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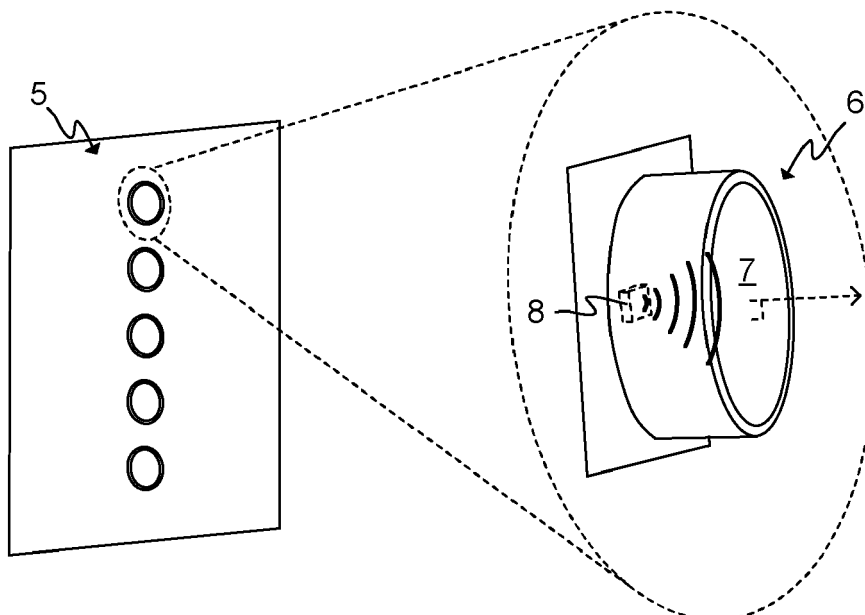
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(54) **ELEVATOR OPERATING PANEL, ELEVATOR SYSTEM, AND METHOD**

(57) An elevator operating device (5) comprising an elevator button (6) comprising a touch surface (7) and configured to generate an elevator call or command in response to operation of the elevator button (6). The elevator operating device (5) further comprises a radiation

device (8) arranged to emit radiation to affect the touch surface (7), wherein the radiation is adapted to be suitable for causing an antipathogenic effect on the touch surface (7).



**FIG. 2**

## Description

### FIELD OF THE INVENTION

**[0001]** The present invention relates in general to elevator systems. In particular, however not exclusively, the present invention concerns elevator operating devices, such as related to car operating panels, landing call devices, and/or destination control panels, and methods for providing an elevator call or command.

### BACKGROUND

**[0002]** Typical elevator operating devices require a passenger to push a button either on a car operating panel, on a landing call device or a destination control panel in order to give an elevator call. The touching will also expose the passenger to get pathogens, such as viruses or bacteria, from the button since in many cases the touch surface of the button can be regarded to be a high-touch surface.

### SUMMARY

**[0003]** An objective of the present invention is to provide an elevator operating device, an elevator system, and a method. Another objective of the present invention is that the elevator operating device, the elevator system, and the method at least reduces the risk of getting a pathogen when making the elevator call.

**[0004]** The objectives of the invention are reached by an elevator operating device, an elevator system, and a method as defined by the respective independent claims.

**[0005]** According to a first aspect, an elevator operating device is provided. The elevator operating device comprises an elevator button comprising a touch surface and configured to generate an elevator call or command in response to operation of the elevator button. The elevator operating device further comprises a radiation device arranged to emit radiation to affect the touch surface, wherein the radiation is adapted to be suitable for causing an antipathogenic effect on the touch surface.

**[0006]** In an embodiment, the elevator operating device comprises an electronic switch operable by the elevator button, wherein the electronic switch and the radiation device are arranged to a common base member, such as a circuit board.

**[0007]** In various embodiments, the elevator operating device may be arranged to detect external motion based on the emitted radiation and received radiation, such as reflected radiation. Furthermore, the elevator operating device may be configured to generate the elevator call or command based on the detected external motion. Optionally, the external motion may be arranged to be detected at most one-meter or preferably at most 10 centimeters distance away from the touch surface, that is, close to the touch surface.

**[0008]** In some embodiments, the radiation device may

be a radiation transceiver. Alternatively, the elevator operating device may comprise a radiation transmitter or emitter, and a radiation receiver.

**[0009]** In some embodiments, the radiation device may be arranged at least partly on opposite side of the elevator button with respect to the touch surface.

**[0010]** Alternatively, the radiation device may be arranged to emit radiation from a position which is a distance away from the touch surface in the perpendicular direction with respect to a normal of the touch surface.

**[0011]** In various embodiments, the radiation device may be based on emitting ultraviolet radiation.

**[0012]** Alternatively, the radiation device may be based on emitting ultrasound waves. Optionally, the frequency of the ultrasound waves may be at the range from about 200 kilohertz to about 1200 kilohertz, preferably, from 500 kilohertz to 900 kilohertz.

**[0013]** In various embodiments, the elevator operating device may comprise at least two said elevator buttons and corresponding radiation devices. Optionally, at least adjacent ones of the radiation devices may be arranged to emit radiation in a substantially non-overlapping manner, such as in turns.

**[0014]** According to a second aspect, an elevator system is provided. The elevator system comprises at least one elevator car movable in at least one elevator shaft between landings, and the elevator car or the landing comprises the elevator operating device according to the first aspect.

**[0015]** According to a third aspect, a method is provided. The method is preferably suitable for generating an elevator call or command. The method comprises emitting radiation to affect a touch surface of an elevator button, wherein the radiation is adapted to cause an antipathogenic effect on the touch surface, receiving radiation, such as reflected radiation, detecting external motion based on the emitted radiation and the received radiation, and generating an elevator call or command based on the detected external motion.

**[0016]** The present invention provides an elevator operating device, an elevator system, and a method. The present invention provides advantages over known solutions in that the risk of getting a pathogen when making the elevator call by operating the elevator operating device is reduced. This applies whether the passenger touches the elevator button or not.

**[0017]** Various other advantages will become clear to a skilled person based on the following detailed description.

**[0018]** The terms "first", "second", and so on are herein used to distinguish one element from other element, and not to specially prioritize or order them, if not otherwise explicitly stated.

**[0019]** The exemplary embodiments of the present invention presented herein are not to be interpreted to pose limitations to the applicability of the appended claims. The verb "to comprise" is used herein as an open limitation that does not exclude the existence of also unrecited

features. The features recited in depending claims are mutually freely combinable unless otherwise explicitly stated.

**[0020]** The novel features which are considered as characteristic of the present invention are set forth in particular in the appended claims. The present 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

**[0021]** Some 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 an elevator system according to an embodiment of the present invention.

Figure 2 illustrates schematically an elevator operating device according to an embodiment of the present invention.

Figure 3 illustrates schematically an elevator operating device according to an embodiment of the present invention.

Figure 4 illustrates schematically an elevator operating device according to an embodiment of the present invention.

Figure 5 illustrates schematically an elevator operating device according to an embodiment of the present invention.

Figure 6 illustrates schematically an elevator operating device according to an embodiment of the present invention.

Figure 7 illustrates schematically an elevator operating device according to an embodiment of the present invention.

Figure 8 shows a flow diagram of a method according to an embodiment of the present invention.

Figure 9 illustrates an elevator system according to an embodiment of the present invention.

#### DETAILED DESCRIPTION OF SOME EMBODIMENTS

**[0022]** Figure 1 illustrates an elevator system 100 according to an embodiment of the present invention. The elevator system 100 may comprise a plurality of elevators or be an elevator group, that is, having several, in this case three, elevator shafts along which elevator cars are

movable to serve landings 19 of the elevator system 100. Furthermore, the elevator system 100 preferably comprises at least one, preferably several, elevator operating devices 5. The elevator operating devices 5 may be, for example, car operating panel(s) inside the elevator car(s), landing call device(s) at the landing(s) 19, and/or destination control panel(s) at the landing(s) 19. Still furthermore, the elevator operating device(s) 5 may comprise at least one, preferably several, elevator buttons 6 comprising a touch surface and configured to generate an elevator call or command in response to operation of the elevator button 6. The elevator call or command may then be provided to an elevator control system for controlling the movement of one or several of the elevator cars in response to the elevator call or command.

**[0023]** Figure 2 illustrates schematically an elevator operating device 5 according to an embodiment of the present invention. The elevator operating device 5 may comprise the elevator button 6 comprising a touch surface 7 and configured to generate the elevator call or command in response to operation of the elevator button 6. The touch surface 7 may, preferably, be movable so that when being pushed, the touch surface 7 moves, and in response to that the elevator call or command is being generated. Furthermore, the elevator operating device 5 comprises a radiation device 8 arranged to emit radiation to affect the touch surface 7, wherein the radiation is adapted to be suitable for causing an antipathogenic effect on the touch surface 7.

**[0024]** In the elevator operating device 5 of Fig. 2, the radiation device 8 is arranged on opposite side of the elevator button 6 relative to the touch surface 7. The emitted radiation thus affects to touch surface 7 by penetrating through the surface 7 or moving around the surface 7 by reflections, for instance.

**[0025]** In various embodiments, the elevator operating device 5 may comprise at least two said elevator buttons 6 and corresponding radiation devices 8.

**[0026]** In some embodiments, the radiation device 8 may be based on emitting ultraviolet radiation. In case of an embodiment in accordance with Fig. 2, the touch surface 7 may preferably be of material which is substantially transparent to the ultraviolet radiation. The wavelength of the ultraviolet radiation may be from about 100 nanometers to about 380 nanometers, preferably from 100 nanometers to 280 nanometers, essentially corresponding to ultraviolet C (UVC) radiation. In the frequency ranges these correspond to about 789 THz to about 3000 THz, preferably from 1070 THz to 3000 THz, respectively.

**[0027]** Alternatively, the radiation device 8 may be based on emitting ultrasound waves. Furthermore, the frequency of the ultrasound waves may be, for example, at the range from about 200 kilohertz to about 1200 kilohertz, preferably, from 500 kilohertz to 900 kilohertz. The ultrasound waves may be conducted to the touch surface 7 by the physical structures of the elevator operating device 5 or may be emitted thereto via a layer of

air therebetween, if any.

**[0028]** Figure 3 illustrates schematically an elevator operating device 5 according to an embodiment of the present invention. The elevator operating device 5 may comprise an electronic switch 4 operable by the elevator button 6 and the radiation device 8 being arranged to a common base member, such as a circuit board. The electronic switch 4 may be, for example, electrodes which are connected to each other when the elevator button 6 is operated, such as when the touch surface 7 is pushed to its extreme position. However, it is to be noted that the electronic switch 4 may, alternatively, have some other known structure and/or operating principle.

**[0029]** Figure 4 illustrates schematically an elevator operating device 5 according to an embodiment of the present invention. In Fig. 4, a normal 50 of the touch surface is shown. Even though the touch surface 7 have been shown as a plane or planar element, it may, however, exhibit other shapes as well. The normal 50 may then be defined to be parallel to the movement direction of the touch surface 7 when being pushed. In Fig. 4, the radiation device 8 is attached to the opposite side of the elevator button 6 comprising the touch surface 7. For example, the corresponding portion of the elevator button 6 defining the touch surface 7 may be a film or other relatively thin element in the direction of the movement of the touch surface 7. Thus, by attaching the radiation device 8 to said portion, the emitted radiation does not have to travel via any layer of air.

**[0030]** Figure 5 illustrates schematically an elevator operating device 5 according to an embodiment of the present invention. The radiation device 8 may be arranged to emit radiation from a position which is a distance away from the touch surface 7 in the perpendicular direction with respect to a normal 50 of the touch surface 7 as shown in Fig. 5. In some embodiments, the radiation device 8 is thus arranged to the side so that a portion of the emitted radiation may travel parallel to the touch surface 7, however, another portion of the emitted radiation hits the touch surface 7. In an embodiment, the radiation device 8 arranged to the side may be directed so that substantially all emitted radiation hits the touch surface 7 at least first although would then reflect or pass through the touch surface 7. In Fig. 5, the touch surface 7 is shown in its normal position, that is, not operated or pushed. The elevator button 6 may thus define a flange to the side to which the radiation device 8 is arranged to.

**[0031]** In various embodiments, such as with respect any one or several or all of Figs. 2-5, the elevator operating device 5 may be arranged to detect external motion based on the emitted radiation and received radiation, such as reflected or passed radiation. The external motion may refer to, for example, movement of passenger's finger towards the elevator button 6. The external motion may refer to any motion which is not part of the elevator operating device 5. For example, the movement of the touch surface 7 itself is not considered to be external motion. Thus, In some embodiments, such as ones in

Figs. 2-5 or the like, the radiation device 8 may be a radiation transceiver.

**[0032]** Furthermore, the elevator operating device 5 may be configured to generate the elevator call or command based on the detected external motion. The elevator operating device 5, or specifically the radiation device 8, may be configured so that the external motion is detected at most one-meter or preferably at most 10 centimeters distance away from the touch surface 7.

**[0033]** Figure 6 illustrates schematically an elevator operating device 5 according to an embodiment of the present invention. The elevator operating device 5 may comprise, such as be comprised in the radiation device 8, a radiation transmitter or emitter, and a radiation receiver 9. In Fig. 6, the radiation receiver 9 may be arranged, for example, close to the transmitter or emitter. They may be, such as shown in Fig. 3, arranged to a common base member, such as a circuit board.

**[0034]** Figure 7 illustrates schematically an elevator operating device 5 according to an embodiment of the present invention. The elevator operating device 5 may be substantially similar to the one shown in Fig. 5, however, it may additionally comprise the radiation receiver 9. The detection of the external motion may be based on the emitted radiation, and the reflected radiation or the passed radiation such as visible in Fig. 7. Regarding the passed radiation, the radiation transmitter or emitter may be configured to emit radiation towards the radiation receiver 9 on the opposite side of the touch surface 7. If an object, such as passenger's finger, blocks a portion of the emitted radiation, this can be detected as the external motion, and, thus, the elevator call or command may be generated.

**[0035]** Figure 8 shows a flow diagram of a method according to an embodiment of the present invention.

**[0036]** Step 800 refers to a start-up phase. Suitable equipment and components may be obtained and systems assembled and configured for operation.

**[0037]** Step 810 refers to emitting radiation to affect a touch surface 7 of an elevator button 6, wherein the radiation is adapted to cause an antipathogenic effect on the touch surface 7, such to inactivate viruses and/or bacteria.

**[0038]** Step 820 refers to receiving radiation, such as reflected radiation or passed radiation.

**[0039]** Step 830 refers to detecting external motion based on the emitted radiation and the received radiation.

**[0040]** Step 840 refers to generating an elevator call or command based on the detected external motion.

**[0041]** The method may be ended at step 899. The method may preferably be performed continuously. However, the method may be configured to be performed on demand so that it can be started or stopped by a command via the elevator control system.

**[0042]** Figure 9 illustrates an elevator system 100 according to an embodiment of the present invention. The elevator system 100, or as visible in the figure, an elevator 100, may comprise an elevator car 10 arranged to be

moved or movable in an elevator shaft 12. The moving of the elevator car 10 may be implemented, preferably, by a hoisting rope or belt 13 in connection with a traction sheave 14 or the like. Furthermore, the elevator 100 comprises an electric motor 20 arranged to operate, such as rotate by the rotor thereof, the traction sheave 14 for moving the elevator car 10, if not essentially directly coupled to the hoisting rope 13. The traction sheave 14 may be connected, via a mechanical connection 22, directly or indirectly via a gear to a shaft of the motor 20. The elevator 100 may comprise a machine room or be machine roomless, such as have the motor 20 in the elevator shaft 12.

**[0043]** The elevator 100 may preferably comprise landings 19 or landing floors and, for example, landing floor doors and/or openings, between which the elevator car 10 is arranged to be moved during the normal elevator operation, such as to move persons and/or items between said landings 19.

**[0044]** The elevator 100 may preferably comprise at least one, or at least two, hoisting machinery brake(s) 16 configured for resisting or, preferably, preventing the movement of the motor 20, that is the rotor thereof, directly or via the traction sheave 14 or components thereof and/or therebetween. Furthermore, the elevator 100 may comprise a brake controller 25 configured to operate at least one of the at least one hoisting machinery brake 16. The brake controller 25 may further be in connection with other elements of the elevator 100, such as an elevator control system 1000. The brake controller 25 may comprise an actuator (not shown) for operating the brake 16 or at least be in connection with such an actuator.

**[0045]** There may additionally be, at least in some embodiments, a counterweight 18 arranged in connection with the elevator car 10 such as is known to a person skilled in the art of elevators. Still further, the elevator 100 may additionally comprise a guide rail 17 or rails 17 arranged into the elevator shaft 12 for guiding the movement of the elevator car 10. The elevator car 10 may comprise rollers or the like in moving in contact with the guide rails 17.

**[0046]** Furthermore, the elevator system 100 may comprise one or several elevator operating devices 5 such as illustrated in Figs. 2-7 and/or described hereinbefore.

## Claims

1. An elevator operating device (5) comprising:

an elevator button (6) comprising a touch surface (7) and configured to generate an elevator call or command in response to operation of the elevator button (6),  
**characterized in that** the elevator operating device (5) comprises  
 a radiation device (8) arranged to emit radiation

to affect the touch surface (7), wherein the radiation is adapted to be suitable for causing an antipathogenic effect on the touch surface (7).

2. The elevator operating device (5) of claim 1, wherein an electronic switch (4) operable by the elevator button (6) and the radiation device (8) are arranged to a common base member, such as a circuit board.
3. The elevator operating device (5) of claim 1 or 2, arranged to detect external motion based on the emitted radiation and received radiation, such as reflected radiation.
4. The elevator operating device (5) of claim 3, configured to generate the elevator call or command based on the detected external motion.
5. The elevator operating device (5) of claim 3 or 4, wherein the external motion is arranged to be detected at most one-meter or preferably at most 10 centimeters distance away from the touch surface (7).
6. The elevator operating device (5) of any one of claims 1-5, wherein the radiation device (8) is a radiation transceiver; or comprises a radiation transmitter or emitter, and a radiation receiver (9).
7. The elevator operating device (5) of any one of claims 1-6, wherein the radiation device (8) is arranged at least partly on opposite side of the elevator button (6) with respect to the touch surface (7).
8. The elevator operating device (5) of any one of claims 1-7, wherein the radiation device (8) is arranged to emit radiation from a position which is a distance away from the touch surface (7) in the perpendicular direction with respect to a normal (50) of the touch surface (7).
9. The elevator operating device (5) of any one of claims 1-8, wherein the radiation device (8) is based on emitting ultraviolet radiation.
10. The elevator operating device (5) of any one of claims 1-9, wherein the radiation device (8) is based on emitting ultrasound waves.
11. The elevator operating device (5) of claim 10, wherein a frequency of the ultrasound waves is at the range from about 200 kilohertz to about 1200 kilohertz, preferably, from 500 kilohertz to 900 kilohertz.
12. The elevator operating device (5) of any one of claims 1-11, comprising at least two said elevator buttons (6) and corresponding radiation devices (8).

13. The elevator operating device (5) of claim 12, wherein at least adjacent ones of the radiation devices (8) are arranged to emit radiation in a substantially non-overlapping manner, such as in turns.

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14. An elevator system (100) comprising an elevator car (10) movable in an elevator shaft (12) between landings (19), wherein the elevator car (10) or the landing (19) comprises an elevator operating device (5) of any one of claims 1-13.

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15. A method comprising:

- emitting (810) radiation to affect a touch surface (7) of an elevator button (6), wherein the radiation is adapted to cause an antipathogenic effect on the touch surface (7);
- receiving (820) radiation, such as reflected radiation;
- detecting (830) external motion based on the emitted radiation and the received radiation; and
- generating (840) an elevator call or command based on the detected external motion.

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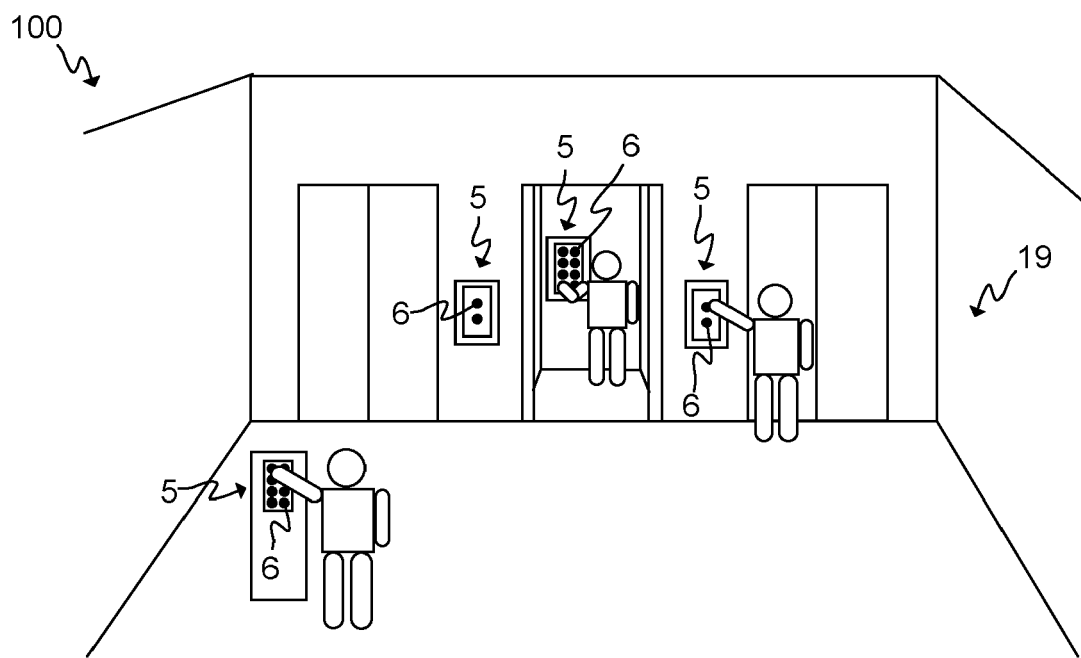


FIG. 1

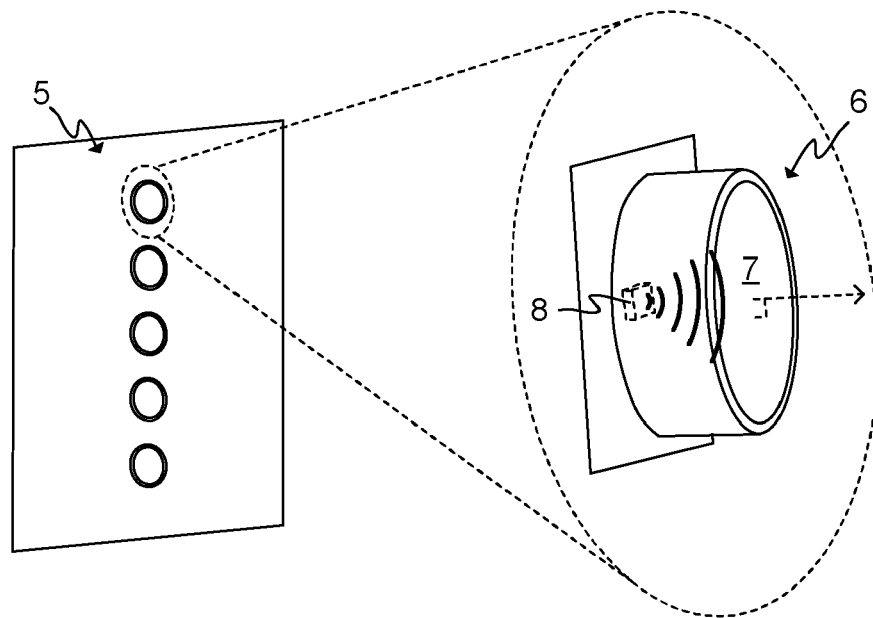


FIG. 2

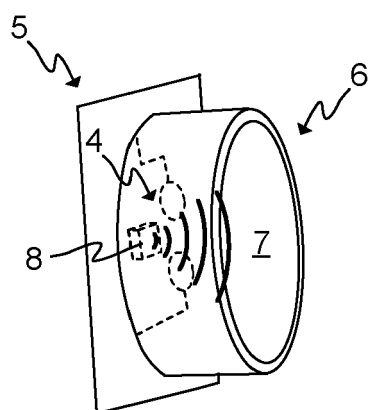


FIG. 3

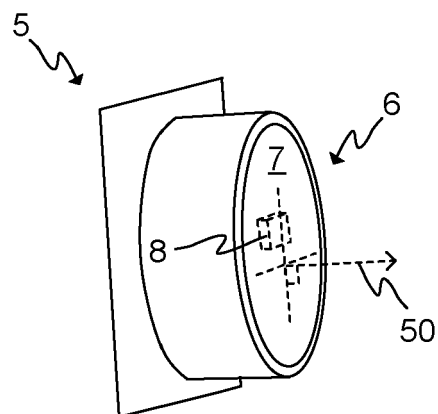


FIG. 4

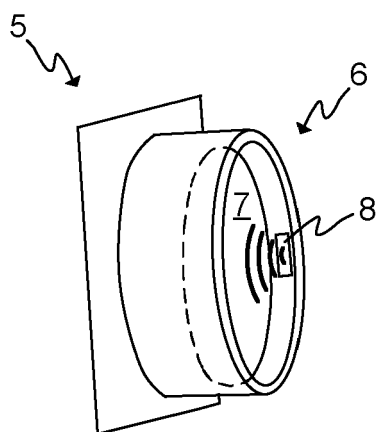


FIG. 5

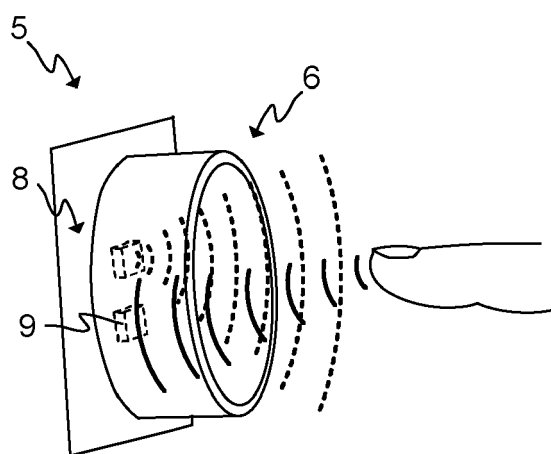


FIG. 6

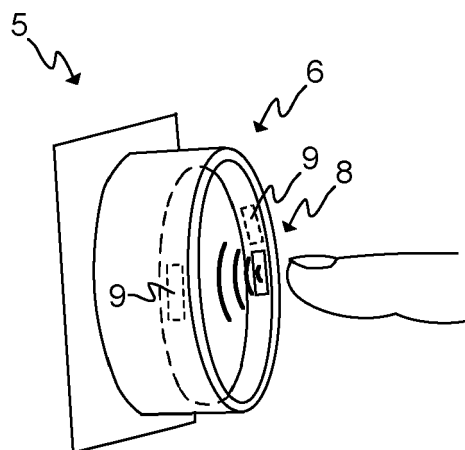


FIG. 7



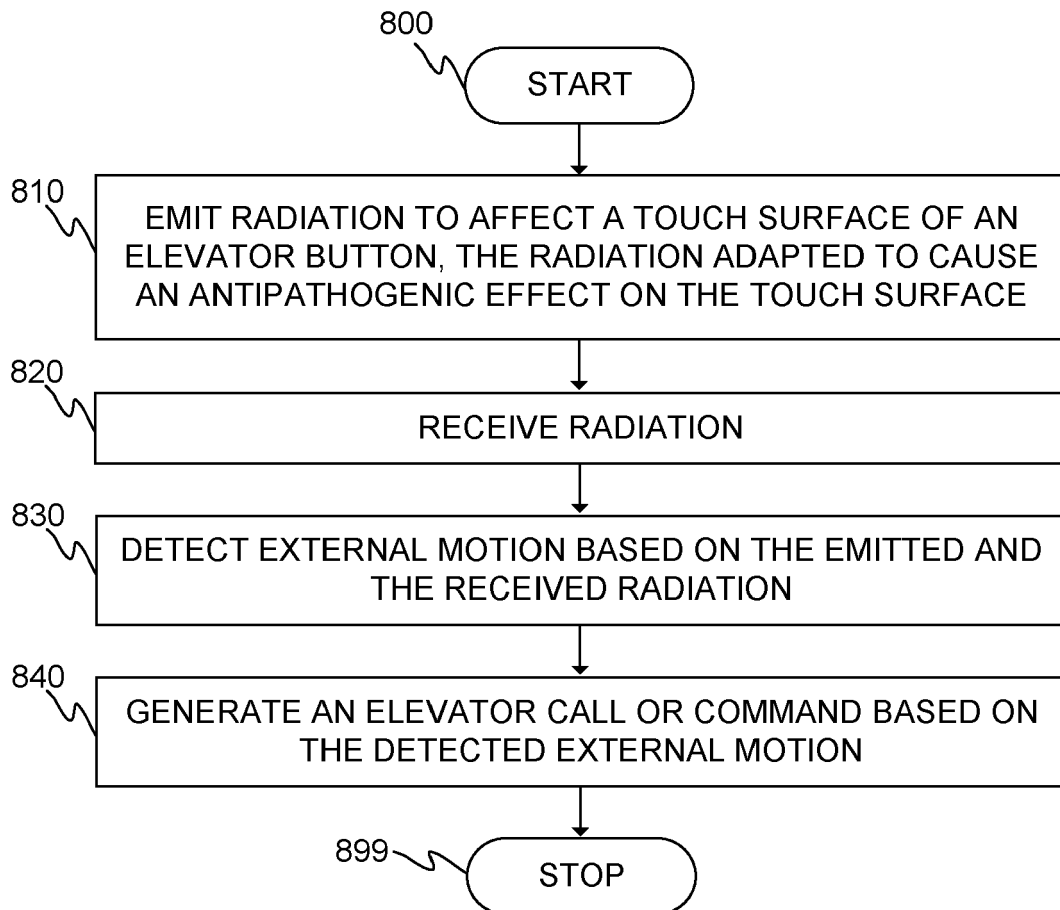


FIG. 8

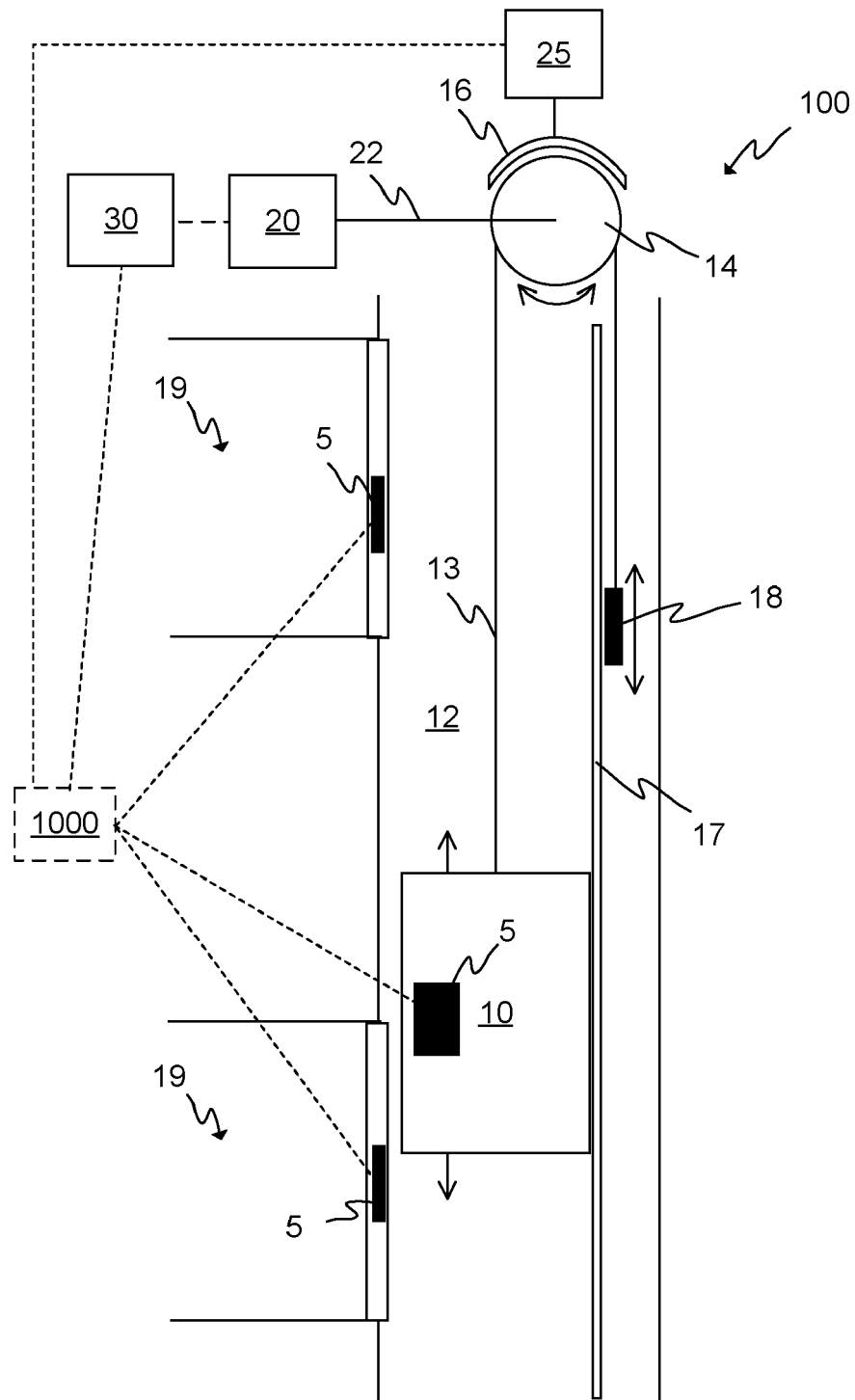


FIG. 9



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 Application Number  
 EP 20 17 6805

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| DOCUMENTS CONSIDERED TO BE RELEVANT                                              |                                                                                                                                                                                                                    |                                                                         |                                         |
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
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EPO FORM P0459

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