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(54) **System for monitoring a cableway**

(57) A monitoring system for monitoring a cableway having a cable transportation vehicle (6a, 6b) and at least one arrival/departure station (2, 3) for the vehicle (6a, 6b); the vehicle (6a, 6b) having: a door (7); locking means (8) for locking the door (7) in a closed position; and detecting means (9) connected to the locking means (8) and for detecting activation or release of the locking means (8) of the door (7); the monitoring system having electronic transmitting-receiving means (11) which are installed in the vehicle (6a; 6b), are connected to the detecting means (9) for detecting activation or release of the locking means (8) of the door (7), and are configured to transmit a signal, containing information relative to activation or release of the locking means (8) of the door (7), to monitoring means (17) for monitoring the cableway.

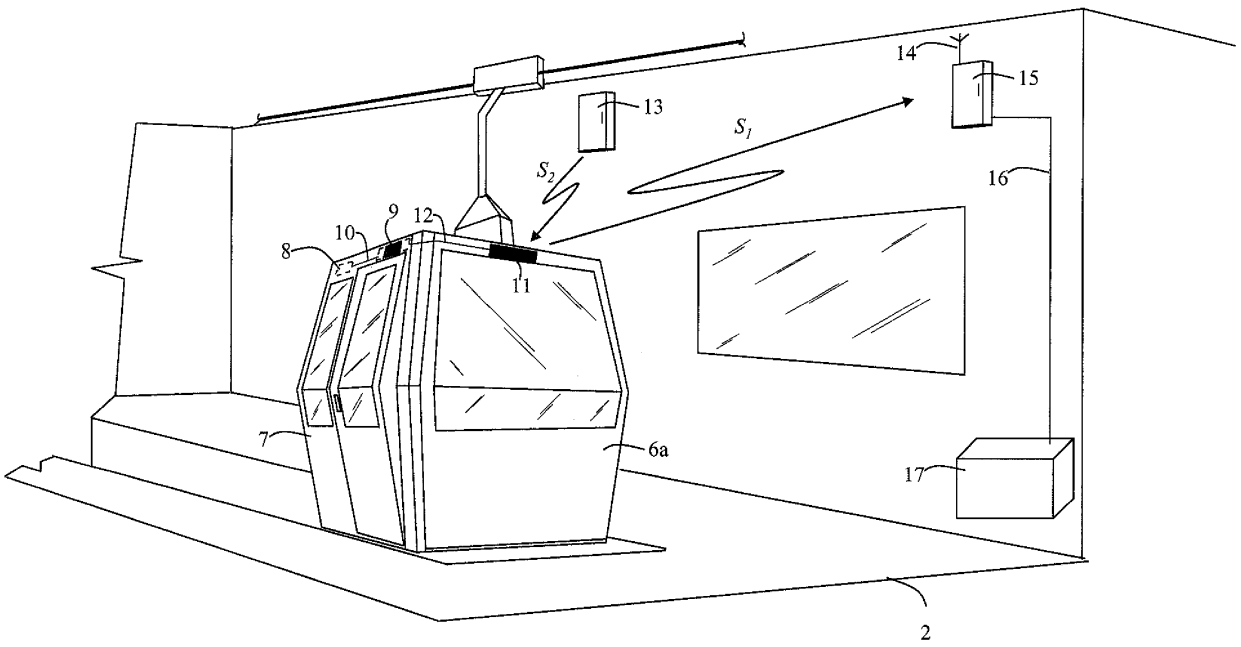

Fig.2

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Description

[0001] The present invention relates to a system for monitoring a cableway, and in particular for monitoring closure of cableway vehicle doors.

[0002] As is known, correct closure and locking of the doors of cableway vehicles, such as shuttle cable cars, cable railway cars, etc., are essential to ensure in-service safety of passengers.

[0003] For this reason, cableway cars are equipped with a locking mechanism activated by the driver before starting the car.

[0004] Correct operation of the car door locking mechanism is normally controlled by a toggle switch which is connected to the door locking mechanism, is activated automatically when the door locking mechanism is operated, and remains in a given position, indicating the car doors are locked, as long as the doors remain closed and the locking mechanism is activated. Correct operation and monitoring the setting of the toggle switch are essential to ensure the car doors are closed and locked when the car is running.

[0005] To improve the safety of cableways, a need is felt to remote monitor the toggle switch settings of all the cars in the cableway, so that immediate steps can be taken in the event of malfunctioning of the car door locking mechanism and/or the switches themselves.

[0006] It is an object of the present invention to provide a system for monitoring a cableway, and in particular for monitoring closure and locking of cableway vehicle doors.

[0007] According to the present invention, there is provided a system for monitoring a cableway, as claimed in the accompanying Claims.

[0008] A preferred, non-limiting embodiment of the present invention will be described by way of example with reference to the accompanying drawings, in which:

Figure 1 shows an example of a cableway;
Figure 2 shows details of a cableway featuring the monitoring system according to the invention.

[0009] Number 1 in Figure 1 indicates as a whole a shuttle cableway, and more specifically a cableway comprising a bottom arrival/departure station 2, a top arrival/departure station 3, an up cable branch 4, a down cable branch 5, a passenger car 6a, and a passenger car 6b.

[0010] More specifically, as shown in Figure 2, each of cars 6a, 6b comprises:

- doors, e.g. sliding doors, 7;
- a locking mechanism 8 (only shown schematically in Figure 2) for locking doors 7; and
- a toggle switch 9 connected to locking mechanism 8 of doors 7, e.g. by a connecting cable 10.

[0011] For the sake of simplicity, the monitoring system according to the invention will be described with reference to Figure 2, which shows one of the two cars, e.g. car 6a, standing in one of the two arrival/departure stations, e.g. bottom station 2.

[0012] As shown in Figure 2, the monitoring system according to the invention comprises:

- a transmitting-receiving device 11 housed in each of cars 6a and 6b (for the sake of simplicity, Figure 2 only shows car 6a) and connected to toggle switch 9 of the car, e.g. by a connecting cable 12;
- a signal transmitting device 13;
- a transmitting-receiving unit 15 with an antenna 14; and
- a control and processing unit 17 connected, preferably by a cable 16, to transmitting-receiving unit 15.

[0013] More specifically, each station 2, 3 is equipped with a signal transmitting device 13, a transmitting-receiving unit 15, and a control and processing unit 17.

[0014] When doors 7 are closed and locking mechanism 8 activated, toggle switches 9 are activated automatically and remain in a given position, indicating doors 7 are closed and locked, as long as the doors remain closed and locking mechanism 8 is activated.

[0015] Whenever it is activated, each toggle switch 9 transmits, to the transmitting-receiving device 11 to which it is connected, a signal S_{closed} indicating it is activated and the car doors 7 are locked.

[0016] Each transmitting-receiving device 11 contains an identification code which is memorized inside it and uniquely identifies the car fitted with transmitting-receiving device 11, e.g. car 6a in Figure 2. Each transmitting-receiving device 11 is configured to transmit a radio signal S_1 of given frequency, e.g. 868 MHz, and of a range ranging between a distance D_1, e.g. 1 metre, between transmitting-receiving device 11 and antenna 14 when cars 6a, 6b are stopped at stations 2, 3, and a given maximum distance D_2, e.g. 25 m, between cars 6a, 6b and stations 2, 3.

[0017] Antenna 14 is therefore still able to receive signal S_1 even after cars 6a, 6b have left stations 2, 3.

[0018] Each signal transmitting device 13 at stations 2 and 3 is configured to continuously transmit a radio signal S_2 of given frequency, e.g. 125 kHz, and of a maximum range substantially equal to the distance between signal transmitting device 13 and transmitting-receiving device 11 when cars 6a, 6b are standing in stations 2, 3.

[0019] That is, by appropriately calculating the maximum range of signal S_2, signal S_2 is only received by the transmitting-receiving device 11 of the car actually standing in the same station as transmitting-receiving device 13, e.g. by transmitting-receiving device 11 of car 6a in Figure 2.

[0020] More specifically, radio signal S_2 contains an identification code uniquely identifying the station in which device 13 is installed.

[0021] Operation of the monitoring system according to the invention will now be described with reference to

Figure 2.

[0022] As car 6a reaches arrival/departure station 2, transmitting-receiving device 11 of car 6a is supplied by transmitting device 13 at station 2 with radio signal S_2 containing the identification code of station 2.

[0023] As long as doors 7 remain closed and locking mechanism 8 is activated, transmitting-receiving device 11 of car 6a therefore sends antenna 14 a signal S_1 containing:

- the identification code of transmitting-receiving device 11;
- the information in signal S_{closed}, transmitted by toggle switch 9, indicating the car doors 7 are locked; and
- the identification code contained in the received radio signal S_2 and uniquely identifying station 2 in which car 6a is standing.

[0024] Antenna 14 transmits signal S_1 to transmitting-receiving unit 15, which sends it over cable 16 to control and processing unit 17, which displays the information in signal S_1 and informs the operator that car 6a is standing in station 2 with doors 7 locked.

[0025] When doors 7 of car 6a standing in station 2 are opened, transmitting-receiving device 11 of car 6a continues receiving radio signal S_2, containing the identification code of station 2, from transmitting device 13 at station 2, but stops receiving signal S_{closed} which, doors 7 being open, is no longer transmitted by toggle switch 9.

[0026] In which case, signal S_1 transmitted by transmitting-receiving device 11 of car 6a to antenna 14 only contains:

- the identification code of transmitting-receiving device 11; and
- the identification code contained in the received radio signal S_2 and uniquely identifying station 2 in which car 6a is standing.

[0027] Antenna 14 transmits signal S_1 to transmitting-receiving unit 15, which sends it over cable 16 to control and processing unit 17, which displays the information in signal S_1 and informs the operator that car 6a is still standing in station 2, but with doors 7 open.

[0028] When doors 7 of car 6a are closed again, and car 6a leaves station 2 and moves outside the range of signal S_2 transmitted by transmitting device 13, transmitting-receiving device 11 of car 6a no longer receives radio signal S_2, and only receives signal S_{closed} transmitted by toggle switch 9 when doors 7 were closed.

[0029] As car 6a moves away from station 2, and as long as car 6a is at a distance from station 2 within the maximum transmission range of signal S_1, transmitting-receiving device 11 of car 6a therefore sends antenna 14 a signal S_1 containing:

- the identification code of transmitting-receiving device 11; and
- the information in signal S_{closed}, transmitted by toggle switch 9, indicating the car doors 7 are locked.

[0030] Antenna 14 transmits signal S_1 to transmitting-receiving unit 15, which sends it over cable 16 to control and processing unit 17, which displays the information in signal S_1 and informs the operator that car 6a has left station 2, and doors 7 are locked.

[0031] When the distance between car 6a and station 2 exceeds the maximum transmission range of signal S_1, antenna 14 no longer receives signal S_1.

[0032] Antenna 14 therefore transmits no signal S_1 to transmitting-receiving unit 15, and control and processing unit 17 informs the operator that car 6a is travelling towards station 3 and that, on the basis of the previously received signal S_1, doors 7 are still locked.

[0033] The advantages of the cable transportation vehicle monitoring system according to the present invention will be clear from the above description.

[0034] The system according to the invention increases the safety of cableways by remotely monitoring the door locking mechanisms of all the vehicles in the cableway, and, in particular, enables immediate steps to be taken in the event of malfunctioning of the vehicle door locking mechanisms.

[0035] Moreover, the monitoring system described can also be applied to cableways in which the cars are slowed down, as opposed to being stopped, at the arrival/departure station.

[0036] Clearly, changes may be made to the monitoring system as described and illustrated herein without, however, departing from the scope of the present invention as defined in the accompanying Claims.

Claims

1. A monitoring system for monitoring a cableway comprising a cable transportation vehicle (6a, 6b) and at least one arrival/departure station (2, 3) for said vehicle (6a, 6b); said vehicle (6a, 6b) comprising: a door (7); locking means (8) for locking said door (7) in a closed position; and detecting means (9) connected to said locking means (8) and for detecting activation or release of said locking means (8) of said door (7); said monitoring system comprising:

   - electronic transmitting-receiving means (11) which are installed in said vehicle (6a; 6b), are connected to said detecting means (9) for detecting activation or release of said locking means (8) of said door (7), and are configured to transmit a signal, containing information relative to activation or release of said locking means (8) of said door (7), to monitoring means (17) for monitoring said cableway.

2. A monitoring system as claimed in Claim 1, and also comprising:

- signal transmitting means (13) installed at said arrival/departure station (2, 3); and
- transmitting-receiving means (15) installed at said arrival/departure station (2, 3);

and wherein said monitoring means (17) are installed at said arrival/departure station (2, 3), and are connected to said transmitting-receiving means (15).

3. A monitoring system as claimed in Claim 1 or 2, wherein said detecting means (9) are configured to transmit a first signal (S_{closed}), containing information relative to activation or release of said locking means (8), to said electronic transmitting-receiving means (11).

4. A monitoring system as claimed in Claims 2 and 3, wherein said signal transmitting means (13) installed at said arrival/departure station (2, 3) are configured to transmit a second signal (S_2) containing information relative to an identification code of said arrival/departure station (2, 3).

5. A monitoring system as claimed in any one of the foregoing Claims, wherein an identification code of said vehicle (6a, 6b) is memorized in said electronic transmitting-receiving means (11) installed in said vehicle (6a, 6b); and wherein said electronic transmitting-receiving means (11) are configured to receive said first signal (S_{closed}) and said second signal (S_2), and to transmit a third signal (S_1) containing said identification code of said vehicle (6a, 6b) and said information contained in said first signal (S_{closed}) and said second signal (S_2).

6. A monitoring system as claimed in Claim 5, wherein said second signal (S_2) transmitted by said signal transmitting means (13) installed at said arrival/departure station (2, 3) is a radio signal of predetermined frequency and with a maximum range equal to a first distance between said signal transmitting means (13) and said electronic transmitting-receiving means (11) when said vehicle (6a, 6b) is standing in said arrival/departure station (2, 3).

7. A monitoring system as claimed in Claim 5, wherein said third signal (S_1) transmitted by said electronic transmitting-receiving means (11) is a radio signal of predetermined frequency and with a maximum range equal to a second distance ranging between a third distance between said electronic transmitting-receiving means (11) and said transmitting-receiving means (15) installed at said arrival/departure station (2, 3) when said vehicle (6a, 6b) is standing in said arrival/departure station (2, 3), and a predetermined fourth distance between said vehicle (6a, 6b) and said arrival/departure station (2, 3).

8. A monitoring system as claimed in any one of the foregoing Claims, wherein said transmitting-receiving means (15) installed at said arrival/departure station (2, 3) are configured to receive and transmit said third signal (S_1) to said monitoring means (17).

9. A monitoring system as claimed in any one of the foregoing Claims, wherein said detecting means (9) are connected to said electronic transmitting-receiving means (11) by a first connecting cable.

10. A monitoring system as claimed in any one of the foregoing Claims, wherein said transmitting-receiving means (15) installed at said arrival/departure station (2, 3) are equipped with an antenna (14) configured to receive said third signal (S_1).

11. A monitoring system as claimed in any one of the foregoing Claims, wherein said transmitting-receiving means (15) installed at said arrival/departure station (2, 3) are connected to said monitoring means (17) by a second connecting cable.

12. A cableway comprising a monitoring system as claimed in Claims 1 to 11.

13. A method of monitoring a cableway comprising a cable transportation vehicle (6a, 6b) and at least one arrival/departure station (2, 3) for said vehicle (6a, 6b); said vehicle (6a, 6b) comprising: a door (7); locking means (8) for locking said door (7) in a closed position; and detecting means (9) connected to said locking means (8) and for detecting activation or release of said locking means (8) of said door (7); said method comprising the step of:

- transmitting a signal, containing information relative to activation or release of said locking means (8) of said door (7), to monitoring means (17) for monitoring said cableway.

14. A method as claimed in Claim 13, and also comprising the steps of:

- memorizing an identification code of said vehicle (6a, 6b) in electronic transmitting-receiving means (11) installed in said vehicle (6a; 6b);
- transmitting a first signal (S_{closed}), containing information relative to activation or release of said locking means (8), to said electronic transmitting-receiving means (11) installed in said vehicle (6a; 6b);
- transmitting a second signal (S_2) containing information relative to an identification code of said arrival/departure station (2, 3);

- receiving said first signal (S_{closed}) and said second signal (S_2) at said electronic transmitting-receiving means (11) installed in said vehicle (6a; 6b);
- transmitting a third signal (S_1) containing said identification code of said vehicle (6a, 6b) and said information contained in said first signal (S_{closed}) and said second signal (S_2); and
- receiving said third signal (S_1) at said monitoring means (17) monitoring said cableway.

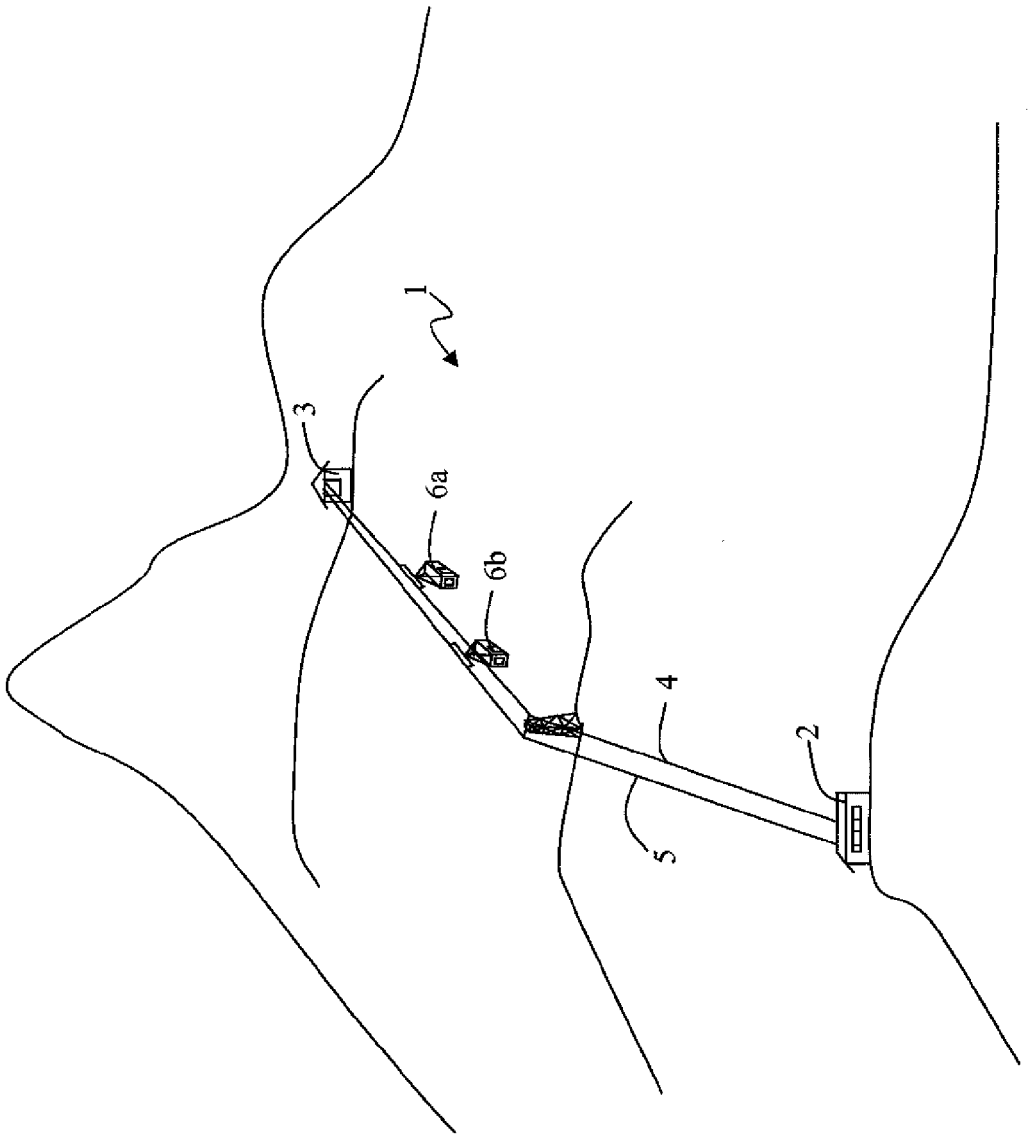

Fig.1

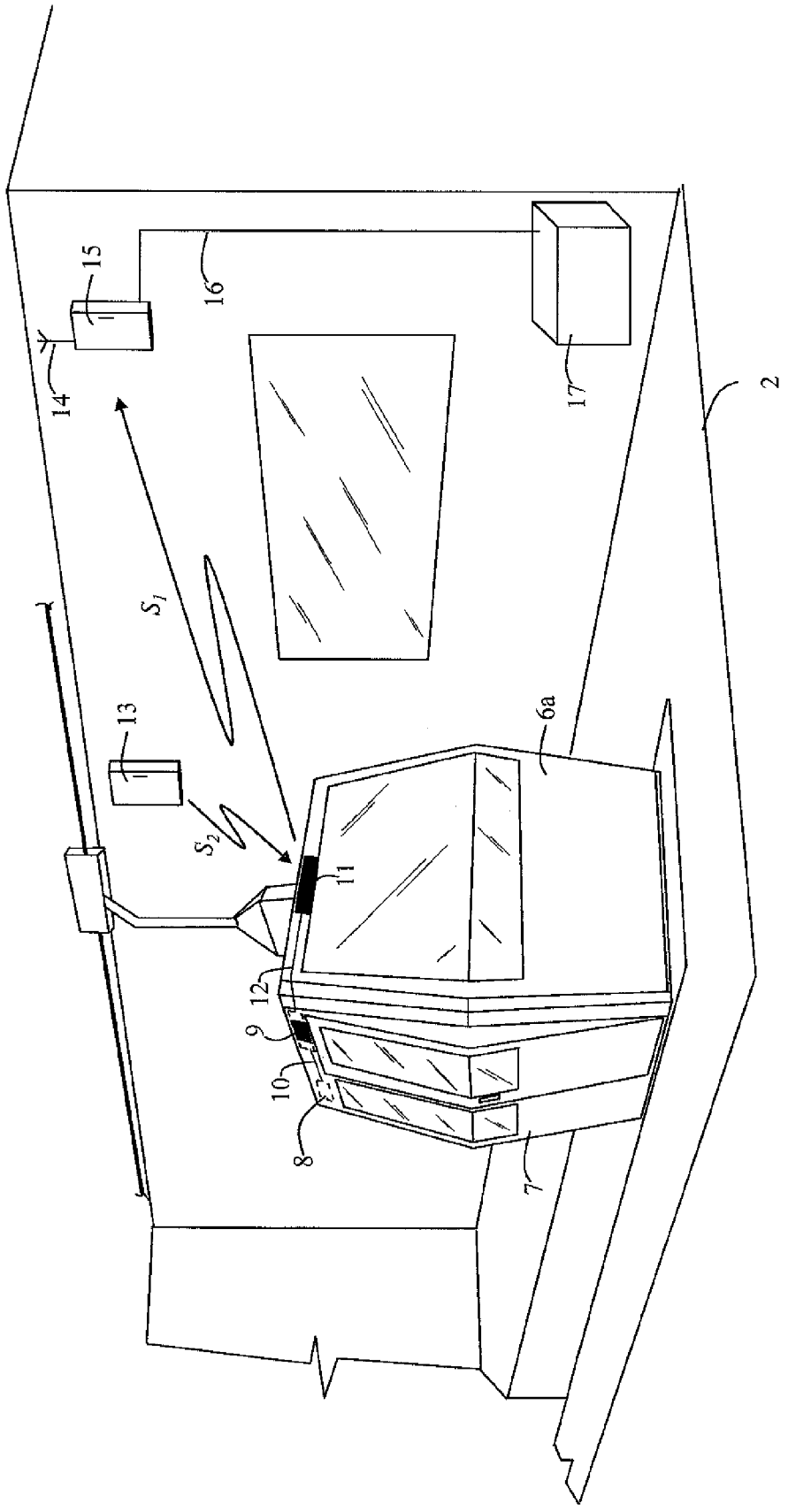

Fig.2

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EUROPEAN SEARCH REPORT

Application Number
EP 08 17 0880

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TECHNICAL FIELDS SEARCHED (IPC)

B61B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	16 March 2009	Awad, Philippe

CATEGORY OF CITED DOCUMENTS

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