



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
21.11.2018 Bulletin 2018/47

(51) Int Cl.:
B66B 13/14 ^(2006.01) **E05F 15/40** ^(2015.01)
E05F 15/70 ^(2015.01)

(21) Application number: **17171431.4**

(22) Date of filing: **17.05.2017**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
MA MD

(72) Inventors:
• **KATTAINEN, Ari**
00330 HELSINKI (FI)
• **AITAMURTO, Juha-Matti**
00330 HELSINKI (FI)
(74) Representative: **Berggren Oy, Helsinki & Oulu**
P.O. Box 16
Eteläinen Rautatiekatu 10A
00101 Helsinki (FI)

(71) Applicant: **KONE Corporation**
00330 Helsinki (FI)

(54) **A DOOR CONTROL UNIT AND A METHOD FOR CONTROLLING AN OPERATION OF AN AUTOMATIC DOOR**

(57) The invention relates to a door control unit (200) for an automatic door comprising a first control unit (210) and a second control unit (220). The second control unit (220) is configured to obtain at least one value representing an operational state of the automatic door; determine on a basis of the obtained at least one value at least one operating parameter of the automatic door; determine if the at least one operating parameter of the automatic

door meets at least one predefined threshold value; and generate a control signal, in response to the at least one operating parameter of the automatic door meeting the at least one predefined threshold value, in order to control the operation of the automatic door. The invention also relates to a method for controlling an operation of an automatic door.

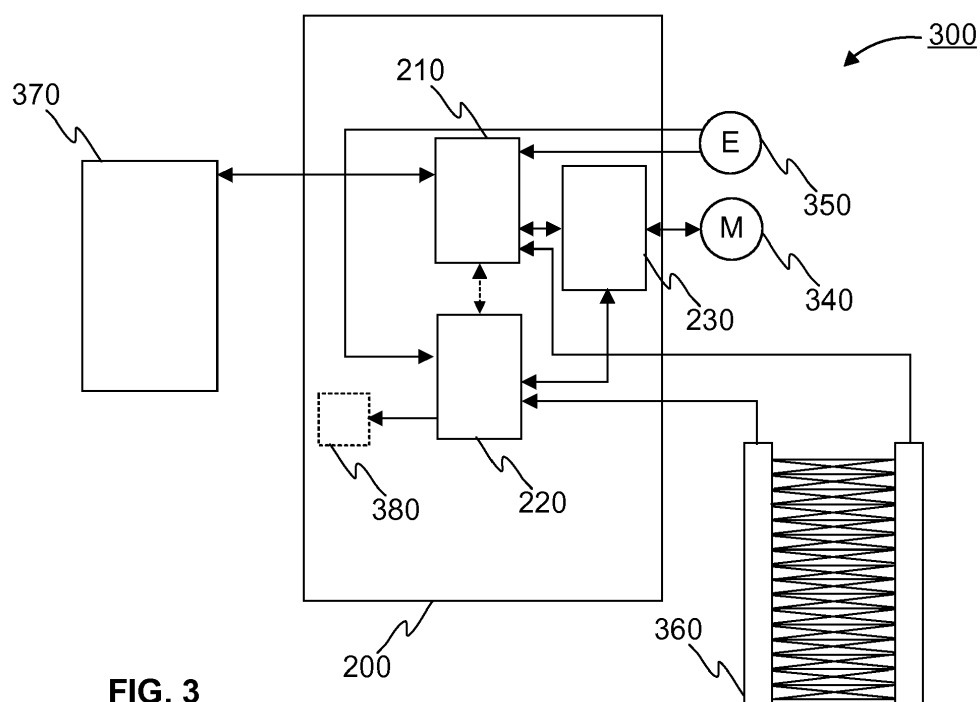


FIG. 3

Description

TECHNICAL FIELD

[0001] The invention concerns in general the technical field of an automatic door technology. Especially the invention concerns enhancing the safety of the automatic door.

BACKGROUND

[0002] Automatic doors are used in a variety of environments, such as in elevators and in buildings. The automatic doors refer to door solutions in which the door is configured to be operated without specific action by a user of the door. Such operation requires that the door system comprises a sensor configured to provide some information to a door control unit in order to determine if the door shall be activated or not. In case of activation the door control unit is configured to deliver a control signal to a door motor in order to move the door in a desired way.

[0003] Regarding requirements set for the automatic doors it is so that on one hand the automatic door must be fast opening and fast closing and on the other hand the automatic door must be safe and not cause any danger or damage to the passenger and/or freight.

[0004] For the safety reason, an aperture of the automatic door must be monitored as referred above. If an object, such as a person, is observed in the aperture of the automatic door or the object is entering into the aperture of the automatic door, when the door is closing, the closing of the door must be stopped or the movement of the door must be slowed down to prevent damage to a life, health or property being caused by the closing door.

[0005] For example, in case of elevators, the European Standard EN 81-20:2014 "Safety rules for the construction and installation of lifts" defines more precise requirements for how the opening of a moving door must be monitored. The standard in question is based on European Parliament and Council Directive 95/16/EC on the 25 approximation of the laws of the Member States relating to lifts, which describes the requirements to be set for new electrically-operated passenger elevators and freight elevators in the European Economic Area.

[0006] The standard in question defines that in the closing direction of the automatic door the kinetic energy of the mechanical parts fixed to the door that is calculated or measured using the average closing speed must not exceed 10 J; the closing force must be limited to 150 N; and a safety equipment must automatically activate the re-opening of the door, if a person bypasses the aperture of the door, when the door is closing. Additionally, in case of automatic door made of glass, the European Standard EN 81-20:2014 defines that the closing force must be limited to 150 N also in the opening direction of the automatic door.

[0007] Fig. 1 illustrates one example of a door control

system of an automatic door used in an elevator. A door control unit 100 comprises a control unit 110 and a power stage 130. The control unit 110 of the door control unit 100 is configured to control the speed, force, and kinetic energy of the automatic door by measuring the speed and current consumption of the motor 140 of the automatic door by means of an encoder 150 and power stage 130. Additionally, the control unit 110 of the door control unit 100 monitors a curtain of light 160 comprising at least one light sensor, which is configured to obtain information from the aperture of the door. If the at least one light sensor 160 observes an object in the aperture of the door, the control unit 100 generates a signal to an elevator control unit 170, which is configured to provide a door-open or a door-close command. The control unit 110 may be implemented as a microcontroller, for example.

[0008] One drawback of the prior art solution is that even a single failure in the door control unit may cause uncontrollably strong closing or opening of the door, which, in turn, may cause danger or damage to the passenger and/or freight. The controlling of the automatic door shall preferably be implemented so that a single failure does not cause danger situations. Reliable door control solutions are important especially for the manufacturers of the automatic doors, because if the door control solution is implemented inadequately or failure sensitively and the automatic door causes an injury to the passenger, the manufacturer of the automatic door has the liability for damages. Thus, more reliable and safer solutions for a door control of the automatic door need to be developed. This is important especially if the safety rules defined by the standards will be tightened even more in the future as well as the liability of the manufacturer.

[0009] Hence, there is need to develop further solutions in order to mitigate the described drawbacks at least partly.

SUMMARY

[0010] An objective of the invention is to present a door control unit and a method for an automatic door. Another objective of the invention is that the door control unit and the method for the automatic door improve the safety of the automatic door.

[0011] The objectives of the invention are reached by an automatic door and a method as defined by the respective independent claims.

[0012] According to a first aspect, a door control unit for an automatic door comprising a first control unit and a second control unit is provided, wherein the second control unit is configured to: obtain at least one value representing an operational state of the automatic door; determine on a basis of the obtained at least one value at least one operating parameter of the automatic door; determine if the at least one operating parameter of the automatic door meets at least one predefined threshold value; and generate a control signal, in response to the

at least one operating parameter of the automatic door meeting the at least one predefined threshold value, in order to control the operation of the automatic door.

[0013] The at least one operating parameter of the automatic door may be at least one of the following: speed, force, kinetic energy.

[0014] The second control unit may be configured to obtain the at least one value representing the operational state of the automatic door from at least one of the following: at least one encoder mounted in connection with the door motor, power stage of the door control unit, at least one acceleration sensor arranged in the automatic door.

[0015] The control signal may comprise an instruction for the first control unit to adjust an operation of a door motor of the automatic door.

[0016] The second control unit may further be configured to: determine if the at least one operating parameter of the automatic door continues meeting the threshold value during a predefined time; and generate a second control signal, in response to the at least one operating parameter of the automatic door continue meeting the predefined threshold value, in order to control the operation of the automatic door.

[0017] The second control unit may further be configured to: determine if the at least one operating parameter of the automatic door meets a second predefined threshold value; and generate a second control signal, in response to the at least one operating parameter of the automatic door meeting the second predefined threshold value, in order to control the operation of the automatic door.

[0018] The second control signal may comprise an instruction for a power stage of the door control unit to shut down an operation of the door motor of the automatic door.

[0019] Alternatively, the control signal may comprise an instruction for a power stage of the door control unit to shut down an operation of the door motor of the automatic door.

[0020] The first control unit and/or the second control unit may be implemented as a microcontroller.

[0021] According to a second aspect, a method for controlling an operation of an automatic door is provided, wherein the method comprises: obtaining at least one value representing an operational state of the automatic door; determining on a basis of the obtained at least one value at least one operating parameter of the automatic door; determining if the at least one operating parameter of the automatic door meets at least one predefined threshold value; and generating at least one control signal, in response to the at least one operating parameter of the automatic door meeting the at least one predefined threshold value, in order to control the operation of the automatic door.

[0022] The at least one operating parameter of the automatic door may be at least one of the following: speed, force, kinetic energy.

[0023] The method may further comprise obtaining the at least one value representing the operational state of the automatic door from at least one of the following: at least one encoder mounted in connection with the door motor, power stage of the door control unit, at least one acceleration sensor arranged in the automatic door.

[0024] The control signal may comprise an instruction for the first control unit to adjust an operation of a door motor of the automatic door.

[0025] The method may further comprise: determining if the at least one operating parameter of the automatic door continues meeting the threshold value during a predefined time; and generating a second control signal, in response to the at least one operating parameter of the automatic door continue meeting the predefined threshold value, in order to control the operation of the automatic door.

[0026] The method may further comprise: determining if the at least one operating parameter of the automatic door meets a second predefined threshold value; and generating a second control signal, in response to the at least one operating parameter of the automatic door meeting the second predefined threshold value, in order to control the operation of the automatic door.

[0027] The second control signal may comprise an instruction for a power stage of the door control unit to shut down an operation of the door motor of the automatic door.

[0028] Alternatively, the control signal may comprise an instruction for a power stage of the door control unit to shut down an operation of the door motor of the automatic door.

[0029] The exemplary embodiments of the invention presented in this patent application are not to be interpreted to pose limitations to the applicability of the appended claims. The verb "to comprise" is used in this patent application as an open limitation that does not exclude the existence of also un-recited features. The features recited in depending claims are mutually freely combinable unless otherwise explicitly stated.

[0030] The novel features which are considered as characteristic of the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objectives and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings.

BRIEF DESCRIPTION OF FIGURES

[0031] The embodiments of the invention are illustrated by way of example, and not by way of limitation, in the figures of the accompanying drawings.

Figure 1 illustrates a door control system of an automatic door used in an elevator according to a prior art.

Figure 2 illustrates schematically a simplified view of an example of a door control unit according to the invention.

Figure 3 illustrates schematically an example a door control system, wherein the embodiments of the invention may be implemented.

Figure 4 illustrates schematically an example configuration of encoder according to the invention.

Figure 5 illustrates schematically an example of the method according to the invention.

Figure 6A and 6B illustrate schematically further examples of the method according to the invention.

DESCRIPTION OF SOME EMBODIMENTS

[0032] Figure 2 discloses a simplified view of an example of a door control unit 200 for an automatic door according to the invention. The door control unit 200 according to the invention comprises a first control unit 210, a second control unit 220 and a power stage 230 among any other entities. The first control unit 210 corresponds to the control unit 110 illustrated in Figure 1. The first control unit 210 is configured to control the operation of the automatic door, such as the speed, force and/or kinetic energy of the automatic door as described in the context of Figure 1. Furthermore, the door control unit 200 may comprise a communication interface and possibly one or more user interfaces. The communication interface may provide interface for communication with any external unit, such as an elevator control unit, for example. The components of the door control unit 200 may be communicatively coupled to each other, e.g. via an internal bus.

[0033] The second control unit 220 is configured to control the operation of the first control unit 210. The second control unit 220 is configured to obtain at least one value representing an operational state of the automatic door. The at least one value representing the operational state of the automatic door may be e.g. speed of a door motor 240, current consumption of the door motor 240, acceleration of the automatic door. The second control unit 220 is further configured to determine at least one operating parameter of the automatic door on a basis of the obtained at least one value representing the operational state of the automatic door. The operating parameter of the automatic door may be at least one of the following: speed, force, kinetic energy.

[0034] Further, the second control unit 220 is configured to determine if the at least one operating parameter of the automatic door meets at least one predefined threshold value. If it is determined that the at least one operation parameter of the automatic door meets the at least one predefined threshold value, the second control unit 220 is configured to generate a control signal in order

to control the operation of the automatic door. The control signal may comprise an instruction for the first control unit 210 to adjust an operation of the door motor 340 of the automatic door. The instruction may be an instruction to adjust the speed, current, and/or force of the door motor 340 of the automatic door, for example.

[0035] Alternatively or additionally, the control signal may comprise an instruction for the power stage 230 of the door control unit 200 to shut down an operation of the door motor 340 of the automatic door. If the control signal is provided for the power stage 230 the communicative coupling between the first control unit 210 and the second control unit 220 is only optional. The optional communicative coupling is illustrated in Figures 2 and 3 with an arrow having dashed line.

[0036] According to an embodiment of the invention after the adjustment of the operation of the door motor 340 of the automatic door the second control unit 220 may further be configured to determine if the at least one operating parameter of the automatic door continues meeting the predefined threshold value during a predefined time. The second control unit 220 may further be configured to generate a second control signal for the power stage 230 of the door control unit 200 in order to control the operation of the automatic door in response to the at least one operating parameter of the automatic door continues meeting the predefined threshold value. Alternatively or in addition, after the adjustment of the operation of the door motor 240 the second control unit 220 may be configured to determine if the at least one operating parameter of the automatic door meets a second predefined threshold value. The second predefined threshold value is higher than the first predefined threshold value. The second control unit 220 may further be configured to generate the second control signal for the power stage 230 of the door control unit 200 in order to control the operation of the automatic door in response to that the at least one operating parameter meets the second predefined threshold value. The second control signal may comprise an instruction to shut down an operation of the door motor 240 of the automatic door. The features of the embodiment may be used in combination with any of the embodiments of the invention.

[0037] Figure 3 discloses an example of the door control system 300 according to the invention, wherein the embodiments of the invention may be implemented. The door control system 300 shown in Figure 3 comprises the door control unit 200, the door motor 240, at least one encoder 350, an elevator control unit 370, and a curtain of light 360. The door control unit 200 comprises the first control unit 210, the second control unit 220, and the power stage 240 as described earlier. The second control unit 220 may be configured to obtain the at least one value representing the operational state of the automatic door from at least one of the following: at least one encoder 350 mounted in connection with the door motor 240, power stage 230 of the door control unit 200, at least one acceleration sensor arranged in the automatic door.

For sake of clarity the acceleration sensor and the automatic door are not shown in Figure 3. The value representing the operational state of the automatic door obtained from the power stage 230 of the door control unit 200 is the current consumption of the door motor 240. The value representing the operational state of the automatic door obtained from at least one acceleration sensor is acceleration of the automatic door. The value representing the operational state of the automatic door obtained from the at least one encoder is the speed of the door motor 240. The at least one encoder 350 may comprise at least one sensor, such as Hall sensor or optical sensor, for example. Advantageously, the speed of the automatic door may be arranged to be measured with one encoder comprising three sensors. The sensors may be arranged in the encoder advantageously so that one sensor 350a is connected to the second control unit 220 and two sensors 350b, 350c are connected to the first control unit 210 as shown in Figure 4. The number of the sensors is not limited, although in Figure 4 the number of the sensors is three. The features of the embodiment may be used in combination with any of the embodiments of the invention.

[0038] Furthermore, according to the invention the first control unit 210 is arranged to monitor the curtain of light 360 comprising at least one light sensor, which is configured to obtain information from an aperture of the door. When the at least one light sensor observes an object in the aperture of the door, the curtain of light 360 is arranged to provide a signal indicating the status information of the at least one light sensor to the first control unit 210. In response to the signal indicating the status information of the at least one light sensor, the first control unit 210 is configured to generate at least one control signal to the elevator control unit 370, which, in turn, is configured to provide a door- open/door-close command to the first control unit 210 in order to control the operation of the automatic door. The at least one light sensor may comprise a pair of transmitter and detector.

[0039] According to an embodiment of the invention the signal provided by the curtain of light 360 to the first control unit 210 may also be provided to the second control unit 220. Alternatively, the curtain of light 360 may generate a plurality of signals indicating the status information of the at least one light sensor, which all signals may be received by the second control unit 220 and the first control unit 210. Alternatively or in addition, one signal may be received by the second control unit 220 and the other signals may be received by the first control unit 210 and vice versa. The features of the embodiment may be used in combination with any of the embodiments of the invention.

[0040] According to a further embodiment of the invention the second control unit 220 and the first control unit 210 may exchange and/or compare their obtained and/or determined information, such as the status information of the at least one light sensor or the operating parameters of the automatic door, for example. If the compared

values differ from each other more than it is predetermined, it is an indication that either the first control unit 210 or the second control unit 220 may be at least partly faulty. As a result of that the automatic door may be arranged to a restricted condition mode, wherein the kinetic energy, speed, and/or force of the door are restricted to predetermined values that may be lower than the normal values, for example. The features of the embodiment may be used in combination with any of the embodiments of the invention.

[0041] According to an embodiment of the invention the second control unit 220 may also be communicatively coupled e.g. via an internal bus to at least one memory 380 of the door control unit 200 for storing at least part of the information obtained and/or determined by the second control unit 220. The memory 380 may be volatile or non-volatile. Some non-limiting examples of the information that may be stored in the memory 380 may be e.g. excesses of the at least one predefined threshold values, abnormal door-openings and/or door closings. The second control unit 220 may be arranged to access the memory 380 and retrieve and store any information therefrom and thereto. The memory 380 is not limited to a certain type of memory only, but any memory type suitable for storing the described pieces of information may be applied in the context of the present invention.

[0042] Figure 5 schematically illustrates an example of a method according to the invention as a flow chart. At the step 510, at least one value representing an operational state of the automatic door is obtained by the second control unit. Next on a basis of the obtained value at least one operating parameter of the automatic door is determined 520. The determined at least one operating parameter of the door motor may be at least one of the following speed, force, kinetic energy, for example.

[0043] At the step 530, it is determined if the at least one operating parameter of the automatic door meets at least one predefined threshold value. If the at least one operating parameter of the automatic door meets the at least one predefined threshold value a control signal is generated 540 in order to control 550 the operation of the automatic door. The control signal may comprise an instruction for the first control unit 210 to adjust the operation of the door motor of the automatic door. The operation may be speed, current, force, or kinetic energy of the door motor, for example. Alternatively or additionally, the control signal may comprise an instruction for the power stage 230 of the door control unit 200 to shut down the operation of the door motor 240 of the automatic door.

[0044] Figure 6A schematically illustrates another embodiment of a method according to the invention as a flow chart. The method comprises the steps 510-550 as described above and in Figure 5.

[0045] At the step 610, after the adjustment of the operation of the door motor of the automatic door it may be determined if the at least one operating parameter of the automatic door continues meeting the predefined thresh-

old value during a predefined time. If the at least one operating parameter of the door motor continues meeting the predefined threshold value, a second control signal may be generated at the step 620 for the power stage 230 of the door control unit 200 in order to control the operation of the automatic door at the step 630. According to another embodiment of the invention, the second control signal may be generated for the power stage 230 of the door control unit 200 in order to control the operation of the automatic door at the step 620, if it is determined that at least one operating parameter of the automatic door meets a second predefined threshold value 640 as illustrated in Figure 6B. The second control signal may comprise an instruction to shut down an operation of the door motor of the automatic door.

[0046] The first control unit 210 and/or the second control unit 220 according to the invention may be implemented as a processor, such as microcontroller, for example. The second control unit 220 is at least configured to implement at least some method steps as described. Moreover, the second control unit 220 may be configured to control the communication through a communication interface with any external unit, such as with the first control unit. The second control unit 220 may also be configured to control storing of received and delivered information. The operations may also be implemented with a microcontroller solution with embedded software.

[0047] Some non-limiting examples of the automatic door may be e.g. a sliding door, swing door, revolving door, or folding door. The door control unit 200 and the method according to the invention may be applied in a variety of environments, such as elevators or building, for example.

[0048] The verb "meet" in context of a threshold value is used in this patent application to mean that a predefined condition is fulfilled. For example, the predefined condition may be that the threshold value is reached and/or exceeded.

[0049] The present invention as hereby described provides great advantages over the prior art solutions. For example, the present invention mitigates at least partly a risk that a single failure in door control operation causes danger or damage to passenger and/or freight. Thus, the safety of the automatic door is at least partly improved.

[0050] The specific examples provided in the description given above should not be construed as limiting the applicability and/or the interpretation of the appended claims. Lists and groups of examples provided in the description given above are not exhaustive unless otherwise explicitly stated.

Claims

1. A door control unit (200) for an automatic door comprising a first control unit (210) and a second control unit (220), wherein the second control unit (220) is configured to:

- obtain at least one value representing an operational state of the automatic door,
- determine on a basis of the obtained at least one value at least one operating parameter of the automatic door,
- determine if the at least one operating parameter of the automatic door meets at least one predefined threshold value, and
- generate a control signal, in response to the at least one operating parameter of the automatic door meeting the at least one predefined threshold value, in order to control the operation of the automatic door.

2. The door control unit (200) according to claim 1, wherein the at least one operating parameter of the automatic door is at least one of the following: speed, force, kinetic energy.

3. The door control unit (200) according to any of the preceding claims, wherein the second control unit is configured to obtain the at least one value representing the operational state of the automatic door from at least one of the following: at least one encoder (350) mounted in connection with the door motor (340), power stage (230) of the door control unit (200), at least one acceleration sensor arranged in the automatic door.

4. The door control unit (200) according to any of the preceding claims, wherein the control signal comprises an instruction for the first control unit (210) to adjust an operation of a door motor (340) of the automatic door.

5. The door control unit (200) according to claim 4, wherein the second control unit (220) is further configured to:

- determine if the at least one operating parameter of the automatic door continues meeting the threshold value during a predefined time, and
- generate a second control signal, in response to the at least one operating parameter of the automatic door continue meeting the predefined threshold value, in order to control the operation of the automatic door.

6. The door control unit (200) according to claim 4, wherein the second control unit (220) is further configured to:

- determine if the at least one operating parameter of the automatic door meets a second predefined threshold value, and
- generate a second control signal, in response to the at least one operating parameter of the automatic door meeting the second predefined

threshold value, in order to control the operation of the automatic door.

7. The door control unit (200) according to any of claims 5 or 6, wherein the second control signal comprises an instruction for a power stage (230) of the door control unit (200) to shut down an operation of the door motor (340) of the automatic door. 5
8. The door control unit (200) according to any of claims 1 to 3, wherein the control signal comprises an instruction for a power stage (230) of the door control unit (200) to shut down an operation of the door motor (340) of the automatic door. 10
9. The door control unit (200) according to any of the preceding claims, wherein the first control unit (210) and/or the second control unit (220) is implemented as a microcontroller. 15
10. A method for controlling an operation of an automatic door, the method comprising: 20
 - obtaining at least one value representing an operational state of the automatic door, 25
 - determining on a basis of the obtained at least one value at least one operating parameter of the automatic door,
 - determining if the at least one operating parameter of the automatic door meets at least one predefined threshold value, and 30
 - generating at least one control signal, in response to the at least one operating parameter of the automatic door meeting the at least one predefined threshold value, in order to control the operation of the automatic door. 35
11. The method according to claim 10, wherein the at least one operating parameter of the automatic door is at least one of the following: speed, force, kinetic energy. 40
12. The method according to claim 10 or 11, the method further comprising obtaining the at least one value representing the operational state of the automatic door from at least one of the following: at least one encoder mounted in connection with the door motor (340), power stage (230) of the door control unit (200), at least one acceleration sensor arranged in the automatic door. 45
13. The method according to any of claims 10-12, wherein the control signal comprises an instruction for the first control unit to adjust an operation of a door motor of the automatic door. 50
14. The method according to claim 13, wherein the method further comprises: 55

- determining if the at least one operating parameter of the automatic door continues meeting the threshold value during a predefined time, and

- generating a second control signal, in response to the at least one operating parameter of the automatic door continue meeting the predefined threshold value, in order to control the operation of the automatic door.

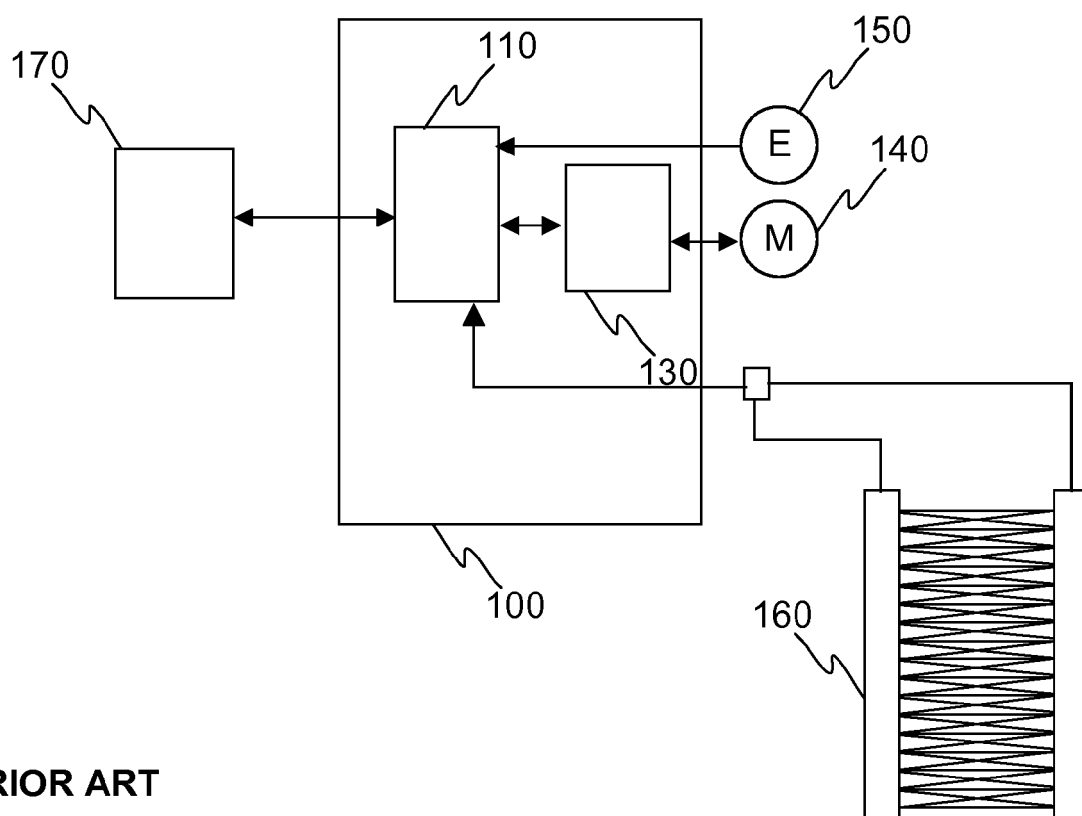
15. The method according to claim 13, wherein the method further comprises:

- determining if the at least one operating parameter of the automatic door meets a second predefined threshold value, and

- generating a second control signal, in response to the at least one operating parameter of the automatic door meeting the second predefined threshold value, in order to control the operation of the automatic door.

16. The method according to any of claims 14 or 15, wherein the second control signal comprises an instruction for a power stage of the door control unit to shut down an operation of the door motor of the automatic door.

17. The method according to any of claims 10-12, wherein the control signal comprises an instruction for a power stage of the door control unit to shut down an operation of the door motor of the automatic door.



PRIOR ART
FIG. 1

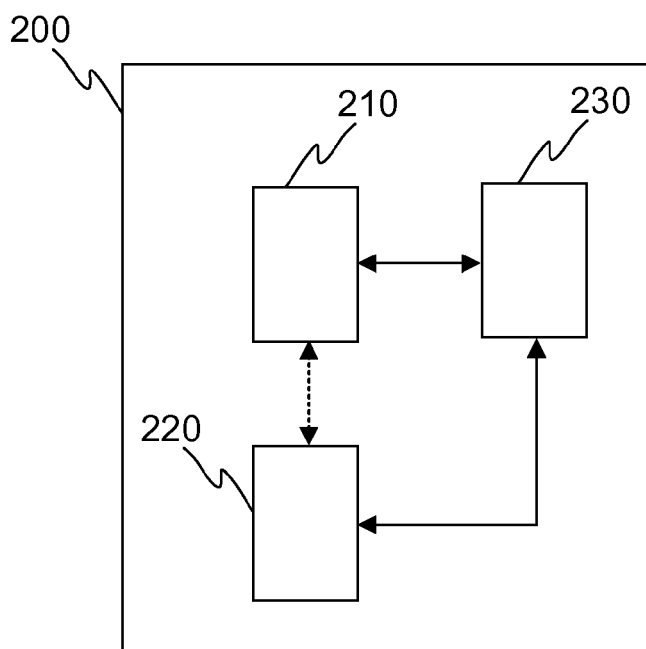
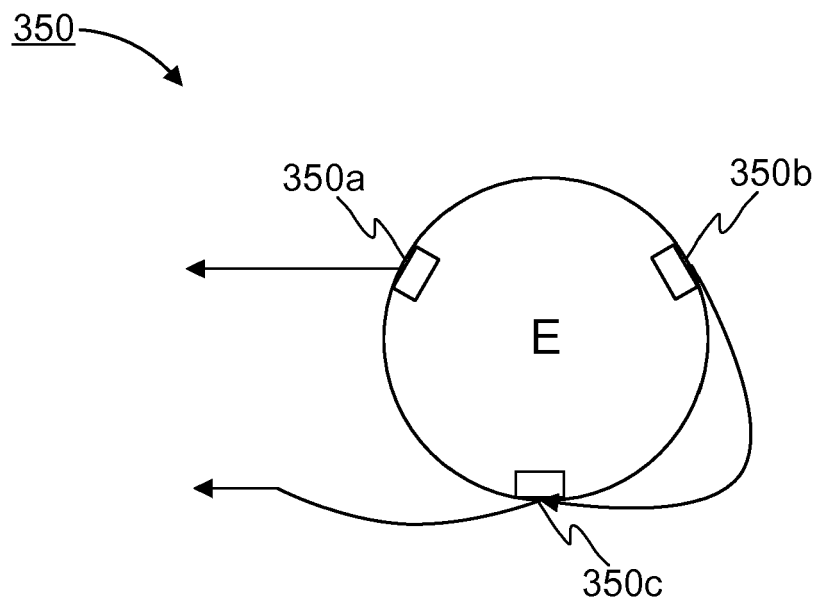
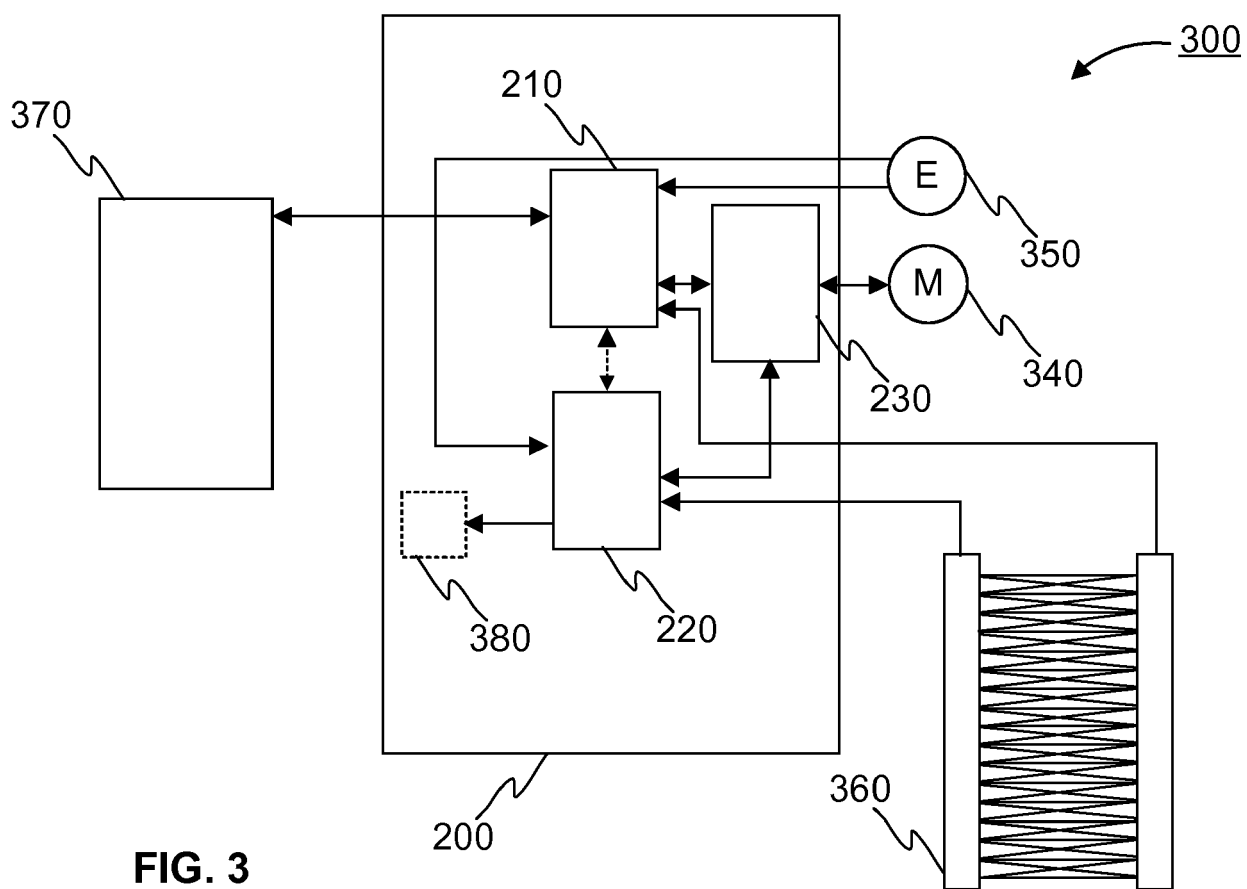


FIG. 2



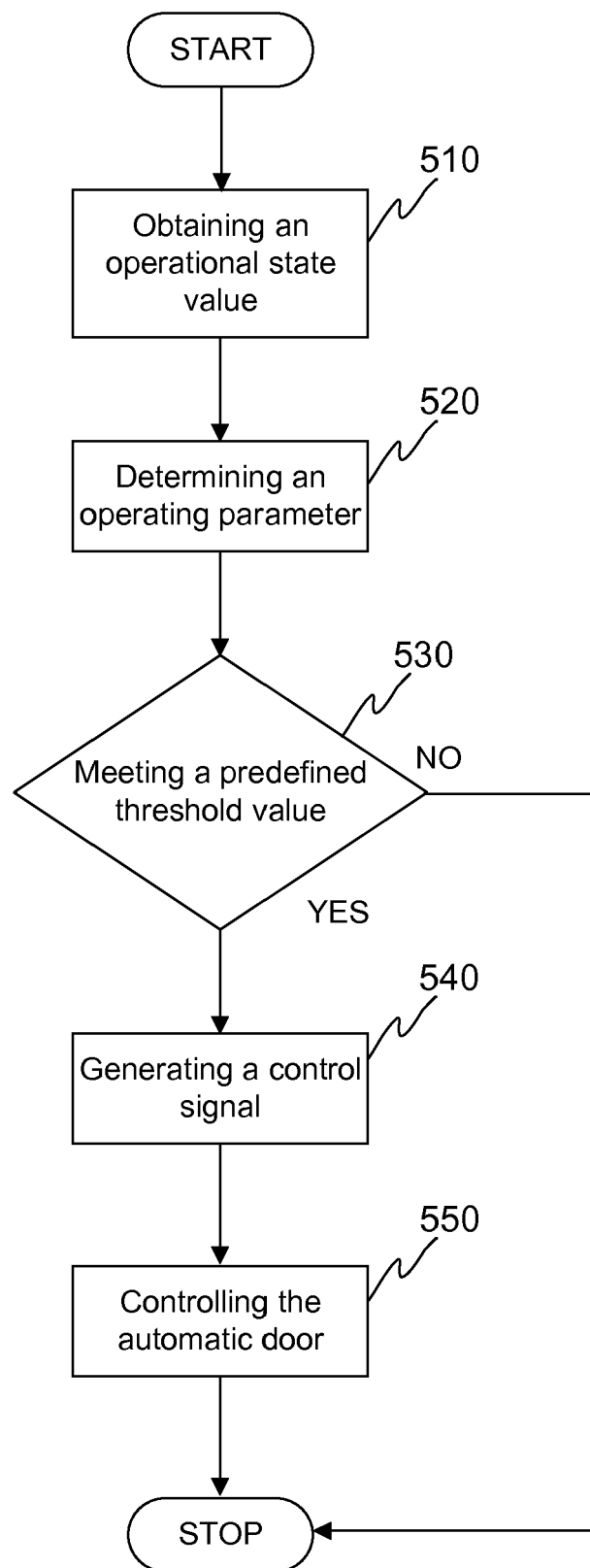


FIG. 5

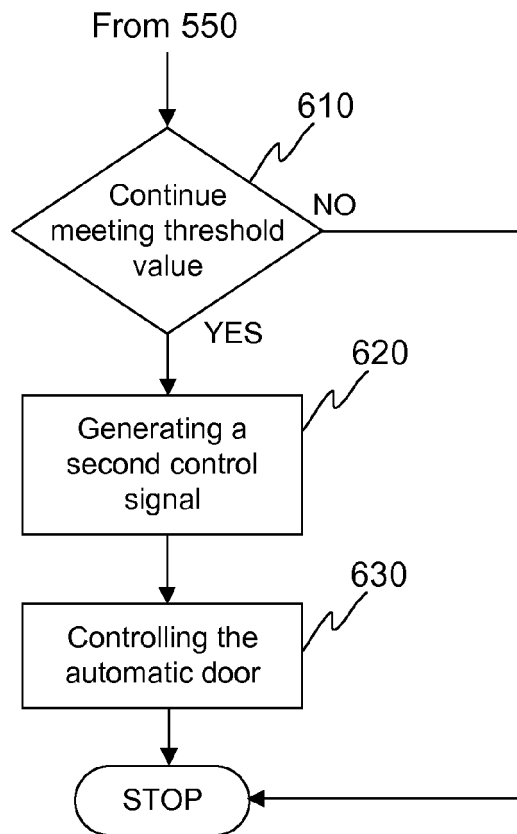


FIG. 6A

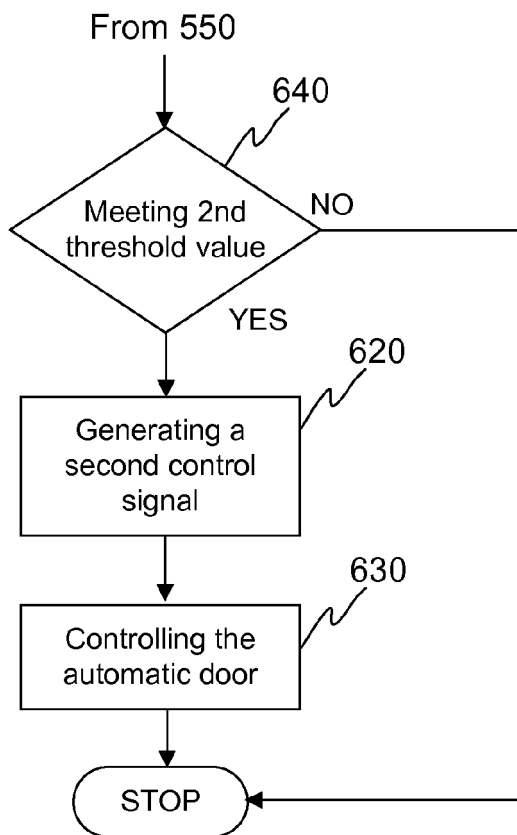


FIG. 6B



EUROPEAN SEARCH REPORT

 Application Number
 EP 17 17 1431

5

10

15

20

25

30

35

40

45

50

55

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2013/025203 A1 (OZAKI SATORU [JP]) 31 January 2013 (2013-01-31) * paragraphs [0014], [0078]; figures 1-4 *	1-17	INV. B66B13/14 E05F15/40 E05F15/70
X	US 2008/258665 A1 (NAGAKURA TAKAYUKI [JP] ET AL) 23 October 2008 (2008-10-23) * paragraphs [0013], [0015], [0063], [0066]; figures 1-3 *	1-17	
X	US 5 137 118 A (IWATA SHIGEMI [JP]) 11 August 1992 (1992-08-11) * column 4, lines 39-55; figures 1,2 *	1-17	
			TECHNICAL FIELDS SEARCHED (IPC)
			B66B E05F
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 30 October 2017	Examiner Lenoir, Xavier
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03/82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 17 17 1431

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

30-10-2017

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2013025203 A1	31-01-2013	CA 2675410 A1	26-02-2010
		FR 2935422 A1	05-03-2010
		US 2010050526 A1	04-03-2010
		US 2013025203 A1	31-01-2013

US 2008258665 A1	23-10-2008	JP 5167684 B2	21-03-2013
		JP 2008271705 A	06-11-2008
		US 2008258665 A1	23-10-2008

US 5137118 A	11-08-1992	CN 1050008 A	20-03-1991
		JP H0398972 A	24-04-1991
		US 5137118 A	11-08-1992
