System for operating a sliding door for a building.

The invention relates to a system for operating a sliding door for a building. The sliding door is suspended by at least one pivotable arm. The arm is at one end connected to a driven track along a façade of a building. On another end, the arm is connected to the sliding door. The connection between the arm and the door is guided by a guiding element that follows a track along the façade and near closing, is curved towards the door opening. This results in the door being pushed in the door opening. At the bottom, a further arm is provided that is pivotally connected to the door and directly connected to the upper door connection. In this way, a turn of the upper arm results in a similar turn of the further arm at the bottom.
System for operating a sliding door for a building

FIELD OF THE INVENTION
The invention relates to sliding doors in buildings and systems for operating such doors.

BACKGROUND OF THE INVENTION
Typical sliding doors for accessing buildings do not close a door opening by closing the door in line with a façade of the building. Such doors run in parallel to the façade and leave upon closing a gap between the side of the door and the façade. Though this gap can be covered with a rubber lining, influences of the weather may still enter the building, in particular stormy winds.

EP 0 916 794 A2 discloses a window or door arrangement for a building façade, where the door in closed position is flush with the fixed building element. The handling of the mobile sash requires various manual operations for opening and closing and in particular for fitting the mobile sash flush with the fixed building element.

OBJECT AND SUMMARY OF THE INVENTION
There is a need for a system for operating a sliding door in a more convenient need way.

The invention provides in a first aspect system for operating a sliding door for a building, said door closing a door opening in a façade of a building, comprising: a door slidable from a first position to a second position and vice versa, the second position being a position in which the door closes the door opening; at least a first top arm, at a first end of the first top arm pivotally connected to a first end of the top side of the door which first end is trailing when the door moves from the first position to the second position; a driving element for driving a second end of the first top arm, the second end of the first top arm being opposite to the first end, the driving element being arranged to drive the second end of the first top arm in a direction substantially parallel to the façade; a first top guiding element for guiding the first end of the first top arm while the door slides from the first position to the second position and vice versa, the first top guiding element being arranged to guide the first end of the first top arm while the door moves from the first position to the second position firstly over a trajectory substantially parallel to the façade and subsequently over a curved trajectory, the curve being directed towards the door opening; and a bottom arm pivotally connected at a first end of the bottom arm to the door at a first end of the bottom side of the door which first end is trailing when the
door moves from the first position to the second position, the first end of the bottom arm being connected to the first end of the first top arm by a connecting member, the bottom arm being pivotally connected to a bottom guiding element at a second end of the bottom arm being opposite to the first end of the bottom arm.

With the second end of the first top arm being driven in a linear way and the first end of the first top arm following a curved trajectory at the end of a trajectory for closing the door opening and the curvature being directed towards the door opening, the door is pushed in the door opening as a result of turning of the first top arm. Furthermore, by providing a connection at the lower end of the door, any imbalance of the sliding door that may result in tilting of the door off the plane of the façade is counterbalanced. The connection provided by the connecting member may also be employed by transferring the turn of the first top arm to the bottom arm. This enhances proper closing of the sliding door. This door is particularly suitable for being driven by a driving element, rather than being operated fully manually as is the case with many prior art sliding doors for buildings.

In an embodiment of the system according to the invention, while the first top arm travels along the substantially linear trajectory of the first top guiding element, the first top arm is substantially parallel to the first top guiding element.

An advantage of this embodiment is that over a significant trajectory of the sliding door traveling from the first towards the second position, the sliding door is kept in line with the driving element. As a result of this, any forces and moments that may result in tilting of the door with respect to the plane of the façade are kept relatively low compared to the first top guiding arm being for example perpendicular to the first top guiding element.

Another embodiment of the system according to the invention further comprises: a second top arm, at a first end of the second top arm mounted at or near a top edge of the door which edge is leading when the door moves from the first position to the second position and of which a second end and at a second end of the second top arm connected to the driving element; and a second top guiding element for guiding the first end of the second top arm while the door slides from the first position to the second position and vice versa.

With a second top arm, the sliding door is well suspended.
In a further embodiment of the system according to the invention, the first top guiding element and the second top guiding element are positioned at an angle between 0° and 10° with the door opening and wherein the first top guiding element and the second top guiding element are at least partially located parallel to one another.

This setup of both guiding elements enables the sliding door being slid in a position beyond the door opening.

In yet another embodiment of the system according to the invention, the angle of the first turn of the first top arm for closing the door effectuated by the curved trajectory of the first top guiding element is larger than the angle of a second turn of the bottom arm for closing the door.

In this embodiment, a torsion force is created in the connecting element, which torsion force acts upon the bottom arm. This torsion force is used to push the lower part of the sliding door in the door opening, improving closure of the door opening.

In yet a further embodiment of the system according to the invention, the bottom arm comprises a first segment and a second segment, the first segment and the second segment being connected at an angle of substantially 90°, the bottom arm being at a first end comprised by the first segment pivotally connected to the door and at a second end comprised by the second segment pivotally connected to the bottom guiding element.

This embodiment allows the sliding door to be closed within the door opening, without an indentation in the façade for accommodating the bottom arm.

**BRIEF DESCRIPTION OF THE DRAWINGS**

The invention and embodiments thereof will now be elucidated by means of Figures. In the Figures,

Figure 1 A shows a top view of a system for operating a sliding door in a building with the door in an open position;

Figure 1 B shows a top view a system for operating a sliding door in a building with the door in a closed position;
Figure 1 C shows a top view of a system for operating a sliding door in a building with the door in a closed position;

Figure 2 shows a front view of a system for operating a sliding door in a building with the door in an open position;

Figure 3 A shows a top view of a lower part of a sliding door system in a building with the door in an open position;

Figure 3 B shows a top view of a lower part of a sliding door system in a building with the door in a closed position;

Figure 3 C shows a side view of a lower guiding track of a sliding door system in a building;

Figure 3 D shows a top view of a lower part of a sliding door system in a building with the door in an open position;

Figure 3 E shows a top view of a lower part of a sliding door system in a building with the door in a closed position;

Figure 3 F shows a top view of a lower part of a sliding door system in a building with the door in an open position;

Figure 3 G shows a top view of a lower part of a sliding door system in a building with the door in a closed position;

Figure 4 A shows a top view of a system for operating a sliding door in a building with the door in an open position;

Figure 4 B shows a top view of a system for operating a sliding door in a building with the door in a closed position;

Figure 5 A shows a top view of a system for operating a sliding door in a building with the door in an open position; and
DESCRIPTION OF PREFERRED EMBODIMENTS

Figure 1 shows a top view of a system 100 for operating a sliding door 108. The sliding door 108 fits in a door opening 102 defined on a left side by a left façade part 104 and on the right side by a right façade part 106. The left façade part 104 and the right façade part 106 are drawn in a dashed line and the sliding door 108 is drawn in a dash-dotted line. Figure 1 A shows the sliding door 108 in an open position and Figure 1 B shows the sliding door 108 in a closed position; both Figures will be discussed in conjunction. In the open position, the sliding door 108 is located on the outside of a building of which the left façade part 104 and the right façade part 106 are part. Alternatively, the sliding door 108 is located on the inside of the building.

The sliding door 108 is at the top of the sliding door 108 connected to a first upper guiding arm 120 via a pivoting first upper door connection 124 on a trailing side of the sliding door 108, which trailing side is trailing when the sliding door 108 moves to the closed position. The pivoting first upper door connection 124 is connected at a first end of the first upper guiding arm 120. In this embodiment, the first upper door connection 124 is a cylindrical rod, though it may also be embodied as another element, preferably elongated, like a pipe or a bus.

The sliding door 108 is at the top of the sliding door 108 connected to a second upper guiding arm 130 via a pivoting second upper door connection 134 on a leading side of the sliding door 108, which leading side is leading when the sliding door 108 moves to the closed position. The pivoting second upper door connection 134 is connected at a first end of the second upper guiding arm 130.

The first upper guiding arm 120 is at a second end of the first upper guiding arm 120 connected to a conveyor track 110 via a pivoting first upper drive connection 122. In this embodiment, the first upper drive connection 122 is a cylindrical rod, though it may also be embodied as another element, preferably elongated, like a pipe or a bus. The conveyor track 100 is drawn in a dashed line. The second upper guiding arm 130 is at a second end of the second upper guiding arm 130 connected to the conveyor track 110 via a pivoting second upper drive connection 132 equivalent to the first upper drive connection 122.
The conveyor track 110 runs over a first spindle 112 and a second spindle 114. The conveyor track 110 revolves by driving either the first spindle 112 or the second spindle 114. In the embodiment shown by Figure 1 A and Figure 1 B, the conveyor track 110 runs on the outside of the building. Alternatively, the conveyor track 110 is located more towards the building as depicted by Figure 1 C.

The first upper door connection 124 is guided by a first upper guiding track 140. In this embodiment, the first upper guiding track 140 is a slit in a plate, for example comprised by a casing for covering the system 100, through which the first upper door connection 124 protrudes. The slit may be complemented by one or more guiding rails along the slit to enforce the first upper guiding track 140. The first upper guiding track 140 comprises a first trajectory 142 that is substantially straight and a second trajectory 144 that is curved towards the door opening 102. In this embodiment, the first trajectory 142 is substantially linear. In another embodiment, where a façade of a building has a curved shape, the first trajectory 142 is curved along the façade, providing a trajectory substantially parallel to the façade.

The second upper door connection 134 is guided by a second upper guiding track 150. The second upper guiding track 150 has in this embodiment characteristics equivalent to those of the first upper guiding track 140. The second upper guiding track 150 comprises a first trajectory 152 that is substantially straight and a second trajectory 154 that is curved towards the door opening 102. The second upper guiding track 150 guides the second upper door connection 134. In this embodiment, the first trajectories of the first upper guiding track 140 and the second upper guiding track 150 run substantially parallel to the conveyor track 110.

By driving the conveyor track 110 clockwise, the first upper guiding arm 120 and the second upper guiding arm 130 are taken along with the conveyor track by virtue of the first upper drive connection 122 and the second upper drive connection 132. The first upper guiding arm 120 and the second upper guiding arm 130 firstly run along in parallel to the conveyor track 110, as the first trajectories of the first upper guiding track 140 and the second upper guiding track 150, leading the first upper door connection 124 and the second upper door connection 134 run parallel to the conveyor track 110.

Upon the first upper door connection 124 and the second upper door connection 134 reaching the second curved trajectories of the first upper guiding track 140 and the second upper guiding track 150, the first upper door connection 124 and the second
upper door connection 134 move away from the conveyor track 110. This is because the first upper drive connection 122 and the second upper drive connection 132 follow the straight trajectory of the conveyor track 110. This results in swivelling of the first upper guiding arm 120 and the second upper guiding arm 130, with the first ends of the first upper guiding arm 120 and the second upper guiding arm 130 moving towards the door opening 102. As the sliding door 108 is connected to the first ends of the first upper guiding arm 120 and the second guiding arm 130, the sliding door 108 is pushed in the door opening 102, thus closing the door opening 102 with the sliding door 108 in line with the left façade part 104 and the right façade part 106. Preferably, this results in the frame of the sliding door 108 forming a planar plane with the left façade part 104 and the right façade part 106.

Figure 2 shows a front view of the system 100. In addition to elements already discussed in conjunction with Figure 1, Figure 2 shows an electromotor 116 for driving the conveyor track 110 via the first spindle 112. The first spindle 112 may be directly driven by the electromotor 116 or driven via one or more gears to adjust the rotation speed of the spindle 116 and the speed of the conveyor track 110. The first spindle 112 and the second spindle 114 are preferably provided as toothed wheels or axles, with the conveyor track 110 being toothed on the inner side of the conveyor track 110. In this way, slip of the conveyor track 110 is highly reduced compared to an embodiment without toothing. The conveyor track 110 is preferably provided in rubber or another elastic material, which may optionally be reinforced using further materials.

Furthermore, Figure 2 shows a lower guiding track 220 for guiding a lower guiding element 230 that is pivotally connected to the sliding door 108 at the trailing end of the sliding door 108. The first upper drive connection 122 is pivotally connected to a conveyor plate 118. This connection is preferably established by providing a bearing attached to the conveyor plate 118, in which the first upper drive connection 122 is rotatably fit. The conveyor plate 118 is fixed to the conveyor track 110, which means that the conveyor plate 118 travels along with the conveyor track 110. To provide additional support to the conveyor plate 118, the conveyor plate 118 is provided with bearings 172 that run over a rail 174 for supporting the conveyor plate 118. In this way, the conveyor plate 118 runs as a carriage over the rail 174, along with movements of the conveyor track 110.

Figure 2 also shows a coupling bar 182 for coupling the conveyor plate 118 to a further conveyor plate (not shown) to which the second upper drive connection 132 is
connected in the same way as the first upper drive connection 122 is coupled to the conveyer plate 118. In this way, the first upper drive connection 122 and the second upper drive connection 132 are substantially rigidly coupled. This ensures proper sliding and closing of the sliding door 108 and reduces wear and tear to the conveyer track 110. Additionally or alternatively to the coupling bar 182, the further conveyer plate is coupled to the conveyer plate 110.

Alternatively to the driving element comprising the conveyer track 110, the first spindle 112, the second spindle 114, the electromotor 118 and the conveyer plate 118, other driving mechanisms may be employed to embody the invention. For example, a toothed rack may be provided along the facade, along the left facade part 104, the right facade part 106, overarchng the door opening 102 with a carriage driven by for example an electromotor may be run. The first upper drive connection 122 would then be pivotally connected to the carriage.

The pivotal connection between the lower guiding element 230 and the sliding door 108 is in this embodiment established by connecting the lower guiding element 230 to the first upper door connection 124 via an elongating connecting rod 212, serving as a connecting member. The connecting rod 212 may be implemented by elongating the first upper door connection 124 or by connecting the connecting rod 212 to the first upper door connection 124, preferably in line with one another. The connecting rod 212 is free to rotate with respect to the sliding door 108, thus establishing a pivotal connection between the sliding door 108 and the first upper guiding arm 120, even when the connecting rod 212 is rigidly fixed to the first upper guiding arm 120. The connecting rod may be provided within the sliding door 108 or along (next to) the sliding door 108.

An advantage of the connecting rod 212 is that turning of the first guiding arm 120 is transferred to the lower guiding element 230 for enhancing closure of the sliding door 108. This will be discussed in further detail below. Another advantage of the connecting rod 212 connected to the lower guiding track 220 is that any momentum and/or change of momentum resulting in the sliding door 108 not being directly below the conveyer track 110 and/or the rail 174 is counterbalanced, preventing or at least reducing unwanted tilting of the sliding door 108.

This also means that support of the sliding door 108 at only one end of the bottom of the sliding door 108 is sufficient for properly guiding the sliding door 108 from an open to
the closed position and vice versa. This has an important additional advantage that
at the bottom of the door opening 102 no additional guiding rails or other indentations
and/or protrusions are required for guiding the sliding door 108; the lower guiding track
220 provided in the left façade part 104 has been proven to be sufficient. In this way, a
very convenient and accessible door opening 102 is provided, without obstacles over
which one would trip or that could be detrimental to the esthetical aspects of a building
in which the system 100 is fitted.

Figure 2 also discloses a casing plate 160 as part of a casing of the driving element of
system 100. As discussed in conjunction with Figure 1 A and figure 1 B, the first upper
guiding track 140 is in this embodiment provided by a slit in a casing and in particular by
a slit in the casing plate 160. The first upper guiding track 140 is reinforced by providing
rails 162 or other articulations along the first upper guiding track 140, preferably on both
sides. These articulations also provide improved guidance to the first upper door
connection 124 that, as discussed before, protrudes through the slit.

The sliding door 108 is connected to the upper door connection 124 by providing a
bearing like a thrust bearing 166 to the sliding door 108 at the top of the sliding door 108
as depicted schematically in Figure 2. The thrust bearing 166 is attached to the sliding
door 108 by means of welding, screwing, rivets, others or a combination thereof. Around
the upper door connection 124, a ring 164 is fixed, by means of welding, screwing,
rivets, other or a combination thereof. The ring 164 supports the thrust bearing 166 and
with that, the weight of the sliding door 108. Additionally or alternatively, the thrust
bearing 166 is secured to the upper door connection by means of circlips on both sides
of the thrust bearing 166. A person skilled in the art will appreciate that instead of or in
addition to the thrust bearing 166, also other bearing means can be used.

The force of the sliding door 108 acting on the upper door connection via the thrust
bearing 166 and the upper door connection 124 acts on the conveyor plate 118 and is
subsequently carried by the rail 174 that is connected to a façade of which the left
façade part 104 and the right façade part 106 form part. As already indicated, any
resulting horizontal forced are counterbalanced by the connecting rod 212 connected to
the lower guiding track 220 via the lower guiding element 230 at a lower end and the
conveyor plate 118 via the various connections at an upper end.
Figure 2 only shows the front view of the system 100 for the first upper guiding arm 120 with the first upper door connection 124; the second upper guiding arm 130 is embodied in an way analogous to the embodiment of the first upper guiding arm 120.

Figure 3 A through Figure 3 G show various variations of the lower guiding element 230. Figure 3 A through Figure 3 C show the left façade part 104, comprising the lower guiding track 220. Figure 3 A shows the sliding door 108 in an open position and Figure 3 B shows the sliding door 108 in a closed position. To the lower guiding track 220, a lower tracking element 302 is connected that is connected to the lower guiding track 220 by means of a guiding pin 304, depicted by Figure 3 C.

To the lower tracking element 302, a lower guiding arm 310 is connected. The lower guiding arm 310 comprises a first lower arm segment 312 and a second lower arm segment 314. The first lower arm segment 312 and the second lower arm segment 314 are rigidly connected at an angle of preferably substantially 90°. Alternatively, the first lower arm segment 312 and the second lower arm segment 314 are connected at an obtuse angle, preferably between 90° and 135°. In yet another alternative, the angle is sharp, though this is not preferred.

The lower guiding arm 310 is connected to the lower tracking element 302 via a pivotal first lower arm connection 316. The lower guiding arm 310 is connected to the sliding door 108 via a pivotal second lower arm connection 318. The pivotal second lower arm connection 318 is be established by connecting the lower guiding arm 310 to the connecting rod 212, either in a pivotal or rigid way. It is noted that even if the lower guiding arm 310 is rigidly connected to the connecting rod 212 at the pivotal second lower arm connection 318, the lower guiding arm 310 is still pivotally connected to the sliding door 108 as the connecting rod 212 is rotatably provided in the sliding door 108.

As already discussed, the first upper guiding arm 120 swivels upon closing the door opening 102 with the sliding door 108. The upper turn of the first upper guiding arm 120 upon closing the door opening 102 is preferably about 90° and is among others determined by the distance between the first upper drive connection 122 and the first upper door connection 124 on one hand - a first distance - and the distance between the right end of the first upper guiding track 140 and in particular the end of the second trajectory 144 and the conveyor track 110 on the other hand - a second distance. If the first distance is smaller than or equal to the second distance, the turn will be about 90°.
If the first distance is larger than the second distance, the turn will be less than 90°. In this way, the upper turn can be designed matching specific requirements.

By virtue of the connection between the first upper guiding arm 120 and the lower guiding arm 310 by means of the connecting rod 212, the guiding arm 310 swivels as well by a lower turn upon closure of the door opening 102. The lower turn is the angle between a first dotted line 300 in Figure 3 A and a second dotted line 301 in Figure 3 B. The angle of the lower turn is among others determined by the lengths of the first lower arm segment 312 and the second lower arm segment 314. By making the first lower arm segment 312 shorter and/or the second lower arm segment 314 longer, the angle of the lower turn can be increased. This implies that the angle of the lower turn is at least not entirely determined by the upper turn of the first upper guiding arm 120.

For proper closing of the door opening 102, it is preferred that the upper turn and the lower turn have approximately the same angle. However, by designing lower guiding arm 310 such that the angle of the lower turn is smaller than the angle of the upper turn, a torsion force is created in the connecting rod 212. This torsion force can be enhanced by connecting the connecting rod 212 to the first upper guiding arm 120 and the lower guiding arm 310 in a rigid, i.e. non-pivotal way. Additionally or alternatively, the torsion force can be determined by varying the difference between the upper turn and the lower turn. The actual force should be carefully engineered as a too high force may result in metal fatigue, deteriorating reliability of the system 100. On the other hand, the torsion force should be high enough to properly push the sliding door 108 in the door opening 102. The force required depends among others on the weight of the sliding door 180; a higher weight requires a larger force.

By means of the torsion force thus created, the force enhances closure of the door opening 102 by the sliding door 108 as the force in the connecting rod 212 acts upon the lower guiding arm 310, forcing the sliding door 108 into the door opening 102. This assures proper closing of the sliding door 108 well in line with the left façade part 106.

From Figure 3 B it can be seen that by providing the lower guiding arm 310 with the first lower arm segment 312 and the second lower arm segment 314 and in particular with an obtuse and more in particular a straight angle between both segments, the lower guiding arm 310 does not interfere with the outer corner of the left façade part 106, in Figure 3 B at the lower right of the left façade part 106. With the sliding door 108 in the door opening 102, the first lower arm segment 312 is parallel to the lower guiding track
220, slightly extending beyond the left façade part 106. In another embodiment, the first lower arm segment 312 is positioned at a certain angle with respect to the left façade part 106, either away from or towards the left façade part 106.

5 In this way, the lower guiding arm 310 and in particular the second lower arm segment 314 does not interfere with the left façade part 106. It is not relevant whether the angle between the first lower arm segment 312 and the second lower arm segment 314 is either 90° or obtuse. It will be apparent to a person skilled in the art that the angle does not necessarily has to be implemented as a hard angle, but can just as well be implemented as a curve having a certain angle, providing a smooth transition between with the first lower arm segment 312 and the second lower arm segment 314

Figure 3 D and Figure 3 E show another implementation of the lower guiding element 230. In the embodiment shown by Figure 3 D and Figure 3 E, a straight lower guiding arm 320 is connected to lower tracking element 302. As already indicated before, this results in the straight lower guiding arm 320 interfering with the outer corner of the left façade part 106. However, by providing an indentation in the outer corner of the left façade part 106, this issue can be mitigated or at least alleviated.

20 Figure 3 F and Figure 3 G show yet another implementation of the lower guiding element 230. In the embodiment shown by Figure 3 F and Figure 3 G, the lower tracking element 302 and a lower guiding arm, either straight or with an angle, is replaced by a single lower guiding arm 330 that is pivotally connected to in the lower guiding track 220 by a pivotal track connection 332 and a pivotal door connection 334. As with the embodiment discussed directly above, an indentation in the outer right corner of the left façade part 106 should be provided to accommodate the single lower guiding arm 330 upon closure of the door opening 102.

Figure 4 A discloses another embodiment of the system 100. Instead of having a straight trajectory parallel to the conveyor track 100 followed by a curved trajectory, the second upper guiding track 150 has one straight trajectory that is placed diagonally with respect to the conveyor track 110 and the door opening 102. This results in the second support arm 130 to swivel gradually over the whole trajectory of the second upper guiding track instead of only of the last part of the trajectory. A person skilled in the art will appreciate that with replacement of the partly straight, partly curved first upper guiding track 140, the left trailing edge of the sliding door 108 will collide with the left
façade part 106, preventing the sliding door 108 from closing the door opening 102. Therefore, such a replacement of the first upper guiding track 140 is not preferred.

Figure 5A shows yet another embodiment of the system 100. The first trajectory 142 of the first upper guiding track 140 and the first trajectory 152 second upper guiding track 150 still run substantially parallel to the conveyor track 110, though both first trajectories are slightly tilted with respect to the conveyor track 110. This enables the second upper guiding member to run partly parallel to the first upper guiding track 150. This, in turn, enables the sliding door 108 to be moved to the location depicted by Figure 5A, where the sliding door does not obscure the door opening 102. With the guiding tracks not running parallel and without overlapping trajectories, this would not be possible, as depicted by Figure 1A.

So far, embodiments of the invention have been presented with one single sliding door. A person skilled in the art will appreciated that the invention may also be embodied in a double door configuration, with two doors sliding towards one another for closing a door opening. By implementing the configuration as for example disclosed by Figure 1A and Figure 2 in a mirrored way, such double door configuration can be implemented.

Operating the doors, in particular activation of the electromotor 116 as depicted by Figure 2, may be controlled by a person manually operating the opening and/or closing of the door. Alternatively, sensors may be provided that sense any activity in front of a door opening. Upon detecting a person or a movement in general, an actuator controlling movement of the sliding doors may be triggered to open the sliding doors and to keep the doors open until no further movement is detected.

Expressions such as "comprise", "include", "incorporate", "contain", "is" and "have" are to be construed in a non-exclusive manner when interpreting the description and its associated claims, namely construed to allow for other items or components which are not explicitly defined also to be present. Reference to the singular is also to be construed in be a reference to the plural and vice versa.

In the description above, it will be understood that when an element such as layer, region or substrate is referred to as being "on", "onto" or "connected to" another element, the element is either directly on or connected to the other element, or intervening elements may also be present.
Furthermore, the invention may also be embodied with less components than provided in the embodiments described here, wherein one component carries out multiple functions. Just as well may the invention be embodied using more elements than depicted in the Figures, wherein functions carried out by one component in the embodiment provided are distributed over multiple components.

A person skilled in the art will readily appreciate that various parameters disclosed in the description may be modified and that various embodiments disclosed and/or claimed may be combined without departing from the scope of the invention.

It is stipulated that the reference signs in the claims do not limit the scope of the claims, but are merely inserted to enhance the legibility of the claims.
Conclusies

1. Systeem voor het bedienen van een schuifdeur voor een gebouw, welke deur is ingericht voor het sluiten van een deuropening in de façade van een gebouw, het systeem omvattende:
   a) Een deur schuifbaar van een eerste positie naar een tweede positie en vice versa, welke tweede positie een positie is waarin de deur de opening sluit;
   b) Ten minste een eerste top arm, aan een eerste einde draaibaar vervonden aan of nabij een eerste uiteinde van de bovenkant van de deur welke eerste uiteinde van de deur volgend is als de deur van de eerste positie naar de tweede positie beweegt;
   c) Een aandrijfelement voor het aandrijven van een tweede einde van de eerste top arm, welk tweede einde van de eerste top arm tegenover het eerste einde gelegen is, welk aandrijfelement is ingericht om het eerste einde van de eerste top arm aan te drijven in een richting welke in hoofdzaak parallel aan de façade is;
   d) Een eerste top geleidingselement voor het geleiding van het eerste einde van de eerste top arm als de deur van de eerste naar de tweede positie beweegt en vice versa, waarbij het eerste top geleidingselement is ingericht om als de deur van de eerste naar de tweede positie beweegt eerst over een in hoofdzaak lineair traject te geleiden dat in hoofdzaak parallel aan de façade is en vervolgens over een gebogen traject te geleiden, welke bocht naar de deur opening is gericht; en
   e) Een onderste arm welke draaibaar is vervonden aan een eerste einde van de onderste arm aan een eerste einde van de ondernend van de deur welk eerste einde volgend is als de deur van de eerste naar de tweede positie beweegt, waarbij het eerste einde van de onderste arm aan het eerste einde van de eerste top arm is verbonden met een verbindings-element, welke onderste arm draaibaar is verbonden aan een onderste geleidingselement aan een tweede einde van de onderste arm welk tegenover het eerste einde van de onderste arm is gelegen.

2. Systeem volgens conclusie 1, waarbij als de eerste top arm langs het in hoofdzaak lineaire traject van het eerste top geleidingselement beweegt, de eerste top arm in hoofdzaak parallel aan het eerste top geleidingselement is.
3. Systeem volgens conclusie 1, verder omvattende:
  a) Een tweede top arm, aan een eerste einde van de tweede top arm bevestigd aan of nabij een tweede uiteinde van de deur welk uiteinde leiding is als de deur van de eerste positie naar de tweede positie beweegt en van welke tweede top arm een tweede einde gelegen tegenover het eerste einde is verbonden met het aandrijfewelelement; en
  b) Een tweede top geleidingselement voor het geleiden van het einde van de tweede top arm als de deur van de eerste positie naar de tweede positie beweegt en vice versa.

4. Systeem volgens conclusie 3, waarbij de het tweede top geleidingselement is ingericht om het eerste einde van de tweede top arm, als de deur van de eerste positie naar de tweede positie beweegt, eerst over een traject te geleiden dat in hoofdzaak parallel aan de façade loopt en vervolgens over een gebogen traject te geleiden, welke bocht naar de deuropening is gericht.

5. Systeem volgens conclusie 3, waarbij het eerste top geleidingselement en het tweede top geleidingselement in elk geval gedeeltelijk parallel naast elkaar lopen ten opzichte van de façade een hoek maken tussen 0° en 10°.

6. Systeem volgens conclusie 1, waarbij de hoek van een eerste draai van de eerste top arm voor het sluiten van de deur aan de bovenkant van de deur geëffectueerd door het volgen van het gebogen traject door het eerste einde van de eerste top arm groter is dan de hoek van een tweede draai van de onderste arm voor het sluiten van de deur aan de onderkant van de deur.

7. Systeem volgens conclusie 6, waarbij het verschil tussen de eerste draai en de tweede draai in een van de volgende intervallen:

   a) 0° - 10°
   b) 0° - 5°
   c) 0° - 3°
   d) 0° - 1°

8. Systeem volgens conclusie 1, het aandrijfewelelement omvattende:
   a) Een stationaire aandrijfeenheid; en
   b) Een aandrijfband;
Waarbij de eerste top arm aan de aandrijfband is verbonden aan het tweede einde van de eerste top arm.

9. Systeem volgens conclusie 1, waarbij het verbindingselement vast is verbonden aan de eerste top arm en/of de onderste arm.

10. Systeem volgens conclusie 1, waarbij het verbindingselement een in hoofdzaak rechte staaf is.

11. Systeem volgens conclusie 1, waarbij de onderste arm een eerste segment en een tweede segment omvat, waarbij het eerste segment en het tweede segment zijn verbonden onder een in hoek die in hoofdzaak groter of gelijk is aan 90°, welke onderste arm aan een eerste uiteinde omvat door het eerste segment draaibaar is verbonden aan de deur en aan een tweede uiteinde draaibaar is verbonden aan het onderste geledingselement.

12. Systeem volgens conclusie 11, waarbij als de deur in de deuropening is geplaatst, het tweede segment in hoofdzaak parallel is aan de deur opening.

13. Systeem volgens conclusie 11, waarbij als de deur open is, de hoek tussen een lijn door de draaibare verbinding tussen de onderste arm en de deur en de draaibare verbinding tussen de onderste arm en het onderste geleidingselement aan de ene kant en de deur opening aan de andere kant in de volgende intervallen is:
   a) 80° - 90°
   b) 85° - 90°
   c) 87° - 90°
   d) 89° - 90°
**SAMENWERKINGSVERDRAG (PCT)**

**RAPPORT BETREFFENDE NIEUWHEIDSONDERZOEK VAN INTERNATIONAAL TYPE**

<table>
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<tr>
<th>IDENTIFICATIE VAN DE NATIONALE AANVRAGE</th>
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I. **CLASSIFICATIE VAN HET ONDERWERP** (bij toepassing van verschillende classificaties, alle classificatiesymbolen opgeven)

Volgens de internationale classificatie (IPC)

| E05D15/10 | E05F15/14 |

II. **ONDERZOCHTE GEBIEDEN VAN DE TECHNIEK**

Onderzochte minimumdocumentatie

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<th>Classificatiesysteem</th>
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Onderzochte andere documentatie dan de minimum documentatie, voor zover dergelijke documenten in de onderzochte gebieden zijn opgenomen

III. **GEEN ONDERZOEK MOGELIJK VOOR BEPAALDE CONCLUSIES** (opmerkingen op aanvullingsblad)

IV. **GEBREK AAN EENHEID VAN UITVINDING** (opmerkingen op aanvullingsblad)

Form PCT/ISA 201 A (11/2000)
ONDERZOEKRAPPORT BETREFFENDE HET
RESULTAAT VAN HET ONDERZOEK NAAR DE STAND
VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE

A. CLASSIFICATIE VAN HET ONDERWERP
INV. E05D15/10 E05F15/14
ADD.

Volgens de Internationale Classificatie van octrooien (IPC) of zowel volgens de nationale classificatie als volgens de IPC.

B. ONDERZOEKHOBIELEN VAN DE TECHNIEK

Onderzochte minimum documentatie (classificatie gevolgd door classificatiesymbolen)
E05D E05F

Onderzochte andere documentatie dan de minimum documentatie, voor dergelijke documenten, voor zover dergelijke documenten in de onderzochte gebieden zijn opgenomen

Tijdens het onderzoek geraadpleegde elektronische gegevensbestanden (naam van de gegevensbestanden en, waar uitvoerbaar, gebruikte trefwoorden)
EPO-Internal

C. VAN BELANG GEACHTTE DOCUMENTEN

<table>
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<tr>
<th>Categorie</th>
<th>Geciteerde documenten, eventueel met aanduiding van speciaal van belang zijnde passages</th>
<th>Van belang voor conclusie nr.</th>
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</table>

[ ] Verdere documenten worden vermeld in het vervolg van vak C.
[ ] Leden van dezelfde octrooifamilie zijn vermeld in een bijlage

* Speciale categoriën van aangehaalde documenten
* A* niet tot de categorie X of Y behorende literatuur die de stand van de techniek beschrijft
* D* in de octrooiaanvraag vermeld
* E* eerdere octrooiaanvraag, gepubliceerd op of na de indieningsdatum, waarin dezelfde uitvinding wordt beschreven
* L* om andere redenen vermelde literatuur
* O* niet-schriftelijke stand van de techniek
* P* tussen de voorrangsdatum en de indieningsdatum gepubliceerd

Datum waarop het onderzoek naar de stand van de techniek van internationaal type werd voltrokken

24 augustus 2011

Nummer van het verzoek om een onderzoek naar de stand van de techniek
NL 2005836

Naam en adres van de instantie
European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax (+31-70) 340-3016

De bevoegde ambtenaar
Guillaume, Geert

Formuler: PCT/ISA/201 (tweede blad) (January 2004)
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<td>FR 2805242 A1</td>
<td>24-08-2001</td>
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This opinion contains indications relating to the following items:

- **✓** Box No. I  Basis of the opinion
-  Box No. II  Priority
-  Box No. III  Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
-  Box No. IV  Lack of unity of invention
-  Box No. V  Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
-  Box No. VI  Certain documents cited
-  Box No. VII  Certain defects in the application
-  Box No. VIII  Certain observations on the application
WRITTEN OPINION

Box No. I  Basis of this opinion

1. This opinion has been established on the basis of the latest set of claims filed before the start of the search.

2. With regard to any nucleotide and/or amino acid sequence disclosed in the application and necessary to the claimed invention, this opinion has been established on the basis of:
   a. type of material:
      □ a sequence listing
      □ table(s) related to the sequence listing
   b. format of material:
      □ on paper
      □ in electronic form
   c. time of filing/furnishing:
      □ contained in the application as filed.
      □ filed together with the application in electronic form.
      □ furnished subsequently for the purposes of search.

3. □ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

4. Additional comments:

Box No. V  Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

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2. Citations and explanations
   see separate sheet

NL237B (July 2006)
Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1 Reference is made to the following documents:
   D2 WO 01/62586 A1 (BARAT [FR]; PROVOST CHRISTIAN [FR]) 30 augustus 2001 (2001-08-30)

2 To avoid a lack of clarity, the expressions "first top guiding element" and "bottom guiding element" in lines 13 and 25 of claim 1, should have been defined as "first upper guiding track (140)" and "lower guiding track (220)", (see description page 6/line 7 and page 7/line 24), to clarify the meaning of "curved trajectory" and "trajectory substantially parallel".

3 The present application does not meet the criteria of patentability, because the subject-matter of claim 1 is not new for the following reasons:

Document D1 discloses (bladzijde 9, regel 17 - bladzijde 13, regel 15; figuren 1-5) an operating system for a sliding door comprising all the features of claim 1; see especially:

- slidable door (1);
- a first top arm (15), connected to the top side and at the trailing end of the door (1), has two opposed ends (16,17) with a first end (17) pivotally connected to the sliding door (1);
- a driving element (21) drives the second end (16) of the first top arm (15) substantially parallel to the facade;
- the said first end (17) of the said first top arm (15) is guided in a first top guiding element (20) having a trajectory parallel (35) to the facade and a curved trajectory (35) directed towards the door opening;
- the said first end (17) of the first top arm (15) is connected by a connecting member (14) to a first end of a bottom arm (25) guided with a second end (24) in a bottom guiding element (23).
Dependent claims 2-13 are regarded not to contain any additional features which, in combination with the features of any claim to which they refer, meet the requirements of novelty and/or inventive step, as these features are already known from the documents cited in the search report or represent merely a matter of normal design procedure.