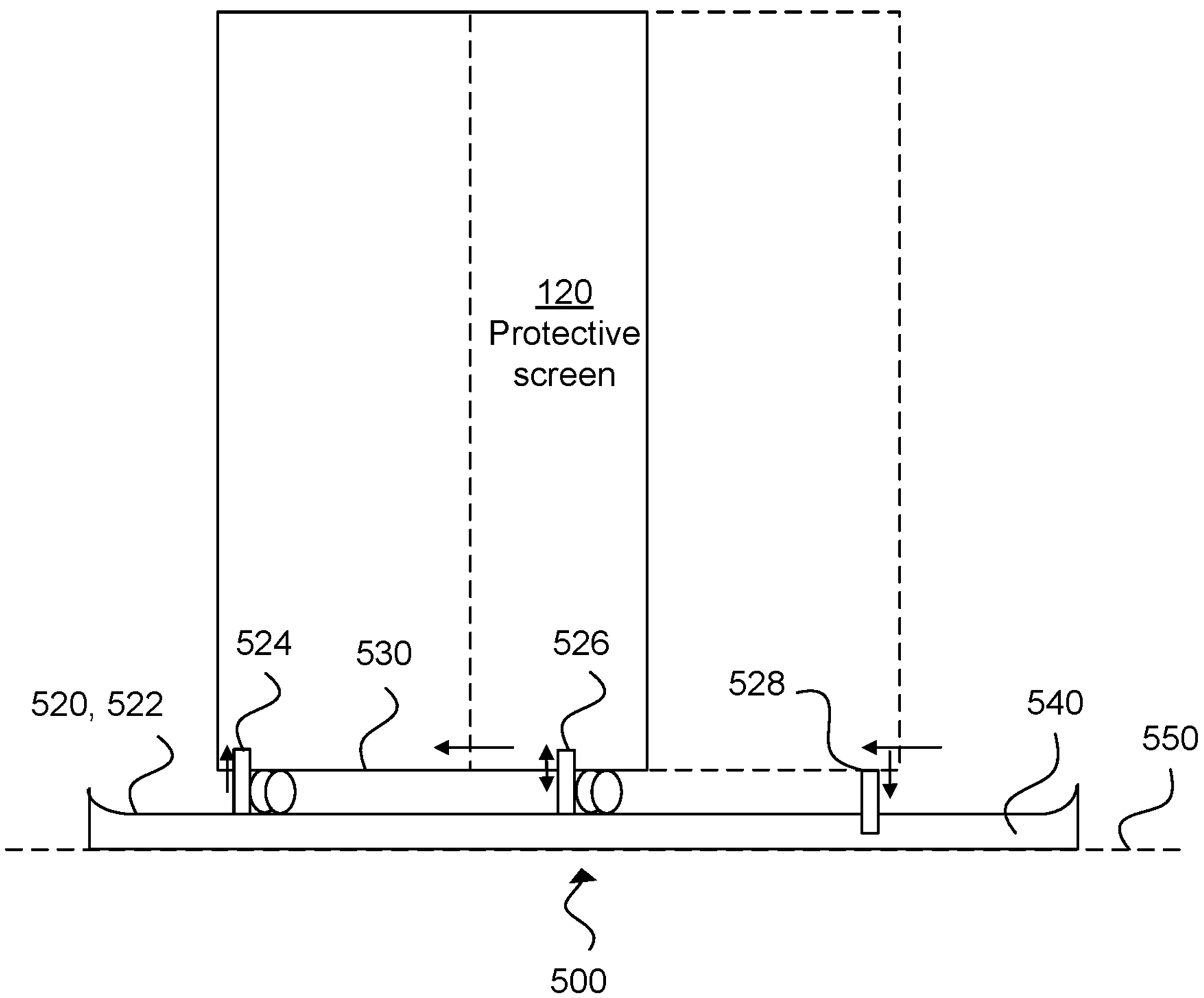


Figure 5B

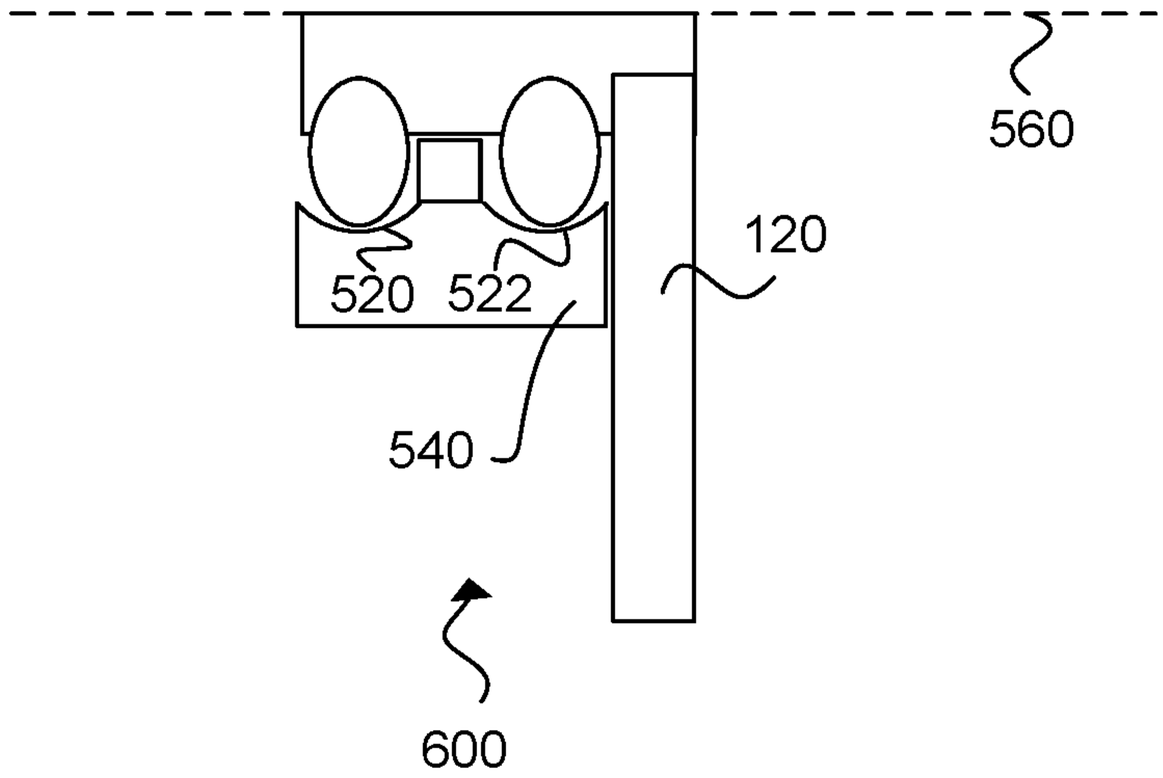


Figure 5C

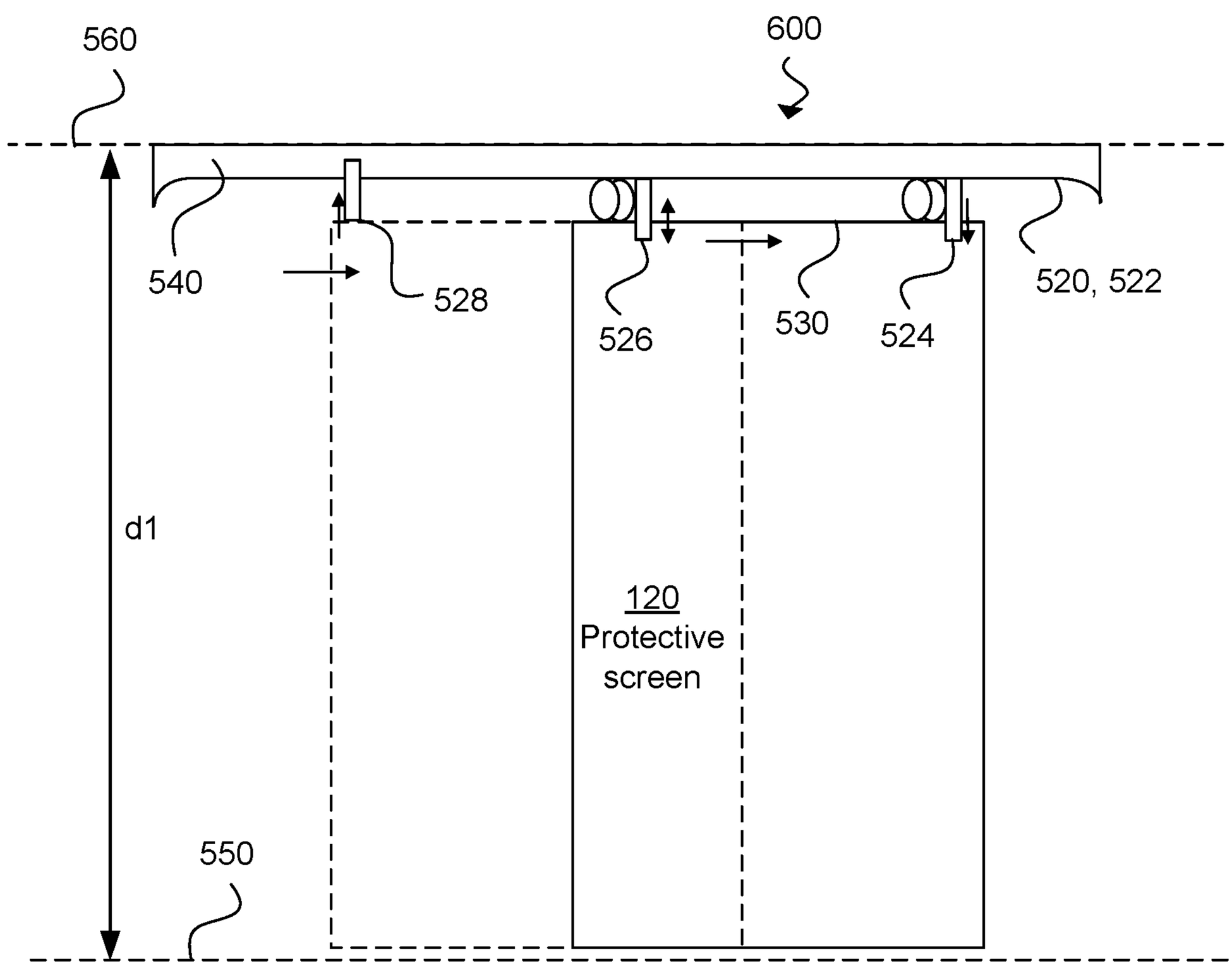


Figure 5D

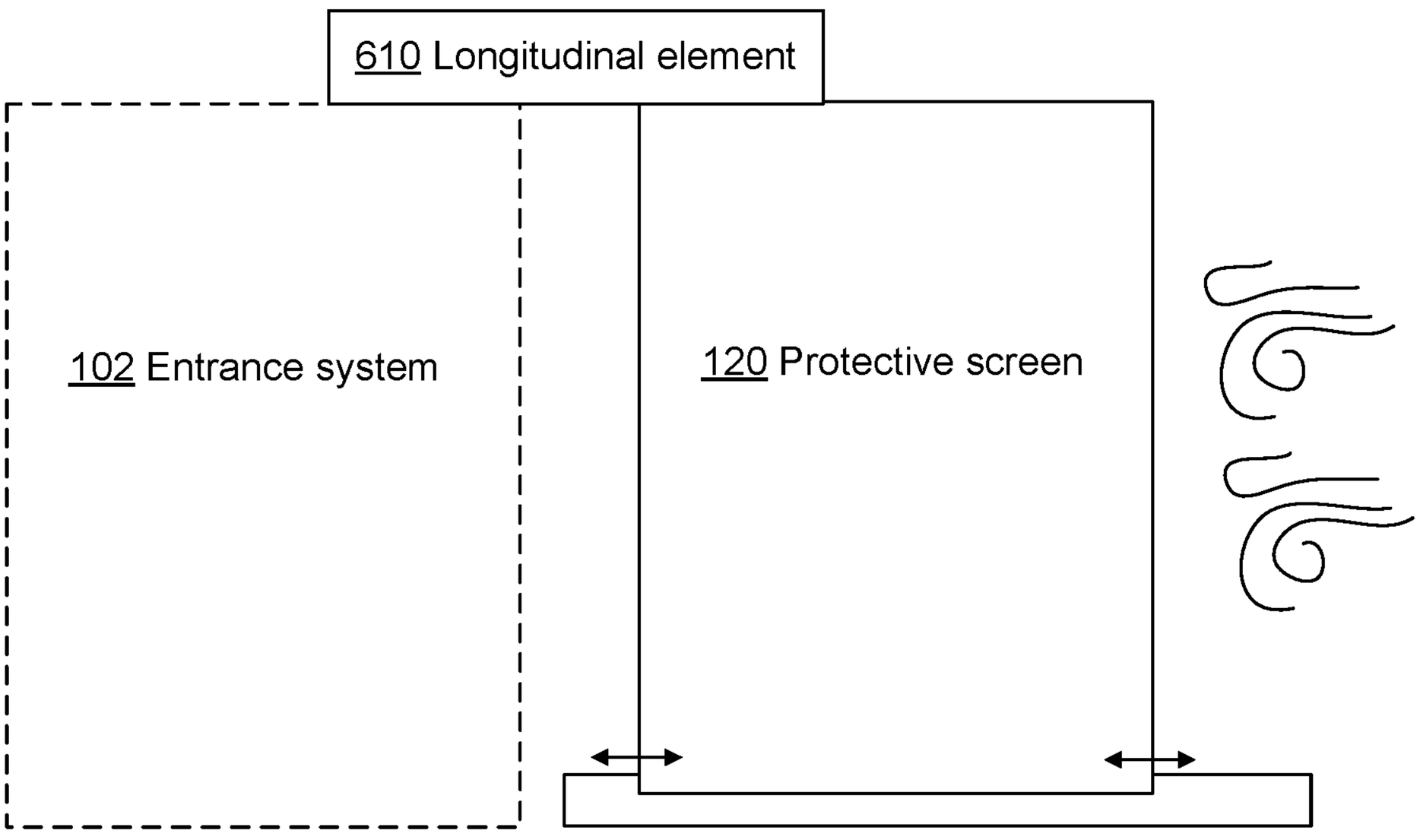

610 Longitudinal element
102 Entrance system
120 Protective screen

Figure 6

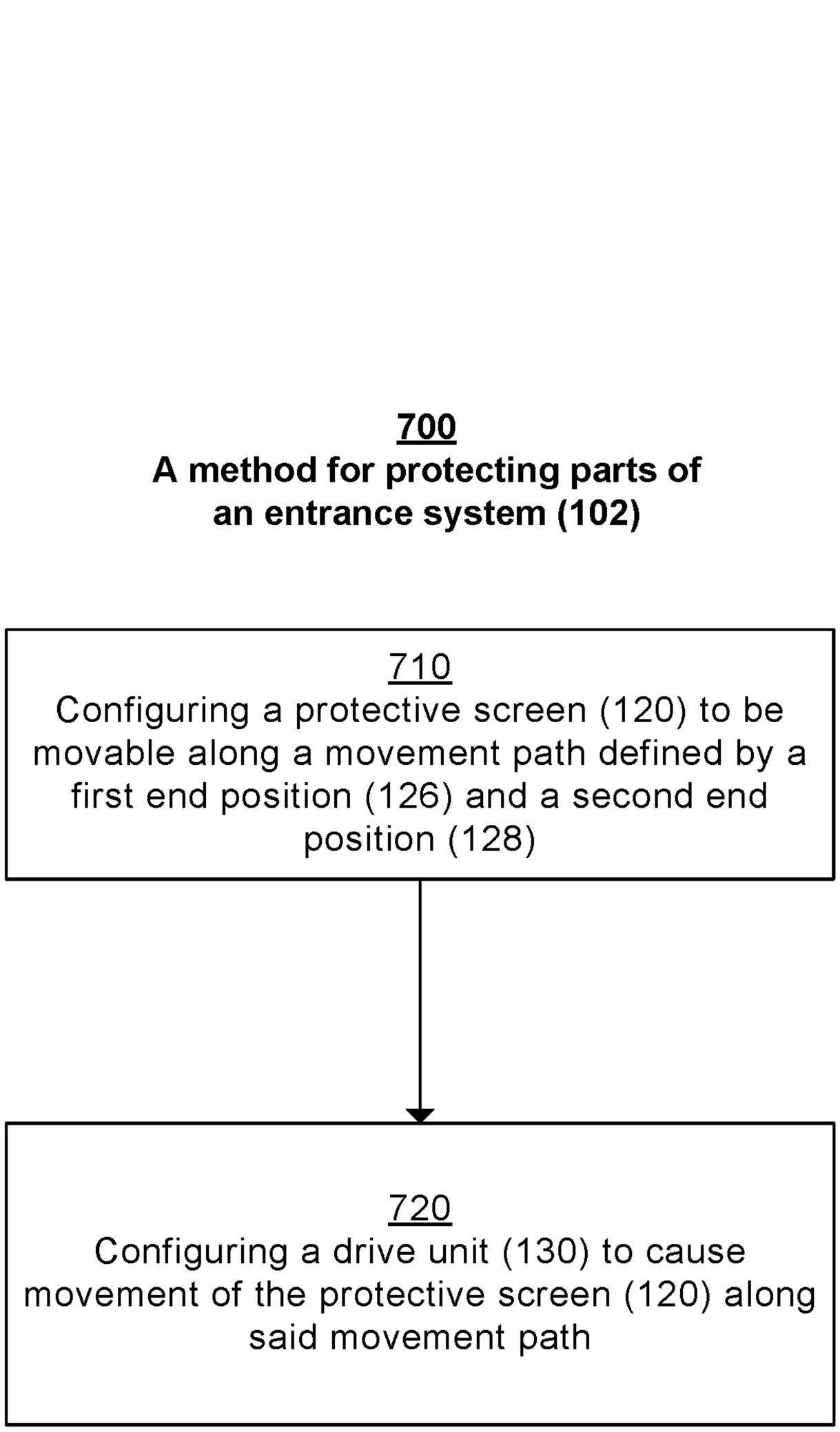

700
A method for protecting parts of an entrance system (102)
710
Configuring a protective screen (120) to be movable along a movement path defined by a first end position (126) and a second end position (128)
720
Configuring a drive unit (130) to cause movement of the protective screen (120) along said movement path

Figure 7

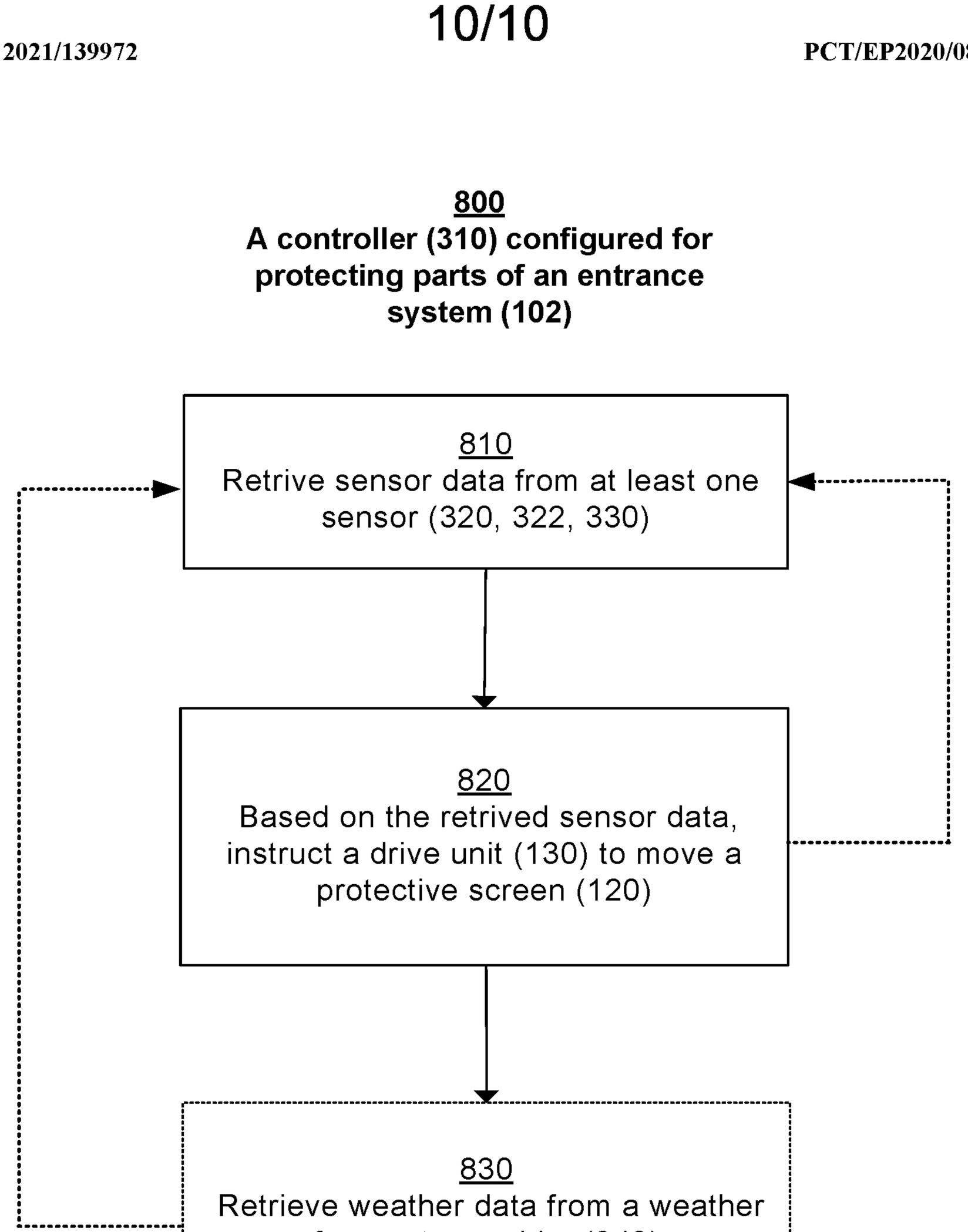

800
A controller (310) configured for protecting parts of an entrance system (102)
810
Retrive sensor data from at least one sensor (320, 322, 330)
820
Based on the retrived sensor data, instruct a drive unit (130) to move a protective screen (120)
830
Retrieve weather data from a weather forecasts provider (340)
840
Based on the retrived weather data, instruct the drive unit (130) to move the protective screen (120)

Figure 8

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2020/086232

A. CLASSIFICATION OF SUBJECT MATTER
INV. E05F15/71 E05F15/73 E06B9/68
ADD. E05D15/06

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)
E05F E06B E05D

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

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2007/097622 A1 (PESSERS HENRICUS JOHANNES RAYM [NL]) 30 August 2007 (2007-08-30) page 4, line 5 - line 7; figures 2A, 2B page 5, line 14 - line 25; figures 6-8 page 6, line 18 - page 7, line 1 -----	1-19
X	EP 0 715 676 A1 (BOON EDAM BV [NL]) 12 June 1996 (1996-06-12) column 2, line 18 - column 3, line 58; figures 1,2 -----	1-19
A	JP 2006 037395 A (MATSUSHITA ELECTRIC IND CO LTD) 9 February 2006 (2006-02-09) paragraphs [0007], [0013], [0026], [0031], [0048] - [0053], [0131], [0140]; figures 1-18 -----	5,19

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

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"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
4 March 2021	16/03/2021
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer Rémondot, Xavier

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2020/086232

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