(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 226 223 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
**04.10.2017 Bulletin 2017/40**

(51) Int Cl.:
***G08G 1/04*** *(2006.01)* ***G08G 1/14*** *(2006.01)*

(21) Application number: **17382165.3**

(22) Date of filing: **31.03.2017**

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

(30) Priority: **01.04.2016 ES 201630390**

(71) Applicant: **Circontrol S.A.**
**08232 Viladecavalls (ES)**

(72) Inventor: **COMELLAS CABEZA, Joan**
**08232 VILADECAVALLS (ES)**

(74) Representative: **Sugrañes Patentes y Marcas**
**Calle Provenza 304**
**08008 Barcelona (ES)**

(54) **DEVICE FOR INDICATING PARKING SPACE OCCUPANCY STATUS**

(57) A device (1) for indicating parking space (2) occupancy status that comprises detection means (3) of the occupancy of the parking space and signaling means (4) of the occupancy status of the parking space, also incorporating illumination means (6) to illuminate the parking space.

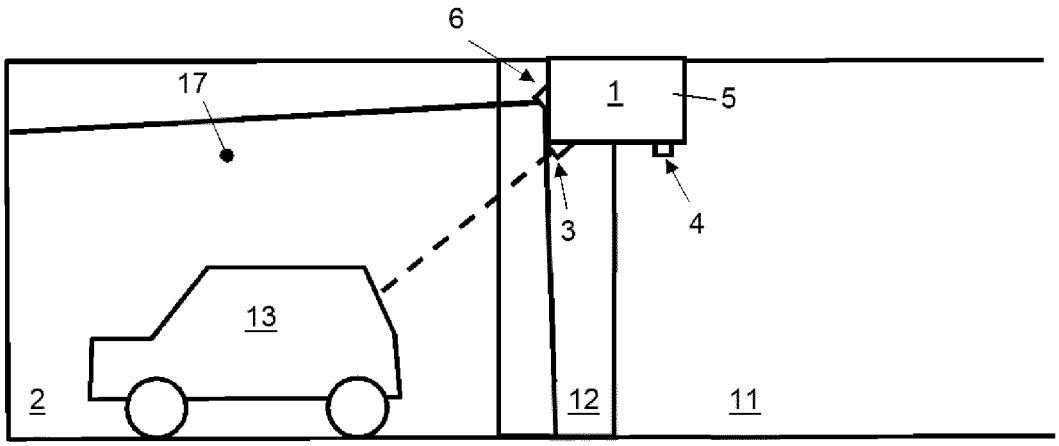


**Fig. 4**

EP 3 226 223 A1

## Description

### Technical sector of the invention

**[0001]** The device for indicating parking space occupancy status of the present invention makes it possible to indicate the occupancy status of each one of the parking spaces to drivers searching for a parking space for their vehicles.

### Background of the invention

**[0002]** There are known devices for indicating parking space occupancy status to inform drivers searching for a parking space for their vehicle in a parking lot of the occupancy status of each one of the parking spaces, for example using red and green indicator lights depending on whether the space is occupied or unoccupied.

**[0003]** However, the known devices limit themselves to merely informing drivers of the occupancy status of the spaces, without offering any additional assistance to park vehicles or promote an environment that facilitates the maneuverability of the vehicle when entering or exiting the parking space.

**[0004]** The objective of this invention is therefore to describe a device for indicating parking space occupancy status that also facilitates maneuvering by the driver to enter and exit the parking space.

### Explanation of the invention

**[0005]** The device for indicating parking space occupancy status of this invention comprises detection means of the occupancy of the parking space and signaling means of the occupancy status of the parking space.

**[0006]** In essence, the device is characterized in that it also comprises illumination of the parking space, the detection means, signaling means, and illumination means being arranged in the same housing, such that these indication and illumination means are integrated into the same housing, creating a compact module that can be easily installed and that also makes it possible, in addition to detecting and indicating the occupancy of the parking space, to illuminate said parking space, for example, when it is occupied, so that a driver can maneuver to enter or exit the parking space comfortably with the vehicle, even when the parking lot is dark. The illumination of the parking space may also be done in a different way, for example constantly or according to a preset program of the device.

**[0007]** It is also disclosed that the device comprises programmable control means, integrated into the device, to control the operation of the illumination means, as indicated above. Preferably, these control means will be connected to a communications network, such that they can transmit the occupancy status of the parking space to a central server and can receive instructions for the operation of the illumination means. The control means are also designed to be programmable during the use of the device to modify its operation, for example to regulate the illumination of the illumination means based on the occupancy of the parking level or a timetable, which will be indicated by the central server.

**[0008]** It is also disclosed that the control means are adapted to activate the illumination means when the detection means detect the occupation of the parking space, allowing the driver of the vehicle to be illuminated while parking, even when the parking lot is dark. Also, the illumination of the parking space during this time also provides the advantage of giving the driver a clear view of the vehicle's lock when locking it.

**[0009]** It is also disclosed that the control means comprise a timer adapted to activate the illumination means for a preset time when the detection means detect the occupation of the parking space. This means that the illumination means only illuminate the parking space for sufficient time to allow the driver to park and leave the vehicle without the need for the illumination means to be constantly activated.

**[0010]** It is also disclosed that the illumination means generate a luminous flux greater than 400 lumens, preferably 450 lumens, which offers a sufficient level of illumination to access the vehicle comfortably, in addition to assisting drivers if they drop the keys or objects on the ground.

**[0011]** It is also disclosed that the illumination means generate a beam of light whose luminous flux is greater on its periphery than on its axis, allowing the illumination to be distributed over the parking space, such that the peripheral zone of the parking space is illuminated, which is where the user will move to enter and exit the vehicle.

**[0012]** It is also disclosed that the illumination means generate a symmetrical beam of light, making it possible to illuminate both lateral peripheral zones of the parking space equally.

**[0013]** It is also disclosed that the illumination means generate a beam of light with an angle of aperture of between 85 and 95 degrees, preferably 90 degrees, which allows the device to be installed a sufficient distance away from the parking space to allow the lighting of the parking space to be correct and also allow the rest of the users to see the indication means indicating the occupancy status of the parking space.

**[0014]** It is also disclosed that the device determines a support plane for installation and anchoring to the ceiling of a parking lot and the illumination means generate a beam of light whose axis forms an angle of between 25 and 35 degrees, preferably 30 degrees, with the normal line to said support plane, in other words, with the vertical once it has been installed, allowing the beam of light to be oriented towards the parking space from a distance to the parking space from which the rest of the users are able to see the signaling means indicating the occupancy status of the parking space.

**[0015]** It is disclosed that the detection means and the illumination means are arranged at the same end of the

housing, thus allowing both the detection signal of the detection means as well as the illumination cone of the illumination means to be directed at the parking space, while the signaling means, installed at the other end of the housing, can be viewed by vehicle drivers who are looking for open spaces in a parking lot. This allows the device to be advantageously installed between the parking space and a lane of the parking lot, without the need to install additional elements.

**[0016]** It is also disclosed that the illumination means have a power of at least 2W, preferably a power of 3W, thus providing sufficient illumination of the parking space.

**[0017]** It is also disclosed that the illumination means are formed by at least one LED source of white light, allowing low power consumption to achieve the necessary lighting intensity, while at the same time providing long life and avoiding the need to replace the illumination means during the lifetime of the device.

**[0018]** It is also disclosed that the detection means comprise a distance sensor, preferably an ultrasonic distance sensor, such that the illumination means do not interfere with the detection means. The detection means will preferably be formed by two distance sensors, preferably two ultrasonic distance sensors, thus ensuring detection. It also provides that the detection means comprise other types of sensors, such as laser distance sensors or graphic or visual distance sensors, such as those based on CMOS technology that allow sufficient resolution for use as a distance sensor, such as XVGA, by way of a photographic camera. Naturally, the different distance sensors will be provided with the corresponding signal processing means, to, for example, determine the distance to a target, such as a vehicle. It even provides that when the detection means comprise two or more distance sensors, these may use different technology, such that the distance, and therefore detection, may be guaranteed by two or more different technologies, also allowing the detection means to operate with different lighting conditions, selecting one or the other based on the surrounding lighting conditions. It is also considered that the distance sensors of the detection means may consist of several pairs of distance sensors, each pair of equal sensors being the same technology, thus achieving, in the first place, that the distance can be verified by each sensor in the pair and compared with the distances obtained from the rest of the sensor pairs, in order to confirm the distance and decide more accurately whether or not there is detection. Naturally, it also provides that the distance sensors may be other than those known in the prior art.

**[0019]** It is also disclosed that the signaling means comprise an RGB LED, in other words, a polychromatic LED that allows the activation of different colors to indicate, for example, that the space is empty by activating with green or that the space is occupied by activating with red.

Brief description of the drawings

**[0020]** The attached drawings illustrate, by way of non-limiting example, the device for indicating parking space occupancy status of the present invention. In said drawings:

Fig. 1 shows a diagram of the components of the device of the present invention;
Fig. 2 shows a diagram of the distribution of the luminous flux in the beam of light generated by the device of the present invention on a plane transversal to the direction of the axis of the beam of light;
Fig. 3 shows the device of the present invention installed in an unoccupied parking space; and
Fig. 4 shows the device of the present invention installed in an occupied parking space.

Detailed description of the drawings

**[0021]** Fig. 1 shows a schematic view of the device 1 for indicating parking space 2 occupancy status of the present invention. As may be seen, the device 1 comprises a series of detection means 3 for detecting the occupation of the parking space 2, formed by at least one ultrasonic distance sensor 10. Preferably, the detection means 3 will be formed by two distance sensors 10, which are shown superimposed on the device 1 in Fig. 1, which allow the distance to a target to be detected by the emission of an ultrasound signal and detection of the echo rebounding off of the target in a known manner. By means of this known technique, the detection means 3 make it possible to determine the distance to the target. If the distance is shorter than the distance to the floor, which will have been calibrated previously, it will mean that the parking space is occupied. Naturally, it provides that the detection means 3 for detecting the occupation of the parking space 2 may be other types, such as optical sensors.

**[0022]** The device 1 is also provided with signaling means 4 to indicate the occupancy status of the parking space 2, arranged in the same housing 5 as the detection means 3. This housing 5 may be, for example, a watertight box, such that the device 1 is a compact module that can be easily installed, for example, on the ceiling of a parking lot adjacent to a parking space 2, both on a metal conduit and on a pipe. The indication means 4 may be, for example, an RGB LED, which allows illumination in red or green, which, depending on the color, makes it possible to indicate to drivers whether the space is unoccupied or occupied.

**[0023]** The device also comprises illumination means 6 arranged on the housing 5, such that an LED source of white light with a power of at least 2W and preferably 3W, that allows proper illumination of the parking space 2, generating a luminous flux of more than 400 lumens, for example 450 lumens, which will allow illumination of between 20 and 22 lux in the parking space 2.

**[0024]** The device 1 is also provided with programmable control means 7 that are also integrated into the housing 5 connected to the detection means 3 and to the indication means 4, such that depending on the distance obtained by the detection means 3, the control means 7 can determine the color of the signaling means 4 to indicate the occupancy status of the parking space 2 and the driver can thus determine the occupancy status of the parking space 2 from a distance. In addition, the control means 7 are in turn connected to the illumination means 6, such that they can also control the activation of the illumination means 6 to illuminate the parking space 2 according to the established program. For example, the control means 7 can be programmed to activate the illumination means 6 when the detection means 3 detect an occupation of the parking space 2. This means that in a parking lot provided with the devices 1 installed in each parking space 2, the number of illuminated parking spaces 2 will indicate the number of occupied spaces, so the overall illumination of the parking lot will be proportional to its occupation. Naturally, the control means 7 may in turn be provided with a timer 9 adapted to activate the illumination means 6 only for a predetermined time, or that may be programmed, when the detection means 3 detect the occupation of the parking space 2. Although Fig. 1 indicates direct connections between the control means 7 and the different components, it is also provided that the control means 7 may be connected to controllers of each one of the components. It is also provided that device 1 is equipped with an electrical power supply, such as a 48 V direct current power supply.

**[0025]** The operating logic of the control means 7 may be programmed both before the device 1 is installed as well as after installation, for example by means of a communications network 8 to which they are connected. This means that not only the control means 7 can receive programming instructions with regards to how the illumination means 6 should be activated, but also, the control means 7 can report the occupancy status of the parking space 2 to a central server. This communication network 8 may be, for example, a known RS485 type network. For example, by means of said communications network 8, it can be established that the illumination means 6 of all of the devices 1 connected to the communications network 8 are activated, if a higher level of illumination is required in the parking lot. Naturally, it is also provided that the intensity of the light from the illumination means 6 can be adjusted by programming in the control means 7.

**[0026]** As also shown in Fig. 1, the device 1 determines a support plane 14 for the installation thereof on the ceiling of the parking lot, aiming both the detection means 3 as well as the illumination means 6 in the direction of the parking space, as will be described below, such that the illumination means 6 generate a beam of light 17 whose axis forms an angle of between 25 and 35 degrees, preferably 30 degrees, with the normal line 15 to said support plane 14, or in other words, with the vertical once it has been installed. It also shows that the angle of aperture $\alpha$ of said illumination means 6 on the plane XY will be approximately between 85 and 95 degrees, preferably 90 degrees.

**[0027]** Fig. 2 shows a diagram of the distribution of the luminous flux in the beam of light generated on the plane transversal to the direction of the beam of light, in other words, the plane YZ, which shows that the beam of light 17 generated by the illumination means 6 is symmetrical on this plane and is not uniformly distributed, but rather that the luminous flux on the periphery of its axis 16, in other words, in the zone furthest from the center, will be greater in the direction of the axis 16, thus allowing the peripheral zone of the parking space to be illuminated with greater intensity. It is also provided that the beam of light 17 also has the same characteristics in the XY plane. This distribution of the beam of light 17 can be achieved by arranging a plurality of power supplies as needed as well as by the proper optics. The angle of aperture $\alpha$ of the illumination means 6 on the plane YZ will also be between 85 and 95 degrees, preferably 90 degrees.

**[0028]** As shown earlier in Fig. 1, the detection means 3 and the illumination means 6 are arranged at the same end of the housing 5, while the signaling means 4 are arranged on the opposite end of the housing 5. This means that, as shown in Fig. 3, the device 1 can be installed adjacent to a parking space, such that on one side, the drivers who approach the parking space 2 with their vehicles along a central lane 11 of a parking lot can see the signaling means 4 of the device 1 without the columns 12 of the parking lot blocking their view. Since the detection means 3 are at the other end of the housing 5, this provides the advantage of positioning them closer to the parking space 2, allowing a more accurate reading of the occupancy status of the space, and preventing users who are traveling along the central lane 11 from distorting the reading of the detection means 3. The illumination means 6 are in turn arranged at the other end, which is closer to the parking space 2, allowing the beam of light 17 to be aimed more directly.

**[0029]** Fig. 3 shows the device 1 installed in a parking space to indicate whether a parking space 2 is unoccupied or occupied. As shown, in the situation presented in Fig. 3 in which the parking space 2 is unoccupied, the detection means 3 of the device 1 will indicate that the parking space 2 is unoccupied, so the signaling means 4 will inform drivers of this situation, for example by a green light. As such, in a parking lot provided with multiple parking spaces 2, a device 1 will be installed adjacent to each parking space 2 to indicate the occupancy status of that parking space 2.

**[0030]** When a vehicle occupies the parking space 2, for example, as illustrated in Fig. 4, the detection means 3 will determine that there is a target before the ground, presumably a vehicle. Naturally, it is provided that the control means 7 are prepared to avoid false positives of occupation in a known manner, such as waiting for the distance to be maintained for sufficient time in order to

verify the occupation of the parking space 2. When the occupation of the parking space 2 is detected, the signaling means 4 will indicate that the parking space 2 is occupied by a vehicle 13, for example by a red light, and the illumination means 6 will be activated, such that they emit a beam of light 17 to allow the driver to maneuver and park comfortably in the parking space 2, due to the fact that the parking space 2 is illuminated. The illumination of the parking space 2 may be maintained for a predetermined time, as described earlier, until the parking space 2 is unoccupied, or in other ways depending on how the device 1 is programmed.

## Claims

1. A device (1) for indicating parking space (2) occupancy status that comprises detection means (3) of the occupancy of the parking space and signaling means (4) of the occupancy status of the parking space, **characterized in that** it also incorporates illumination means (6) of the parking space.

2. The device (1) according to the preceding claim, **characterized in that** it also comprises programmable control means (7) to control the operation of the illumination means (6).

3. The device (1) according to the preceding claim, **characterized in that** the control means (7) are adapted to activate the illumination means (6) when the detection means (3) detect the occupation of the parking space (2).

4. The device (1) according to the preceding claim, **characterized in that** the control means (7) comprise a timer (9) adapted to activate the illumination means (6) for a predetermined time when the detection means (3) detect the occupation of the parking space (2).

5. The device (1) according to any one of claims 2 to 4, **characterized in that** the programmable control means (7) are connected to a communications network (8).

6. The device (1) according to any one of the preceding claims, **characterized in that** the illumination means (6) generate a luminous flux greater than 400 lumens.

7. The device (1) according to any one of the preceding claims, **characterized in that** the illumination means (6) generate a beam of light (17) whose luminous flux is greater on its periphery than along its axis (16).

8. The device (1) according to any one of the preceding claims, **characterized in that** the illumination means (6) generate a symmetrical beam of light (17).

9. The device (1) according to any one of the preceding claims, **characterized in that** the illumination means (6) generate a beam of light (17) with an angle of aperture ($\alpha$) of between 85 and 95 degrees.

10. The device (1) according to any one of the preceding claims, **characterized in that** it determines a support plane (14) for installation and anchoring to a ceiling and the illumination means (6) generate a beam of light (17) whose axis (16) forms an angle of inclination ($\beta$) of between 25 and 35 degrees with the normal line (15) of said support plane.

11. The device (1) according to any one of the preceding claims, **characterized in that** the illumination means (6) have a power of at least 2W.

12. The device (1) according to any one of the preceding claims, **characterized in that** the illumination means (6) are formed by at least one LED source of white light.

13. The device (1) according to any one of the preceding claims, **characterized in that** the detection means (3) comprise a distance sensor (10).

14. The device (1) according to the preceding claim, **characterized in that** the detection means (3) are formed by two distance sensors (10).

15. The device (1) according to any one of claims 13 or 14, **characterized in that** the distance sensor or sensors (10) are ultrasonic distance sensors.

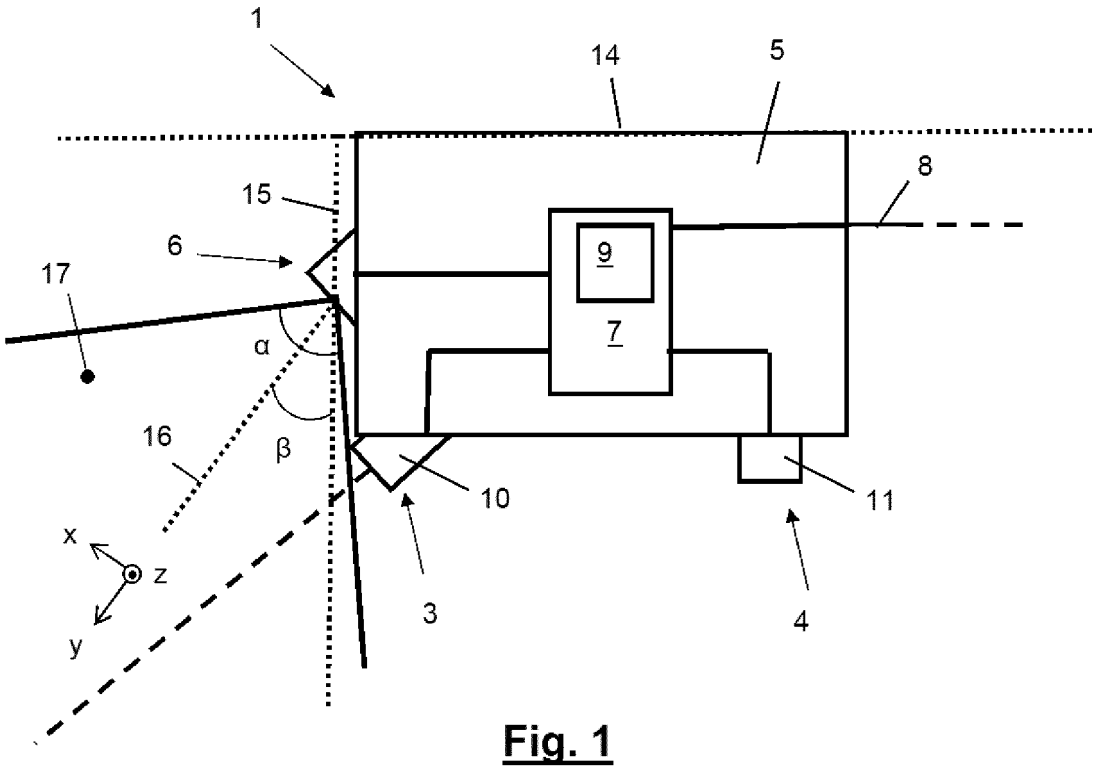


Fig. 1

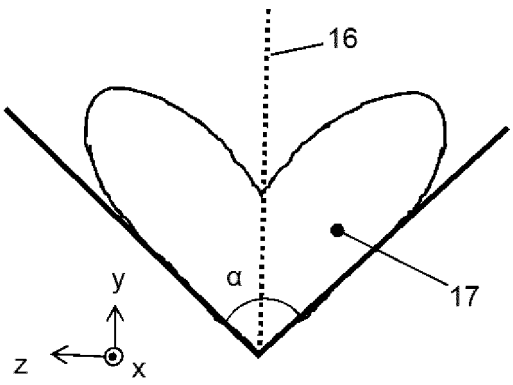


Fig. 2

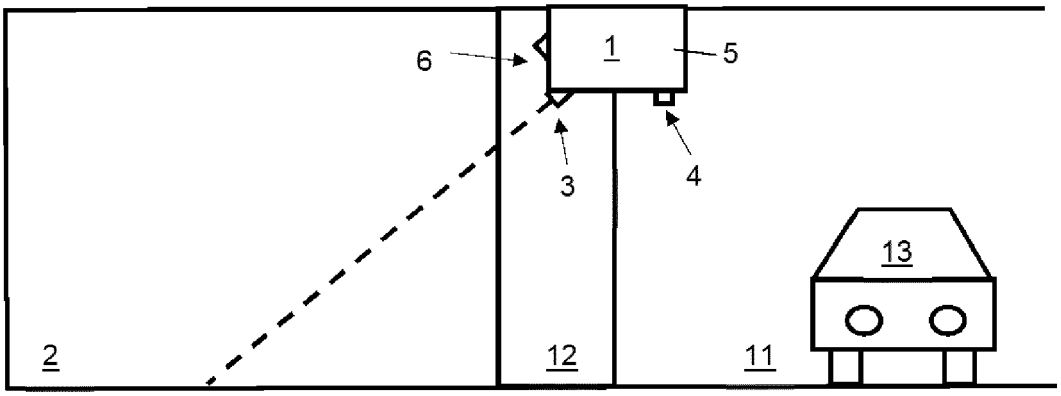


Fig. 3

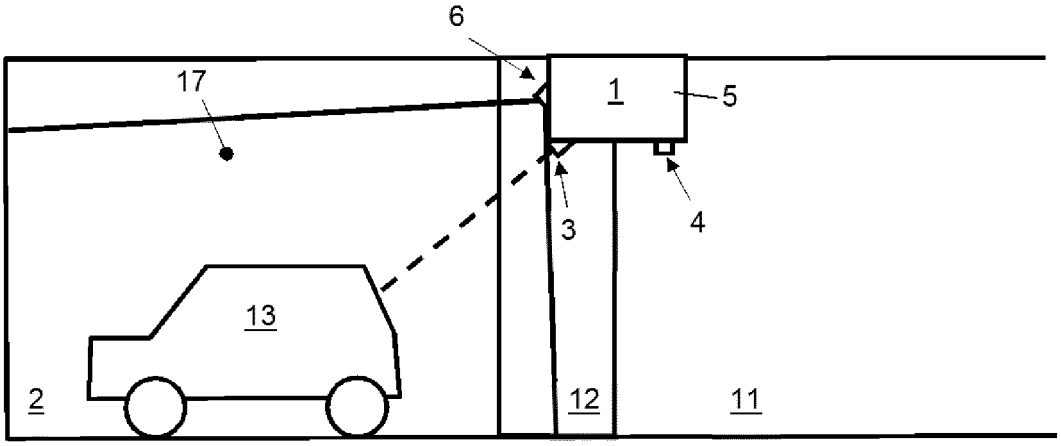


Fig. 4

Europäisches Patentamt
European Patent Office
Office européen des brevets

# EUROPEAN SEARCH REPORT

Application Number
EP 17 38 2165

## DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (IPC) |
|---|---|---|---|
| Y | US 2014/005961 A1 (HOD ARIE [CA] ET AL)<br>2 January 2014 (2014-01-02)<br>* abstract *<br>* paragraph [0071] *<br>* paragraph [0086] *<br>* claims 1-3, 5-9, 11 *<br>* figure 1 *<br>----- | 1-15 | INV.<br>G08G1/04<br>G08G1/14 |
| Y | CN 104 376 740 A (SENGLED PHOTOELECTRIC TECHNOLOGY CO LTD)<br>25 February 2015 (2015-02-25)<br>* page 1, line 21 - line 22 *<br>* page 7, line 1 - line 8 *<br>* page 7, line 14 - line 16 *<br>* claims 1, 2 *<br>----- | 1-15 | |
| Y | FR 2 756 959 A1 (GUERMONPREZ MARC [FR])<br>12 June 1998 (1998-06-12)<br>* abstract *<br>* claim 1 *<br>* figure 1 *<br>----- | 1-15 | |
| | | | TECHNICAL FIELDS SEARCHED (IPC)<br>G08G<br>G01S |

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| The Hague | 29 August 2017 | Renaudie, Cécile |

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

## ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 17 38 2165

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

29-08-2017

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|---|---|---|---|
| US 2014005961 A1 | 02-01-2014 | AU 2013206542 A1 | 16-01-2014 |
| | | CA 2817308 A1 | 29-12-2013 |
| | | US 2014005961 A1 | 02-01-2014 |
| CN 104376740 A | 25-02-2015 | CN 104376740 A | 25-02-2015 |
| | | US 2016328970 A1 | 10-11-2016 |
| | | WO 2016078500 A1 | 26-05-2016 |
| FR 2756959 A1 | 12-06-1998 | NONE | |

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82