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(54) **ELEVATOR DOOR WITH DOOR GUARD ARRANGEMENT**

(57) The present invention relates to a door guard arrangement (1) for an elevator door (4) and an elevator door (4) or an elevator (5) with such a device (1). The door guard arrangement (1) comprises a force sensor (2) and a safety switch (3), wherein the force sensor (2) comprises a contact element (7). For detecting the presence of an object (6), especially a string-like object (6) clamped by the closed elevator door (4) the force sensor (2) is capable of being installed at the elevator door (4) in this manner that the contact element (7) can activate the safety switch (3) when the contact element (7) is operated by the clamped object (6), and the activated safety switch (3) is capable of generating and sending a signal to a controller (9) of the elevator (5) for preventing or stopping a car (11) of the elevator (5) from moving.

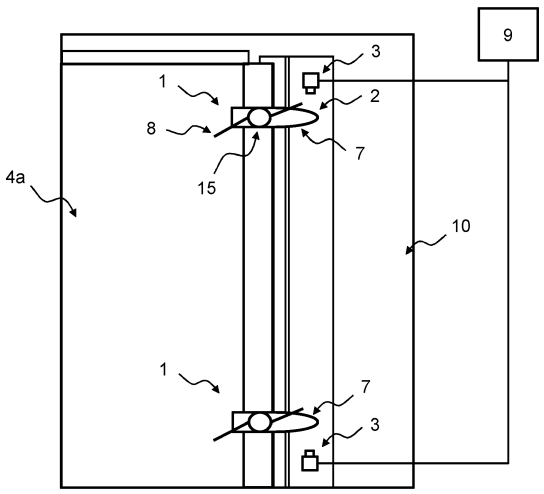

Fig. 2

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Description

[0001] The present invention relates to a door guard arrangement for an elevator door. Furthermore, the invention relates to an elevator door or an elevator provided with such a device.

[0002] As elevators are applied for transporting passengers along substantial vertical distances, strict safety requirements must be fulfilled. Such elevator features may comprise e.g. functions avoiding that an elevator car is displaced as long as the car door or an associated shaft door (also called a landing door) is open, or functions avoiding that the car door may be unlocked as long as the car is outside of a landing area, etc. Normally, there are two different kinds of elevator doors - an inside car door being seen from inside of an elevator car and a landing door being seen from outside of the elevator car. All automatic elevator doors are usually powered by a door operator installed on the elevator car so that the car door may open both itself and a landing door which is coupled with the car door.

[0003] The most common elevator injury is someone being struck by a closing elevator door. This is called a door strike injury or an elevator sandwiching accident, and they generally occur while somebody is entering the elevator car, the resulting injury could be severe, as the door's closing force or speed is quite high. The elevator doors should close safe that would make injury unlikely. The more serious situation is that the car begins to move when the elevator door is already closed with a clamped object which is not detected. An object that has been clamped means that this object cannot enter or exit through the elevator door or cannot be taken away from the elevator door. Currently, to prevent passengers from being clamped by an elevator door, the elevator door is equipped with a variety of safety devices like an optical sensor. The elevator door will reopen, or the elevator car may not drive if such an accident happened.

[0004] To ensure the safety of passengers entering and exiting an elevator car, an elevator door comprises normally a photoelectric sensor or a so-called light curtain with multiple photodetectors and light transmitters (often infrared) along vertical direction mostly in the left and right both sides of the surface of the door. Multiple light beams (light transmit path) can be formed across the door space (entrance to the elevator car) in many horizontal directions between the photodetectors and the light transmitters when the door is open. If a part of these light beams is interrupted, it will be detected as there is an obstacle (passenger or barrier) so that the door will stop closing and reverse open. For instance, it should automatically initiate the re-opening of the elevator door in the event of a person crossing the entrance during the closing movement of this door. However, these photodetectors and light transmitters are set at a fixed interval width, then an object like a rope-shaped object, e.g. a leash, often cannot be detected correctly.

[0005] Moreover, both of a mechanical protect device or a photoelectric protect device like light curtain may be rendered inoperative in the last 20 mm of door closing gap, because even though a completely closed door may inevitably left a door gap. The protection hence depends on how big a clamped object or obstacle is. Normally, the protect device is able to only detect an obstacle with a diameter of minimum 50 mm. In addition, to prevent a possible maloperation of the elevator door due to such as dust or dirt, etc., the safety device is configurated to recognize the existence of an obstacle only when not one, but a part of the light beam (light transmit path) is broken, and the light curtain shall cover the opening over the distance between at least 25 mm and 1600 mm above the elevator door sill. Therefore, an object with a small diameter like a rope-shaped object is more difficult to be detected accurately while the door closing.

[0006] Since already long time, especially since the coronavirus (COVID-19) pandemic outbroke, it has been more and more a stressful and lonely time that many peoples have decided to adopt or buy pets. The pet population has been grown up worldwide. More and more people every day need to take elevators with their pets. But in many countries, there have been many elevator accidents with pets. For example, a dog hanging from its leash at an elevator door is found dead. The cause of this accident is that the dog's owner entered the elevator car without realizing that the dog was still outside. After the elevator door closed, the elevator car went up to the next floor. The dog was dragged upward by the moving car so that the dog's head hit the roof of this floor. The dog then had no chance of survival. In another reported accident, a pet dog that was on a leash with its owner entered an elevator car but went back unexpectedly from there to outside. This dog didn't manage to go back to the elevator car before the elevator door closed, because the owner, who stays inside the car, has not noticed this. However, the owner was still holding on to the dog's leash. It all happened very fast, and the owner had no time to react. The dog is strangled to death after its leash was trapped between the elevator door as the car moved away to the next floor.

[0007] Accordingly, there may be a need to enhance the safety of accessing an elevator car not only for passengers but also for small-sized or soft objects like pets or animals. However, installing more photoelectric sensors in an elevator door system to increase the number of light beams will make the entire door system more complex and expensive. Moreover, the failure rate of the door system will also increase.

[0008] Such needs may be met with the subject-matter of the independent claims. Advantageous embodiments are defined in the dependent claims as well as in the following specification.

[0009] According to the first aspect of the invention, an elevator door with a door guard arrangement for an elevator is provide. The door guard arrangement may comprise a force sensor and a safety switch, wherein the force sensor comprises a contact element. For detecting

the presence of an object clamped by the closed elevator door, the force sensor is capable of being installed at the elevator door in this manner that the contact element can activate the safety switch when the contact element is operated by this object. The activated safety switch may generate and send a signal to a controller of the elevator for preventing or stopping a car of the elevator from moving. The force sensor of this kind of guard arrangement can directly contact an object clamped by the elevator door. Even a string-like object, e.g. a pet leash that is ignored often by a light curtain, can be detected because the force sensor detecting does not rely on the size, dimension, or material of an object. Thus, it may provide and ensure safety for passengers, especially a door strike injury to pets can be avoided as far as possible. The purpose of improving safety protection for pets is achieved without incurring excessive costs.

[0010] According to an embodiment of the invention, the contact element is equipped with a torsional spring so that the contact element may rotate and activate the safety switch when the operating force executed by the clamped object on the contact element exceeds the stiffness of the torsional spring. The spring may keep or hold the contact element when the contact element is contacted by the clamped object and hence rotates. And the torsional spring may also automatically pull the contact element back to its original installed position. The stiffness of the spring can be a bending, torsion, or compression stiffness and corresponding stiffness of the spring.

[0011] According to an embodiment of the invention, the contact element is capable of rotating around a shaft fixed at the elevator door. For example, the contact element can be installed by means of this shaft so that the contact element can act as a rotational lever. The shaft can be constructed as a part of the contact element or as a separate simple structural unit that is suitable for assembling with the contact element. The position of the shaft can be in the middle or on a side of the contact element so that the contact element is able to rotate around this shaft.

[0012] According to an embodiment of the invention, the object operating the contact element is capable of being caused due to the car driving or moving. The operating force acting on the contact element depends on the movement of the object to the contact element. Normally, if the clamped object is detected by the force sensor during the elevator door closing, the door will reopen so that the elevator car will not be allowed to drive away. But if the elevator door has already closed, the elevator car may drive away from the landing floor to a destination floor. In this case, even if the clamped object is stuck between the door gap, after the car begins moving, the clamped object will be drawn by the car and moves vertically to the contact element. The safety switch will be activated when the object reaches the contact element.

[0013] An elevator may comprise a car door and/or at least one shaft door. In the case that an elevator has a car door and one or more shaft doors, the shaft door normally may only close and open together with a shaft door coupled (e.g. through a mechanical interlock) with this car door. Accordingly, the elevator door can comprise a shaft door and/or a car door of the elevator. Consequently, the door guard arrangement can be installed either at a car door or a shaft door.

[0014] Generally, an elevator door is installed in a door frame. And there are different types of elevator doors. For example, the elevator door may be constructed as a side-opening slide door consisting of at least one door panel. Such an elevator door can be a single opening door that only has a single door panel. The door panel opens to the left or right laterally. Particularly, the elevator door can be constructed as a telescopic door consisting of more than one door panel. The force sensor may be attached to the door frame of the elevator door so that the contact element of the force sensor accordingly protrudes from the door frame and across a gap between the door frame and the door panel of the elevator door when the elevator door is closed completely. Certainly, the force sensor can be attached to the door panel. No matter where the force sensor is, the safety switch can be installed freely on the same side, or on the opposite side of the force sensor in relation to the door-opening. This means that the force sensor and the safety switch can be placed on the same side or respectively on both sides of the opening of the elevator door.

[0015] According to another embodiment of the invention, the elevator door can be constructed as a center-opening slide door consisting of at least two door panels. This kind of elevator door consists of two door panels that meet in the middle and slide open laterally. One advantage of such an elevator door is its high-efficiency operation so that the time needed to open or close the door is shorter. For such an elevator door, the force sensor of the door guard arrangement can be attached to one of the door panels, wherein the contact element of the force sensor protrudes from this door panel and across a gap between the two door panels when the shaft door has closed completely. Accordingly, the safety switch can be installed freely at the same door panel or the opposite door panel of the force sensor. This means that the force sensor and the safety switch can be placed on the same side or respectively on both sides of the opening of the elevator door.

[0016] According to another embodiment of the invention, the door guard arrangement can be constructed as a device (e.g. a limit switch) integrated with the force sensor and the safety switch. Alternatively, the slide guard arrangement is able to be constructed as a group of separate components comprising the force sensor and the safety switch. In the latter case, the force sensor and the safety switch may be arranged at different place with the elevator door. For example, the force sensor and the safety switch are at different door panels of an elevator door, or the fore sensor is in the door frame, and the safety switch is at the door panel. The prerequisite for this is to ensure that the force sensor may activate the

safety switch.

[0017] Generally, the elevator door consists of a car door and a shaft door at a landing place of the elevator, wherein the elevator may have more than shaft door. Hence, it can even be that the force sensor is set at the shaft door while the safety switch is at the car door, e.g. on the internal (normally invisible) side of the shaft door and the car door. The achieved advantage herewith is that the safety switch is necessary to be installed only at the car door, but not at every shaft door. The total cost for an elevator that is to be equipped with a door guard arrangement may consequently be reduced. Analogously, the safety switch can be set at the shaft door, and the force sensor is at the car door in this case.

[0018] According to a further embodiment of the invention, at least two door guard arrangements are installed at the elevator door. One of these devices is arranged near to or on the top of the elevator door while another one is near to or on the bottom or sill of the elevator door. Particularly, the lower guard arrangement should be set as close as possible to the sill, as a string-like object, e.g. a pet leash is often dragged on the ground. Therefore, if a pet leash gets stuck at an elevator door in an area where the light curtain at this door is not able to detect it, no matter whether the car travels up or down, this pet leash will reach one of these guard arrangement s to activate a safety switch. It will cause the elevator to stop before the pet or its owner will suffer any harm. An accident thus can be avoided. Furthermore, to ensure more safety it is considerable to set at least one intermediate guard arrangement between the upper and the lower guard arrangement. If a pet dog entered alone the car of an elevator without its owner and then the door closed. In case the car moves down, by the time the pet leash operates the upper force sensor, the dog could be already hung by the leash and might get asphyxiated or seriously injured until the car stops. By setting such an intermediate guard arrangement, the car may stop earlier when a potential danger would happen.

[0019] According to an embodiment, the safety switch of the door guard arrangement can be connected with the controller of the elevator via wired or wireless communication means, preferably over a network (e.g. internet or a local network like LAN), so that the signal of the safety switch can be sent to the controller. According to this signal, when the elevator door is already closed, the controller can prevent the car from moving and optionally reopen the elevator door. Even if the car has begun to move or is already in moving, the controller may stop the car immediately. Thus, an accident is avoidable, if a pet-leash is clamped at an elevator door so that a pet and its owner are separated by this door, for example, the owner is inside the car, but his pet is not yet.

[0020] According to a second aspect of the invention, an elevator door is provided, which may comprise an afore-mentioned door guard arrangement.

[0021] According to a third aspect of the invention, an elevator is provided which may comprise an elevator door according to the second aspect of the invention. For this case, the controller of the elevator is able to prevent and/or stop the car from moving after the controller has received the signal from the door guard arrangement.

[0022] Ideas underlying embodiments of the present invention may be interpreted as being based, inter alia and without restricting the scope of the invention, on the following observations and recognitions.

[0023] One skilled in the art will recognize that the features may be suitably transferred from one embodiment to another and features may be modified, adapted, combined and/or replaced, etc. in order to come to further embodiments of the invention.

[0024] In the following, advantageous embodiments of the invention will be described with reference to the enclosed drawings. However, neither the drawings nor the description shall be interpreted as limiting the invention.

Fig. 1 shows an elevator door according to the prior art,

Fig. 2 shows a rear site of an elevator door with a door guard arrangement according to an embodiment of the present invention,

Fig. 3 shows a front site of an elevator door according to an embodiment of the present invention,

Fig. 4 shows a front site of an elevator door according to another embodiment of the present invention.

[0025] The figures are only schematic and not to scale. Same reference signs refer to same or similar features.

[0026] Fig. 1 shows an elevator 5 with a slide elevator door 4 which opens to left or right laterally. The elevator door 4 can be a shaft door or comprise a shaft door coupled with a car door, wherein the shaft door and the car door close or open simultaneously. The elevator door 4 comprises a light curtain with many photodetectors and light transmitters 14 arranged separately in the door frame 10 and the door panel 4a so that a multiple of light beams are formed horizontally across the door space at the entrance to the elevator car 11 when the elevator door 4 is open. The light beams form an invisible light net at the entrance. Just for the convenience of presentation, these light beams are illustrated in Fig.1. If some light beams are broken during the elevator door 4 is closing, the elevator 5 or the elevator door 4 may know that there is something in the door space. The elevator door 4 will either stop closing or at first open shortly and then try to close again.

[0027] The reliability of this light curtain is related to the number of the existing light beams. The more the number of these detectors/light transmitters 14, the more beams there are, and thus the better safety the elevator door 4 has. However, there are still many spaces and gaps existing in the net formed by the light beams, es-

pecially in the place near the door frame 10 and the door panel 4a. In case that some detectors or transmitters 14 are defective or obscured by dust so that a rope-shaped object like a leash 6 could not be detected correctly. On the other hand, the protection with the light curtain may be rendered inoperative in the last 20 mm of the door closing gap, because even though a closed elevator door 4 may be left a gap between the door panel 4a and the door frame 10. The protection hence still depends on the dimension of a clamped object 6.

[0028] In case that a pet dog 12 on a leash 6 stays outside, but its owner has entered the elevator door 4 which is closing. If the dog cannot follow its owner into the elevator car 11, the leash 6 will be clamped by the elevator door 4. When the leash 6 is clamped in a gap of the net, the light curtain cannot detect this leash 6, and thus the elevator door 4 will close. After the shaft door 4 is closed completely, the elevator car 11 will drive immediately to a destination floor. For some modern elevators e.g. with car levelling, a car 11 may even begin to move away before an elevator door 4 has closed completely. If the owner has not noticed that his dog 12 is not followed or cannot stop the elevator car 11 from moving immediately, this situation would lead to a serious accident to the dog 12.

[0029] Therefore, a door guard arrangement 1 is provided. Such a door guard arrangement 1 is represented in Fig. 2 at an elevator door 4, wherein a rear site of an elevator door with this door guard arrangement. The door guard arrangement 1 comprises a force sensor 2 and a safety switch 3, wherein the force sensor 2 comprises a contact element 7 equipped with a torsional spring 8, wherein the spring 8 may keep or hold the contact element 7. The contact element 7 thus can act as a rotational lever to rotate around a shaft 15 if a force acting on this contact element 7 exceeds the stiffness of the spring 8. After then, the torsional spring can automatically pull the contact element 7 back to its original position. The contact element 7 can be attached to the elevator door 4 using this shaft 15. The shaft 15 can be constructed as a part of the contact element 7 or as a separate unit that is suitable for assembling with the contact element 7.

[0030] At a landing place, the elevator door 4 may comprise a car door and a shaft door coupled with the car door. And for some kinds of elevators, there is no car door. Consequently, the door guard arrangement 1 can be installed either at a car door or a shaft door. Furthermore, the contact element 7 can be arranged to a door panel 4a or a door frame 10 of the elevator door 4, while the safety switch 3 can be flexibly installed independently of the contact element 7. The key is that it must ensure that the contact element 7 in rotating can contact and activate the safety switch 3. This means that the force sensor 2 including the contact element 7 and the spring 8 can be placed with the safety switch 3 either together or apart on the same side or respectively on both sides of the opening of the elevator door 4. For this embodiment shown in Fig. 2, the guard arrangement 1 is installed on the rear side of a shaft door or a car door which is normally not visible for passengers, wherein the contact element 7 is at the door panel 4a, and the safety switch 3 is arranged at the opposite of the contact element 7 at the door frame 10.

[0031] For a not shown embodiment, it can be that the force sensor 2 is at the shaft door while the safety switch 3 is at the car door. For this case, it is no more necessary to set the safety switch 3 at every shaft door respectively, because the car door will be coupled with the shaft door when the car has landed on a floor. And the force sensor 2 at this shaft door and the safety switch 3 at the car door will build a guard arrangement at this moment. The same goes also for the case that safety switch 3 is at the shaft door, while fore sensor 2 is at the car door.

[0032] The contact element 7 protrudes partially from the door panel 4a so that the contact element 7 may cross the door gap when the elevator door is closed. Therefore, the contact element 7 can be operated if an object 6 moves vertically along the door gap so that the contact element 7 may detect such an object 6 without relying on its size, dimension, or material.

[0033] The movement of the object 6 is caused e.g. due to the car 11 moving when the elevator door 4 is closed already, wherein the clamped object 6 is drawn by the car 11. As the car 11 may drive upwards or downwards to a destination floor, one door guard arrangement 1 is arranged near to (e.g. within 5 cm) or on the top of the elevator door 4, while another one is accordingly near to or on the bottom of the elevator door 4. Therefore, if a string-like object 6, e.g. a pet leash, gets stuck at an elevator door 4, no matter whether the car 11 travels up or down, this pet leash 6 will reach one of these guard arrangement s 1 so that a safety switch 3 will be activated. With such an arrangement, the force sensor 2 can detect the presence of the object 6 clamped by the elevator door 4 if this object 6 moves to the contact element 7, even though the object 6 is thin and soft like a pet leash which is thinner than the door gap. An intermediate guard arrangement (not shown) between the upper and the lower guard arrangement 1 is also considerable, in order to ensure more safety. For example, in case a pet is alone in the downwards-moving car 11 and the pet leash 6 is dropped on the ground, the car 11 can stop already when the intermediate force sensor 2 is operated by the pet leash 6. It needs no more to wait, until the leash 6 reaches the upper force sensor 2. A potential danger than may be avoided as far as possible.

[0034] If the operating force on the contact element 7 by the object 6 exceeds the stiffness of the spring 8, the contact element 7 will rotate and then can activate the safety switch 3. Then the activated safety switch 3 will generate a signal. The guard arrangement 1, particularly the safety switch 3 is connected wired or wirelessly with a controller 9 of the elevator 5, wherein the connection is preferable via a network (e.g. internet or LAN), the signal thus can be sent to the controller 9. According to this received signal, the controller 9 will prevent the car

11 from moving and optionally reopen the elevator door. Even if the car 11 is moving, the controller 9 can also stop the car 11 immediately.

[0035] There are different kinds of elevator doors 4. Fig. 3 shows a front site of a slide elevator door 4 with a side-opening, wherein the grey part shows a car 11 behind this elevator door 4. The shaft door 4 consists of at least one door panel 4a. For such a shaft door 4, the force sensor 2 can be attached to the door panel 4a, wherein the contact element 7 partially protrudes from the door panel 4a to the door frame 10, but the contact element 7 will not obstruct the closing of the door 4. The safety switch 3 is placed on the opposite side of the force sensor 2, namely at the door frame 10 at a suitable distance from the contact element 7. A suitable distance is e.g. smaller than the rotating radius of the contact element 7. If a pet leash 6 is clamped in the door gap of a completely closed door 4, one side of the leash 6 held by the owner of a pet then will move with the car 11 away from the landing floor, but another side of this leash 6 bound to the pet cannot follow the car 11, since the pet is left outside of the car 11 on the landing floor.

[0036] Fig. 4 shows a front site of another type of the elevator door 4 which opens and closes from the middle of the door. This kind of the elevator door 4 comprises two door panels 4a, 4b. The elevator door 4 may also consist of a shaft door and/or a car door. The door guard arrangement 1 can be installed at one of the door panels 4a, 4b, e.g. at the door panel 4a. For this embodiment, both the force sensor 2 and the safety switch 3 can be placed on the same side of the elevator door 4, namely at the door panel 4a. The contact element 7 and protrude from this door panel and across a gap between the two door panels when the shaft door has closed completely. In difference to the embodiment represented in Fig. 3, because the force sensor 2 and the safety switch 3 are on the same side of the elevator door 4, the door guard arrangement 1 additionally can be constructed as a single device in which the force sensor 2 and the safety switch 3 are integrated.

[0037] Finally, it should be noted that the term "comprising" does not exclude other elements or steps and the "a" or "an" does not exclude a plurality. Elements described in association with different embodiments may be combined. It should also be noted that reference signs in the claims should not be construed as limiting the scope of the claims.

Claims

1. Elevator door (4) with a door guard arrangement (1) for an elevator (5), wherein the door guard arrangement (1) comprises a force sensor (2) and a safety switch (3), wherein the force sensor (2) comprises a contact element (7), **characterized in that** for detecting the presence of an object (6) clamped by the closed elevator door (4) the force sensor (2) is capable of being installed at the elevator door (4) in this manner that the contact element (7) can activate the safety switch (3) when the contact element (7) is operated by the clamped object (6), and the activated safety switch (3) is capable of generating and sending an alarm signal to a controller (9) of the elevator (5) for preventing or stopping a car (11) of the elevator (5) from moving.

2. Elevator door (4) according to claim 1, wherein the contact element (7) is equipped with a torsional spring (8) in this manner that the contact element (7) is capable of rotating and activating the safety switch (3), when the operating force executed by the object (6) on the contact element (7) exceeds the stiffness of the torsional spring (8).

3. Elevator door (4) according claim 1 or 2, wherein the contact element (7) is capable of rotating around a shaft (15) fixed at the elevator door (4).

4. Elevator door (4) according one of the preceding claims, wherein the object (6) operating the contact element (7) is capable of being caused due to the car (11) driving.

5. Elevator door (4) according one of the preceding claims, wherein the elevator door (4) is a shaft door and/or a car door of the elevator (5).

6. Elevator door (4) according one of the preceding claims, wherein the elevator door (4) is a side-opening slide door consisting of at least one door panel (4a).

7. Elevator door (4) according one of the claims 1 to 5, wherein the elevator door (4) is a center-opening slide door consisting of at least two door panels (4a, 4b).

8. Elevator door (4) according to claim 6, wherein the force sensor (2) and/or the safety switch (3) can be installed at a door frame (10) or a door panel (4a) of the elevator door (4).

9. Elevator door (4) according to claim 7, wherein the force sensor (2) and/or the safety switch (3) can be installed at one or two of the door panels (4a, 4b) of the elevator door (4).

10. Elevator door (4) of one of the preceding claims, wherein the door guard arrangement (1) is constructed as a device comprising the force sensor (2) and the safety switch (3) or as a group of separate components comprising the force sensor (2) and the safety switch (3).

11. Elevator door (4) according to one of the claims 5 to 10, wherein
the force sensor (2) is set at the shaft door while the safety switch (3) is set at the car door, or
the safety switch (3) is set at the shaft door while the contact element (2) is set at the car door.

12. Elevator door (4) according to one of the preceding claims, wherein
at least two door guard arrangements (1) are installed at the elevator door (4), wherein one of the door guard arrangement (1) is arranged near to or on the top of the elevator door (4), and another slide door guard arrangements (1) is near to or on the bottom of the elevator door (4).

13. Elevator door (4) according to one of the preceding claims, wherein
the safety switch (3) is capable of being connected with the controller (9) via wired or wireless communication means.

14. Elevator (5) comprising an elevator door (4) according to one of the preceding claims.

15. Elevator (5) according to claim 14. wherein
the controller (9) of the elevator (5) is capable of preventing and/or stopping the car (11) from moving, when the controller (9) has received the alarm signal from the door guard arrangement (1).

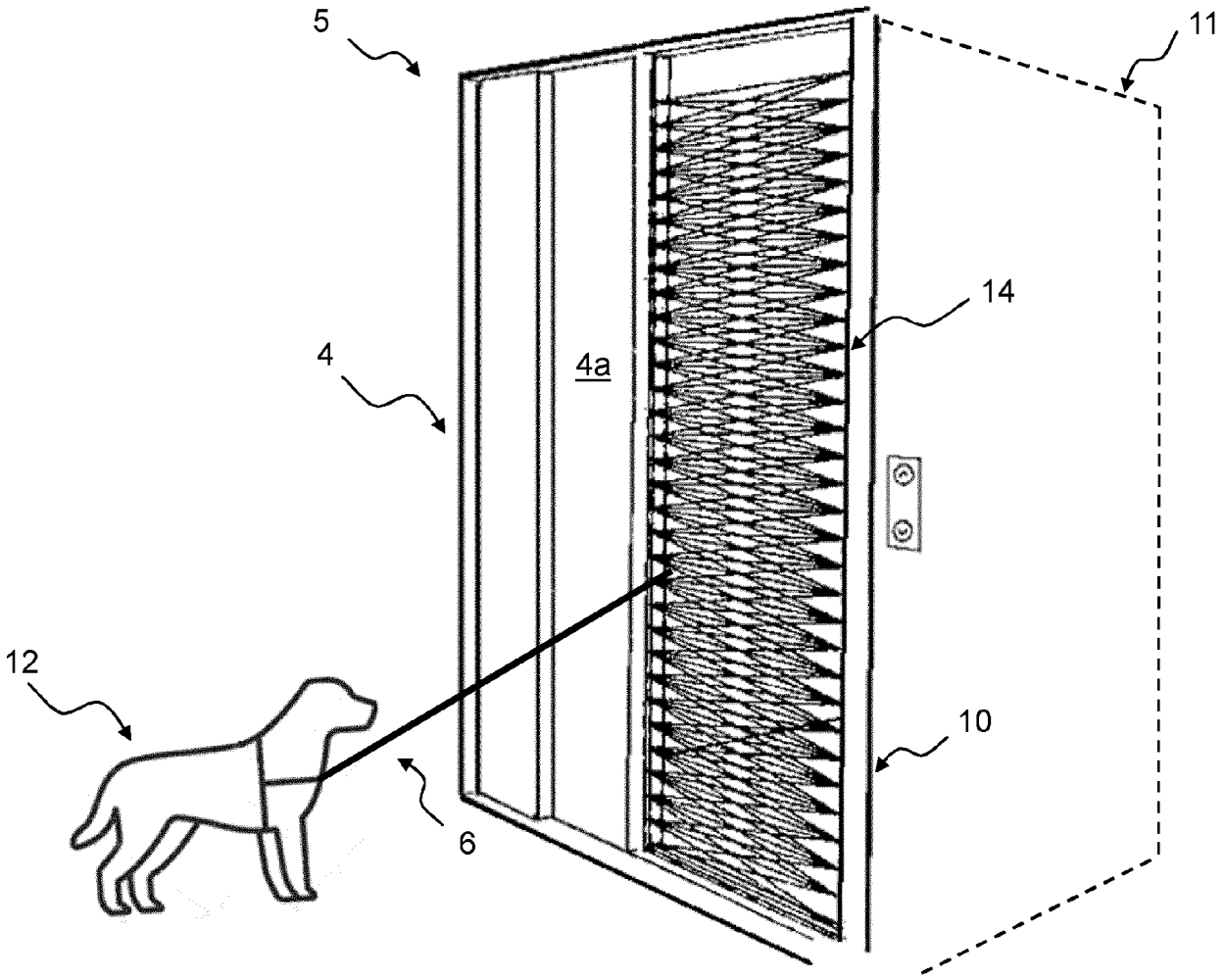

Fig. 1

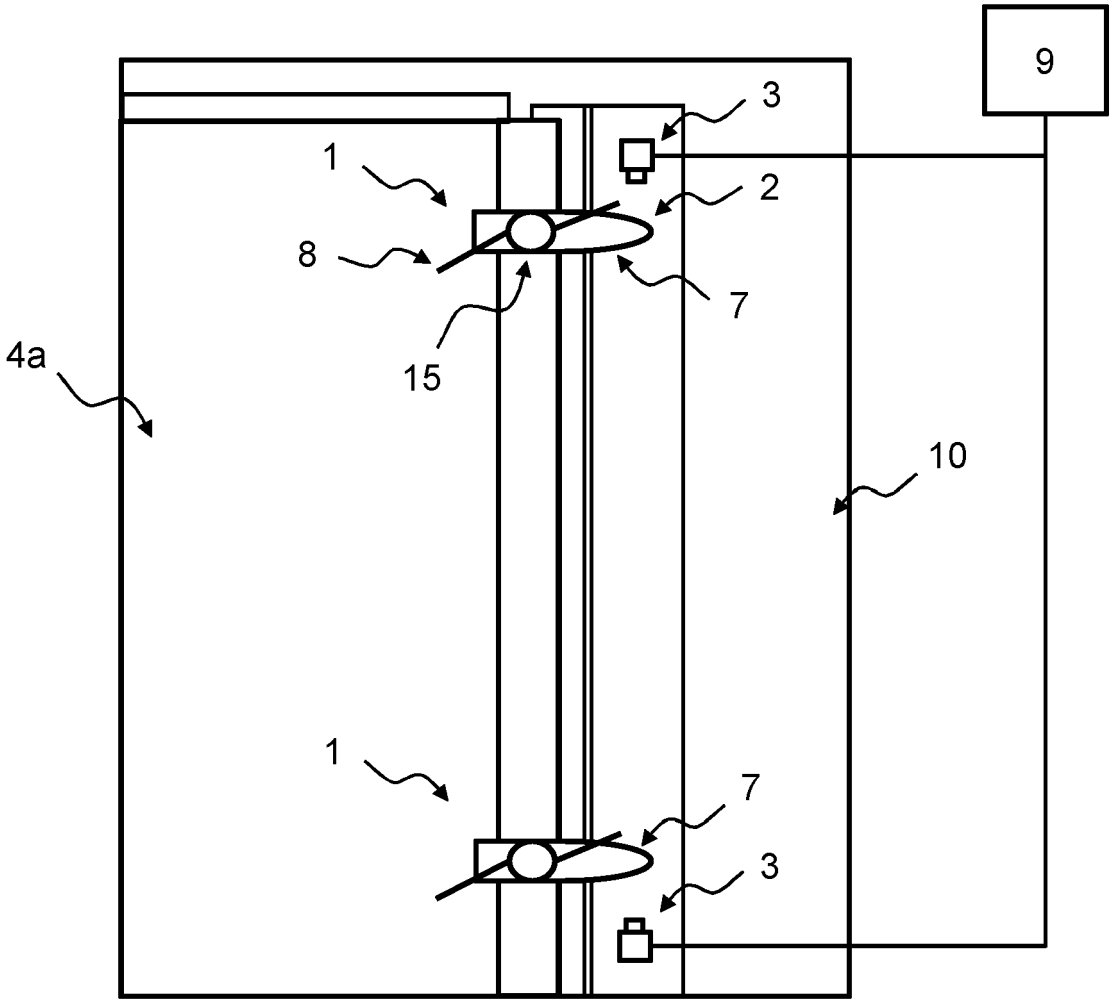

Fig. 2

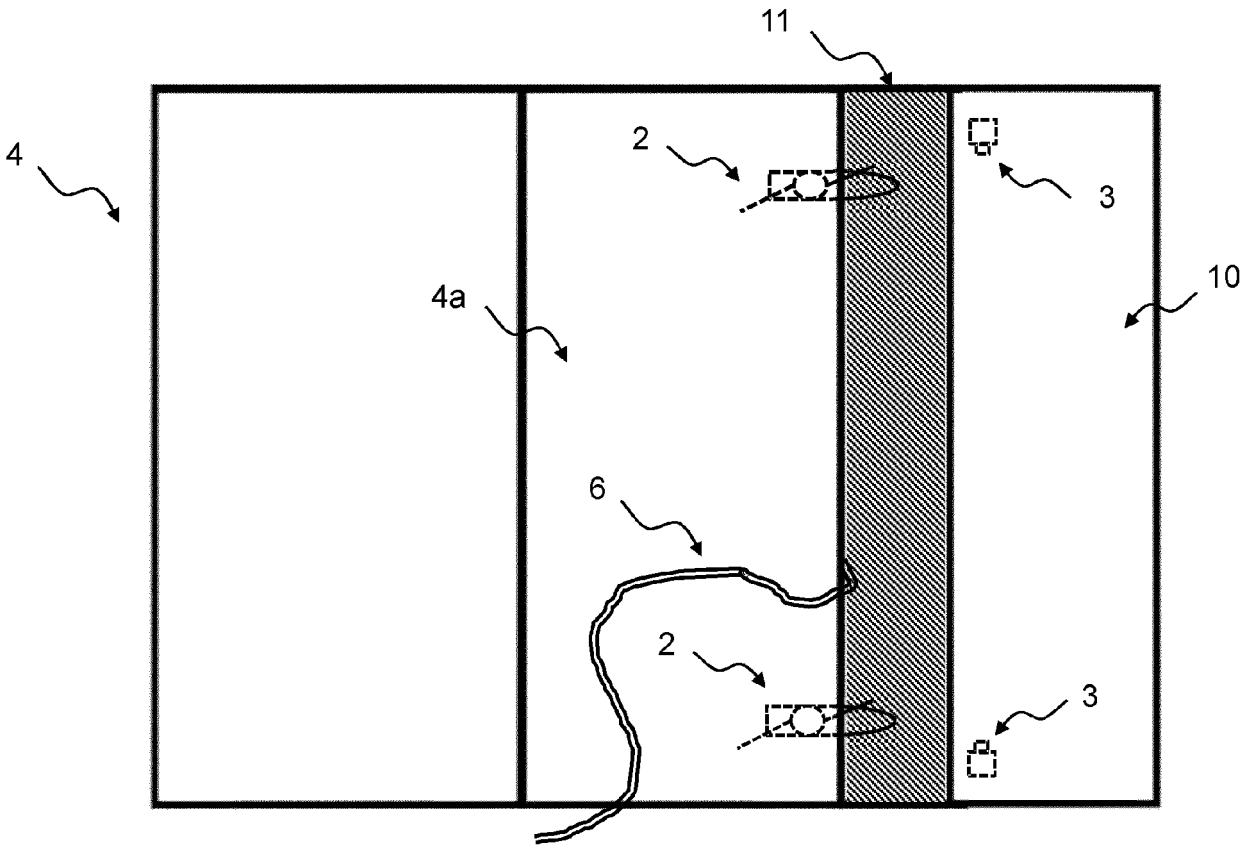

Fig. 3

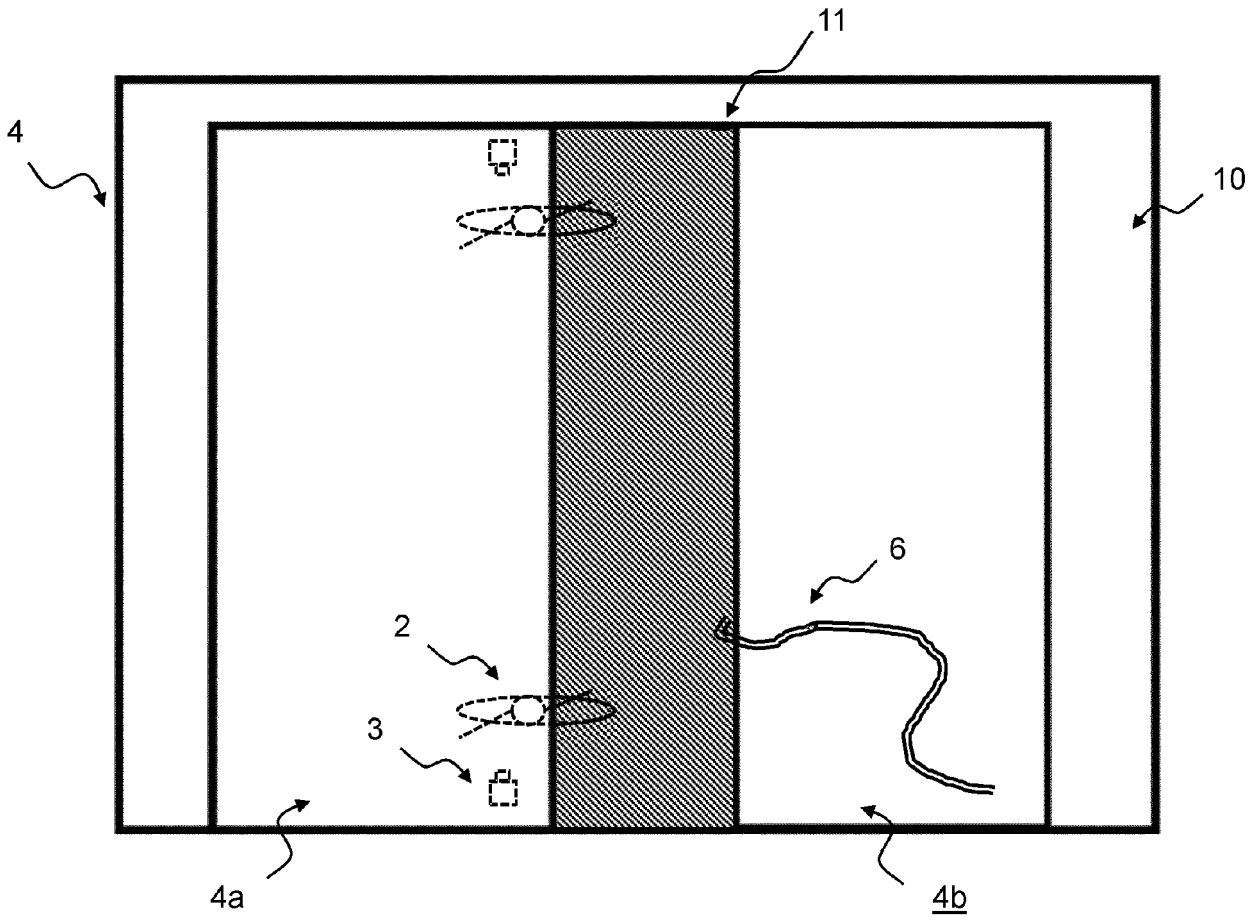

Fig. 4

Europäisches Patentamt
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EUROPEAN SEARCH REPORT

Application Number
EP 21 17 0847

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	27 September 2021	Lohse, Georg

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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