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(54) CONTROL PANEL FOR AN ELEVATOR

(57) The invention relates to a control panel (1) for an elevator, the control panel comprising a base (2), side walls (3', 3"), a door (4) and also a lock mechanism (6, 7, 8, 9, 10, 11) for locking and opening the door. The lock mechanism comprises an arresting means (6), which is adapted to be movable between a locking position and a releasing position, and also an electrically controllable actuator (7) connected to the arresting means, the actuator being adapted to move the arresting means (6) in response to a wireless control signal.

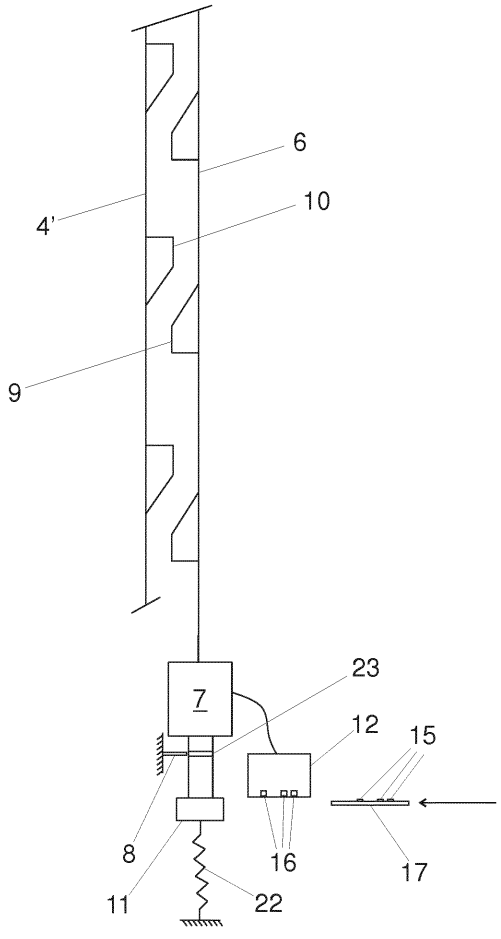

Fig. 4

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Description

Field of the invention

[0001] The invention relates to the structures of control panels for an elevator.

Background of the invention

[0002] An elevator comprises various electrical components, such as electronics cards, relays, switches, safety devices, *et cetera,* with which the operation of the elevator is controlled.

[0003] A large proportion of the electrical components of an elevator are disposed in a separate control panel, from where control cables and current supply cables travel to different parts of the elevator system. The main switch of the elevator and also the elevator control electronics, *inter alia,* are usually disposed in the control panel. Manually-operated devices can also be disposed in the control panel, with which devices the elevator is operated during servicing and maintenance and also when saving passengers stuck in the elevator car in a fault situation.

[0004] The control panel is conventionally situated in a separate machine room, to which access is restricted. Nowadays, however, a great many elevators do not have a separate machine room. In these so-called machine-roomless elevators the control panel can be situated e. g. in the elevator hoistway or on a stopping floor of the elevator outside the elevator hoistway. In this case the control panel is usually locked, so that unauthorized persons cannot gain access to the components in the control panel.

[0005] One problem is that control panels on a floor level and also, on the other hand, in the elevator hoistway, can be a target for vandalism. The locking of the control panel is not necessarily sufficiently effective to prevent unauthorized opening of the control panel. In addition, the actual lock of the control panel can itself become a target for vandalism; for example, attempts may be made to insert foreign objects into the keyhole that is in the control panel.

Aim of the invention

[0006] One aim of the invention is to disclose an elevator control panel that is better protected against vandalism than what is known in the art.

[0007] To achieve this aim the invention discloses an elevator control panel according to claim 1 and also a key according to claim 9. The preferred embodiments of the invention are described in the dependent claims. Some inventive embodiments and inventive combinations of the various embodiments are also presented in the descriptive section and in the drawings of the present application.

Summary of the invention

[0008] One aspect of the invention is an elevator control panel comprising a base, side walls, a door and also a lock mechanism for locking and opening the door. The lock mechanism comprises an arresting means, which is adapted to be movable between a locking position and a releasing position, and also an electrically controllable actuator connected to the arresting means, the actuator being adapted to move the arresting means in response to a wireless control signal. In this case the lock can be opened and closed electrically with the actuator by sending a wireless control signal for controlling the actuator. Thanks to the wireless electronic control, a control panel with its locking mechanisms can be designed without a conventional keyhole in the control panel door. In some embodiments the control panel is fitted into the doorframe of a landing door, and the outer surface of the control panel forms an unbroken finished surface as a part of the doorframe when installed on a stopping floor. In this case a person near the landing door does not even necessarily notice the control panel in the doorframe of the landing door.

[0009] A second aspect of the invention is a key for locking and opening the lock mechanism of the elevator control panel presented in the description.

[0010] In some embodiments the control panel includes electronics configured to control the movement of the elevator car. In some embodiments the control panel includes an inspection drive connection, via which a serviceman can give a control command for performing servicing procedures and/or rescue procedures.

[0011] In one preferred embodiment of the invention the lock mechanism comprises a manually-operated latch engaging with the actuator, which latch is adapted in the first position to prevent and in the second position to allow movement of the arresting means towards the releasing position. In some embodiments the control panel has a spring, the force brought about by which tries to displace the arresting means towards the releasing position. In some embodiments the arresting means is thus adapted so that the gravity being exerted on the arresting means tries to displace the arresting means towards the releasing position. In this case by opening the manually-operated latch, the arresting means can be displaced by means of a spring/gravity into the releasing position, in which case opening of the door is also possible in situations in which electricity is not available for operating the actuator (e.g. possible electricity outages). In one preferred embodiment of the invention the axis of rotation of the latch is in the direction of the surface of the control panel door. In this case a flat key can be pushed into the control panel from the narrow gap in the door or in the edge of the door, and the latch/locking of the door can also be opened by turning the key in the direction of the gap.

[0012] In one preferred embodiment of the invention the latch is turnable. In one preferred embodiment of the

invention the key comprises a counterpart engaging with the manually-operated latch, around the axis of rotation of the latch, as well as a handle, by turning from which handle the latch can be turned around its axis of rotation. In this case the latch can be released and the door can be opened by hand by turning the key.

[0013] In one preferred embodiment of the invention the arresting means is an elongated rail traveling along a side wall of the panel, the rail having detents in the longitudinal direction that are adapted to engage with counterparts on the door. In some embodiments the control panel is elongated, in which case it can be easily situated e.g. in the doorframe of a landing door. In this case the door can be locked by means of the consecutive detents of the elongated rail/on the rail for essentially the whole of its length, which makes opening the control panel without a key difficult.

[0014] In one preferred embodiment of the invention the control panel has an elongated, sloping wall part. In one preferred embodiment of the invention the rail is adapted to travel along the outer surface of the sloping wall part, and the actuator is fitted into the space between the sloping wall part and the door. In one preferred embodiment of the invention the sloping wall part is situated between the base and the second side wall, and the door continues from the hinge point over the doorway bending to be in the direction of the second wall part and over the second wall part onwards bending to be in the direction of the base in such a way that a space for the actuator remains between the door and the sloping wall part. In this case space is created for the actuator outside the control panel but under the cover and sheltered from vandalism. Since the actuator is outside the control panel, the components of the control panel are also better sheltered when operating the actuator.

[0015] In one preferred embodiment of the invention the edge of the first side wall on the door side bends outwards, and the edge of the door bends correspondingly inwards in such a way that the bends form a detachable hinging between the first side wall and the door. In this way a simple hinge mechanism can be formed, by means of which the door can be turned in a small space and the opened door can also be easily detached from the control panel during working.

[0016] In one preferred embodiment of the invention the counterparts of the detents, the counterparts being on the door, are disposed on the inside surface of the door in the part in the direction of its base. In this case when locking the door the detents wedge against the counterparts, and a force from the effect of the detents is exerted on the door, the force pressing the door against the doorway compressing the contact between the door and the doorway.

[0017] In one preferred embodiment of the invention the actuator comprises an electronic control unit, which comprises an input circuit for a wireless control signal. In one preferred embodiment of the invention the input circuit comprises a plurality of magnetic sensors disposed at a predefined position in relation to each other, and the control unit is configured to form a control command for the actuator for moving the arresting means when the measurement results being received from all the magnetic sensors correspond to predefined values. In one preferred embodiment of the invention the means for forming a wireless control signal comprise a plurality of permanent magnets fitted so as to be interpositioned to correspond to the magnetic sensors of the description. This means that a position coding has been made with the magnetic sensors, in which case opening of the door requires taking a key that is position-coded in the same way to the correct location in the proximity of the electronic control unit.

[0018] In one preferred embodiment of the invention the actuator is a spindle motor. One advantage of a spindle motor is that sufficient force for moving the rail/detents with sufficient reliability is obtained with a small-sized motor.

[0019] In one preferred embodiment of the invention the control panel comprises an end doorframe, and between the end doorframe and the door is a gap for receiving a key. In this case a flat key can be taken from the gap to the correct location in the proximity of the electronic control unit, and a separate keyhole does not need to be made in the cabinet door.

[0020] In one preferred embodiment of the invention the key comprises means for forming a wireless control signal. Instead of, or in addition to, what is described above the key can include a radio transmitter, which sends an electromagnetic signal that is read by a receiver in the electronic control unit. In place of an electromagnetic signal, e.g. an ultrasound signal can also be used.

[0021] The aforementioned summary, as well as the additional features and additional advantages of the invention presented below, will be better understood by the aid of the following description of some embodiments, said description not limiting the scope of application of the invention.

Brief explanation of the figures

[0022]

Fig. 1 presents a front view of an elevator control panel fitting into the doorframe of a landing door.

Fig. 2 presents a vertical portion of the control panel of Fig. 1 as viewed from behind.

Fig. 3 diagrammatically presents the control panel of Fig. 1 as viewed from below.

Fig. 4 diagrammatically presents the locking mechanism of the control panel of Figs. 1 - 3.

Fig. 5 presents a key suiting the locking mechanism of Fig. 4.

Fig. 6 presents a cross-section of the bolt 11 of Fig. 4 at the point of the groove 23.

More detailed description of preferred embodiments of the invention

[0023] Fig. 1 presents an elongated control panel 1, which is intended to be disposed in the side doorframe of a landing door of a machine-roomless elevator. A landing door means a door that closes access from a floor level into the elevator hoistway. Elevator passengers are able to transfer into the elevator car, and to leave the elevator car, via a landing door when the elevator car is situated at a floor level at the point of the landing door. At other times a landing door can be opened with a special service key, in which case a serviceman is able to go into the elevator hoistway via the open landing door.

[0024] Unlike control panels that are known in the art, the door 4 of the control panel of Fig. 1 does not have a separate keyhole, but instead the outer surface of the control panel forms an unbroken finished surface as a part of the doorframe. Consequently, the control panel is better protected against vandalism. The unbroken outer surface also improves the visual appearance of the doorframe of a landing door. The new type of control panel according to Fig. 1 has become possible thanks to a new type of locking mechanism that is presented below in more detail.

[0025] Fig. 2 presents a rear view of the control panel of Fig. 1. Fig. 3 diagrammatically presents the control panel of Fig. 1 as viewed from below. Fig. 4, on the other hand, diagrammatically presents the locking mechanism of the control panel of Figs. 1 - 3.

[0026] The control panel comprises a base 2, side walls 3', 3", a door 4 and also a lock mechanism for locking and opening the door. The edge of the first side wall 3' on the door side bends outwards, and the edge of the door 4 bends correspondingly inwards in such a way that the bends 5A, 5B form a detachable hinging between the first side wall 3' and the door 4. In this case a simple hinge mechanism is formed from the bends of the door 5B and of the side wall 5A, by means of which mechanism the door can be turned in a small space and the opened door can also be easily detached from the control panel 1 during working.

[0027] The control panel 1 has an elongated, sloping wall part 3"', which is situated between the base 2 and the second side wall 3". The lock mechanism comprises an elongated steel rail 6 traveling along the pins 25 that are on the outer surface of the sloping wall part 3"', which steel rail is moved in the vertical direction with the spindle motor 7 fixed to the steel rail 6. In the steel rail 6 are grooves 24 that move along the pins 25 when moving the steel rail 6 in the vertical direction.

[0028] The door 4 continues from the hinge point 5A, 5B over the doorway 14 bending to be in the direction of the second wall part 3" and over the second wall part 3" onwards bending 4' to be in the direction of the base in such a way that a space 13 remains for the spindle motor 7 between the door and the sloping wall part 3"'.

[0029] Fixed to the steel rail 6 in the longitudinal direction are wedge-shaped detents 9, which are adapted to press against the wedge-shaped counterparts 10 in the door when the steel rail 6 is moved upwards. The counterparts 10 of the detents are disposed on the inside surface of the door, in the part 4' in the direction of its base. The upward-moving detents 9 wedge against the counterparts 10 and lock the door. At the same time the door 4 is pressed tightly against the doorway 14, and the components of the control panel 1 are sheltered from dirt and moisture. The door is opened by moving the steel rail 6/detents 9 downwards in such a way that the detents 9 again separate from the counterparts 10.

[0030] The spindle motor 7 is controlled with an electronic control unit 12, which is situated in the same space as the spindle motor 7. In some other embodiments the electronic control unit 12 is, however, situated in the inside space 21 of the control panel, in which case it is better protected from moisture and dirt.

[0031] The electronic control unit 12 has three reed switches 16 on a circuit card, which are disposed at a predefined position in relation to each other. The electronic control unit 12 is configured to form a control command for the spindle motor 7 to move the steel rail 6 when all three reed switches 16 are controlled into a conducting state. This occurs by taking the key board 17 next to the circuit card for the reed switches 16. On the key board 17 are three permanent magnets, the interpositioning of which corresponds to the interpositioning of the reed switches 16 on the circuit card (see Fig. 5). When the permanent magnets 15 on the key board are situated next to the reed switches 16, the magnetic field of each permanent magnet 15 controls the contact of the reed switch 16 in the immediate proximity of it to be conducting.

[0032] Between the end doorframe 18 of the control panel 1 and the door 4 is a narrow gap via which a flat key 17 is pushed to inside the door 4 to near the electronic control unit 12.

[0033] As is known in the art, a spindle motor 7 is an actuator, the movement of a rotating electric motor in which actuator is converted into linear movement of the spindle. The control method of the spindle motor 7 is in itself known in the art, and it is not presented here in more detail.

[0034] The lock mechanism of the control panel 1 also comprises a manually-operated latch. By turning the latch the locking of the door 4 can be opened also in a situation in which electricity is not available for the spindle motor 7. The latch comprises a rotating bolt or stud bolt 11, the head of which fits into the jaws 19 in the key 17. The latch also comprises a stationary pin 8, which presses into the groove 23 in the bolt 11. The bolt 11 is asymmetrical in relation to the axis of rotation in such a way that the pin 8 exits from the groove 23 when turning the bolt, see Fig. 6. The lock mechanism also comprises a

tension spring 22, which pulls the bolt 11 downwards. When the bolt 11 is turned with the key 17, the pin 8 leaves the groove 23, the latch opens and the tension spring 22 pulls the bolt 11, the spindle motor 7 and at the same time the steel rail 6 downwards, in which case the locking of the control panel opens. The bolt is disposed in such a way that the jaws of the key 17 meet with the head of the bolt 11, when the latch is closed, when the key is pushed into the space 13 below the covers 4 from the gap between the door 4 and the end doorframe 18.

[0035] When the control panel has been opened from the manually-operated latch, the latch must be reset before the electrical opening mechanism can again be used. This occurs by first lifting the bolt 11/spindle motor 7 against the pulling force of the spring 22 back to the original position and after this by rotating the bolt 11 in such a way that the pin 8 presses back into the groove 23 that is in the bolt 11.

[0036] In the embodiments described above the control panel is presented as a part of the doorframe of a landing door. In some other embodiments the control panel is disposed in the elevator hoistway, where it can be fixed e.g. to the wall of the elevator hoistway, to a guide rail of the car or counterweight, or into connection with the electric drive of the elevator.

[0037] Instead of reed switches, e.g. Hall sensors or magnetoresistive sensors can be used as magnetic sensors 16. The number of magnetic sensors can vary; in principle, there can be 2 - N units of them instead of three. What is essential is that the number of magnetic sensors and their interpositioning is consistent with the permanent magnets 15 that are on the key.

[0038] Instead of a spindle motor 7, e.g. a solenoid, step motor or corresponding drive device bringing about a linear movement from the effect of electric power can be used in the actuator.

[0039] The invention is not only limited to be applied to the embodiments described above, but instead many variations are possible within the scope of the inventive concept defined by the claims.

Claims

1. Control panel (1) for an elevator, the control panel comprising a base (2), side walls (3', 3"), a door (4) and also a lock mechanism (6, 7, 8, 9, 10, 11) for locking and opening the door **characterized in that** the lock mechanism comprises:

   an arresting means (6), which is adapted to be movable between a locking position and a releasing position; and also
   an electrically controllable actuator (7) connected to the arresting means, the actuator being adapted to move the arresting means (6) in response to a wireless control signal.

2. Control panel according to claim 1, **characterized in that** the lock mechanism comprises a manually-operated latch (8, 11) engaging with the actuator (7), which latch is adapted in the first position to prevent and in the second position to allow movement of the arresting means (6) towards the releasing position.

3. Control panel according to claim 2, **characterized in that** the latch (8, 11) is turnable.

4. Control panel according to any of the preceding claims, **characterized in that** the arresting means (6) is an elongated rail traveling along a side wall of the control panel, the rail having detents (9) in the longitudinal direction that are adapted to engage with counterparts (10) on the door (4).

5. Control panel according to any of the preceding claims, **characterized in that** the edge of the side wall (3') on the door side bends outwards, and **in that** the edge of the door (4) bends correspondingly inwards in such a way that the bends (5A, 5B) form a detachable hinging between the first side wall and the door (4).

6. Control panel according to any of the preceding claims, **characterized in that** the actuator (7) comprises an electronic control unit (12), which comprises an input circuit for a wireless control signal.

7. Control panel according to claim 6, **characterized in that** the input circuit comprises a plurality of magnetic sensors (16) disposed at a predefined position in relation to each other;
   and **in that** the electronic control unit (12) is configured to form a control command for the actuator (7) for moving the arresting means (6) when the measurement results being received from all the magnetic sensors (16) correspond to predefined values.

8. Control panel according to any of the preceding claims, **characterized in that** the actuator (7) is a spindle motor.

9. Key (17) for locking and opening a lock mechanism (6, 7, 8, 9, 10, 11) according to any of claims 1 - 8.

10. Key according to claim 9, **characterized in that** the key (17) comprises means (15) for forming a wireless control signal.

11. Key according to claim 9 or 10, **characterized in that** the key (17) comprises a counterpart (19) engaging with the manually-operated latch (11), around the axis of rotation of the latch, as well as a handle (20), by turning from which handle the latch (11) can be turned around its axis of rotation.

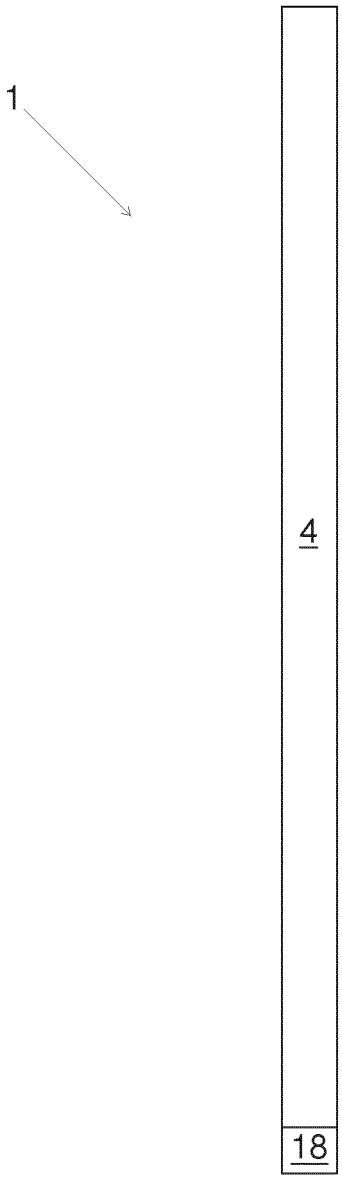

Fig. 1

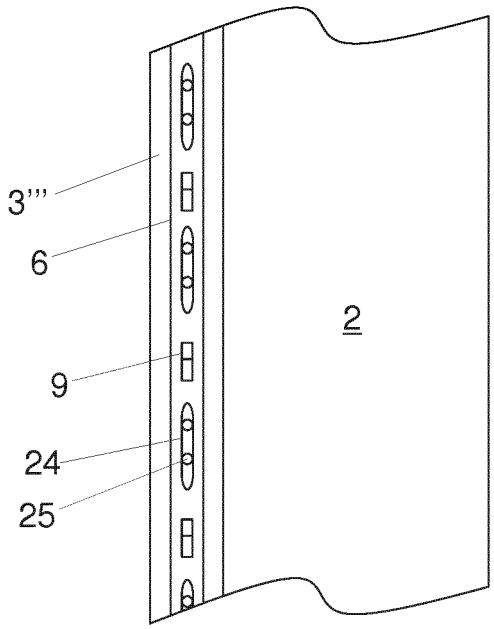

Fig. 2

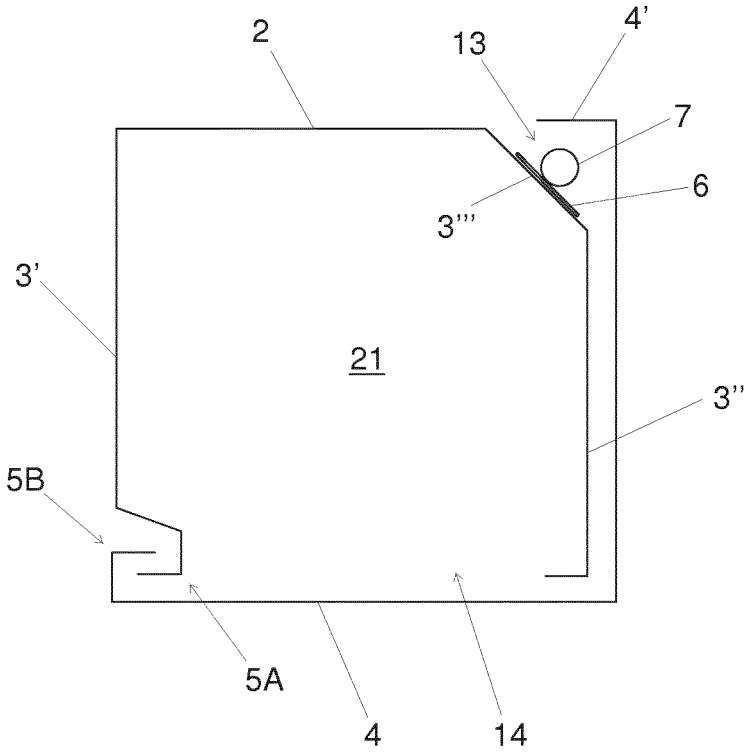

Fig. 3

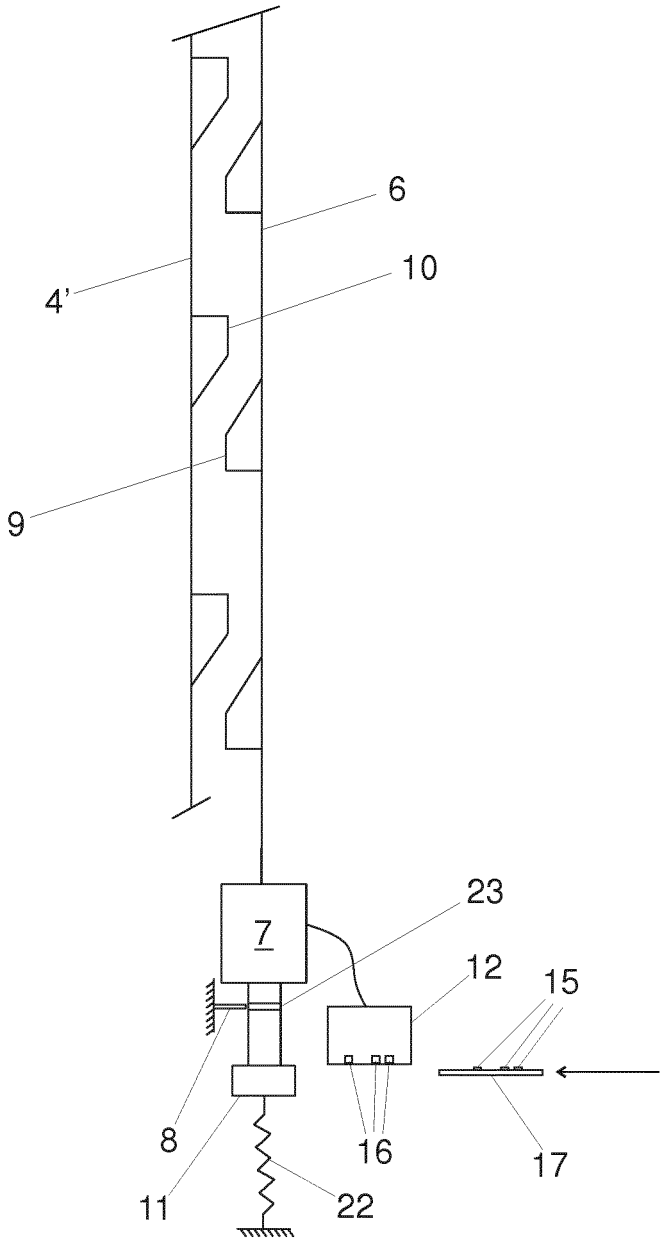

Fig. 4

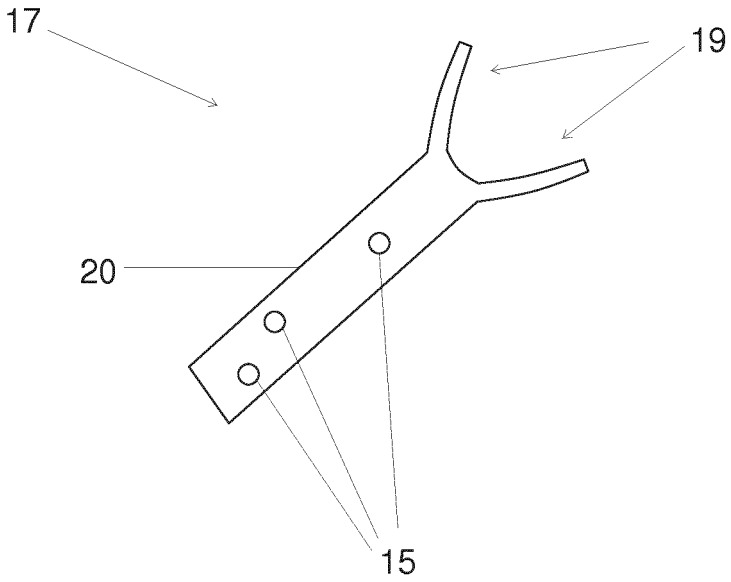

Fig. 5

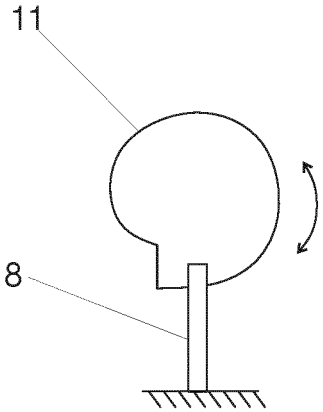

Fig. 6

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EUROPEAN SEARCH REPORT

Application Number
EP 15 16 9241

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	WO 2011/015895 A1 (OTIS ELEVATOR CO [US]; REBILLARD PASCAL [FR]) 10 February 2011 (2011-02-10) * abstract; figures 1-6 * * page 4, line 20 - page 5, line 4 * * page 8, line 15 - page 13, line 27 *	1-11	INV. B66B1/34 B66B11/00 B66B13/30 E05B47/00
A	US 2011/253483 A1 (REBILLARD PASCAL [FR] ET AL) 20 October 2011 (2011-10-20) * abstract; figures 1-4 * * paragraph [0026] *	1-11	
A	JP 2011 043044 A (R & D COMMUNICATIONS KK) 3 March 2011 (2011-03-03) * abstract; figures 1-6 * * paragraph [0034] *	1-11	
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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	23 October 2015	Bleys, Philip

CATEGORY OF CITED DOCUMENTS

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