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(71) Applicant: **Green Seed S.r.l.**
24121 Bergamo (BG) (IT)

(72) Inventor: **CAIMI, Sergio Renato**
I-24121 Bergamo BG (IT)

(74) Representative: **Ercolani, Simone Pietro et al Marietti, Gislone e Trupiano S.r.l.**
Via Fiume, 17
06121 Perugia (PG) (IT)

(54) **SYSTEM AND METHOD FOR THE MANAGEMENT OF A PARKING**

(57) A system (10) is described for the management of a parking (1) comprising a plurality of parking places (2) for vehicles (3), and a numberplate detector (4) designed to read the numberplate (8) of vehicles (3) parked in said plurality of places (2), said system further comprising a control unit (5) designed to receive said numberplate (8) read by said numberplate detector (4) and transmit it to a parking recording server (S), said control unit (5) being further designed to transmit an end-of-parking message to said server (S) when said numberplate (8) is no longer detected by said numberplate detector

(4). It is further described a method for the management of a parking provided with a plurality of parking places (2) for vehicles (3), comprising the steps of: a) reading the numberplate (8) of the vehicles (3) parked in said plurality of places (2) by means of a numberplate detector (4); b) transmitting said numberplate (8) read in said step a) to a parking recording server (S); c) transmitting an end-of-parking message to said server (S) when said numberplate (8) is no longer detected by said numberplate detector (4).

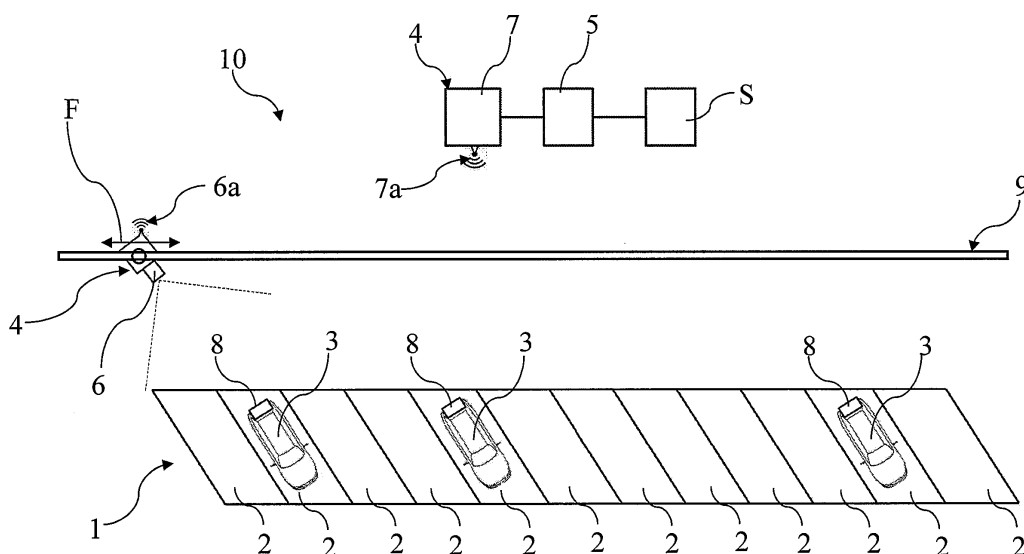


Fig. 3

Description

Field of the Invention

[0001] The present invention concerns a system for the management of a parking. In particular, the invention is used in large public and/or private facilities (stadiums, shopping centers, airports, car parks, etc.) provided with a space intended for vehicle parking. Preferably, the invention is above all used in fee car parks, wherein the users can make use of the parking depending on the payment made before or after the vehicle has been parked.

Background Art

[0002] Fee car parks are known in which the users can park their own vehicles for a given parking time. In some fee car parks the parking payment is made in advance by means of tickets valid for a given time interval (for example, one hour, one day, etc.), which have to be left in full view inside its own vehicle. Such a managing system produce huge disadvantages for users, who always are forced to overpay or are likely to be fined in case wherein the vehicle stays parked inside the parking longer than planned, as they don't know the parking duration a priori.

[0003] To solve these problems fee car parks are known, which have means for barring and/or allowing the vehicle transit (usually automatic barriers) through the entrance and exit ways of the parking. Typically, the entrance way is opened to allow the vehicle entry after an admission ticket has been withdrawn (sometimes being coin-like) and dispensed at the parking entrance. In the admission ticket the parking entrance time is registered. The exit way is kept closed to prevent users from leaving the parking without paying for the parking time. Therefore, inside this type of car parks there are one or more places for paying for the parking time. In particular, the payment points are provided with an automatic dispensing machine in which a ticket withdrawn at the entrance can be inserted; afterwards, the user pays the parking depending on the time passed from the parking entrance, the dispensing machine dispenses another exit ticket through which the exit way will be opened.

[0004] This solution has a number of disadvantages too. For example, in case of loss of the entrance ticket, the parking time charged to the user will be calculated as the amount for a maximum parking time (for example, a parking time of 24 hours). Furthermore, the operations of entrance ticket withdrawal and exit ticket insertion, in order to respectively open the entrance and exit ways of the parking, slow down the flow of vehicles entering and exiting the parking, thereby causing long queues sometimes creating inconveniences and traffic congestion, most of all in case of car parks of large size adapted to accommodate a great number of vehicles. Moreover, the presence of barriers entails considerable costs for the

making and maintenance thereof, in addition to determine a parking area completely closed to traffic in which the fee car parks are arranged.

5 Summary of the invention

[0005] Object of the present invention is to solve the afore mentioned problems and to provide a system and a method for the management of a parking, which are able to speed up the entrance in the parking and the exit therefrom of vehicles and, at the same time, allow simplifying the payment operations for users also in car parks without entrance/exit ways, such as parking places at the street side.

10 **[0006]** Further object of the present invention is to provide a system and a method for the management of a parking, which are able to calculate the real parking time of vehicles housed inside the parking itself, by keeping the entrance and exit ways of the parking always open and free for the car passages.

20 **[0007]** These and additional objects are solved by the present invention by a system for the management of a parking according to claim 1 and the respective dependent claims, and by a method for the management of a parking according to claim 7 and the respective dependent claims.

25 **[0008]** In particular, the system allows managing a parking comprising a plurality of parking places for vehicles. The system comprises a numberplate detector designed to read the numberplate of vehicles parked in said plurality of places. Furthermore, the system comprises a control unit designed to receive said numberplate read by said numberplate detector and transmit it to a parking recording server. The control unit being further designed to transmit an end-of-parking message to said server when said numberplate is no longer detected by said numberplate detector.

30 **[0009]** The system for the management of a parking according to the present invention allows always keeping open the entrance and exit ways of the parking or, alternatively, regulating the parking bay not having entrance/exit ways such as car parks at the street side, i.e. parking with no entrance/exit ways. In particular, thanks to the present invention there is no need of opening and closing an entrance or exit way of the parking each time a vehicle is entering the parking or exiting therefrom. In case of car parks with no entrance/exit ways, the parking amount can be paid at the end, by paying depending on the real parking time.

35 **[0010]** Advantageously, the numberplate detector comprises at least one video camera arranged to frame said plurality of places of said parking. Such a solution, in addition to be reliable for detecting the number plates, is cost effective and of simple maintenance.

40 **[0011]** According to an aspect of the present invention, said at least one video camera is movable along at least one path between said plurality of places. Such an embodiment allows using a lower number of video cameras

and/or framing a lower number of places, for example in car parks with large size or else along main roads. Preferably said at least one numberplate detector comprises a processing unit to process the images acquired by said at least one video camera, said image processing unit being designed to optically recognize the characters included in said acquired images. Such a solution allows reliably automating the detection of the numberplate of a vehicle parked inside a parking.

[0012] According to a particular aspect of the present invention, said at least one video camera is connected to said at least one image processing unit by means of at least one radio communicating module. Such an embodiment allows aiding the installation of one or more video cameras, most of all in case of systems according to the present invention and provided with a great number of video cameras and/or in case of the embodiments in which at least one video camera is movable.

[0013] Preferably said control unit is further designed to transmit the time of the first and the last detections of said numberplate to said server. In this way it is possible to associate the time with the acquired images and to calculate precisely the real parking time of the vehicle inside the parking area.

[0014] Another object of the present invention is a method for the management of a parking provided with a plurality of parking places for vehicles. The method comprises the steps of:

- a) reading the numberplate of the vehicles parked in said plurality of places by means of a numberplate detector;
- b) transmitting said numberplate read in said step a) to a parking recording server;
- c) transmitting an end-of-parking message to said server when said numberplate is no longer detected by said numberplate detector.

[0015] Advantageously, said step a) is carried out by means of at least one video camera arranged to frame said plurality of places of said parking.

[0016] According to an aspect of the present invention, said step a) comprises a step of a1) moving said at least one video camera along at least one path between said plurality of places.

[0017] Advantageously, during said step b) the time of the first detection of said numberplate is transmitted to said server, and during said step c), the time of the last detection of said numberplate is transmitted to said server.

Brief Description of the Drawings

[0018] Further aspects and advantages of the present invention will be more evident from the following description, made for illustration purposes only and without limitation, referring to the accompanying schematic drawings, in which:

- Figure 1 schematically shows a first embodiment of the present invention;
- Figure 2 schematically shows a second embodiment of the present invention;
- Figure 3 schematically shows a third embodiment of the present invention.

Embodiments of the invention

[0019] In figure 1 a system 10 for the management of a parking 1 is shown. In particular, the parking 1 comprises a plurality of parking places 2 for the vehicles 3 (for example cars, mopeds, vans, etc.). Here in the present invention with "vehicle" is meant a generic transport means provided with a licence plate (required by law).

[0020] The system 10 comprises a numberplate detector 4 designed to read the numberplate 8 of the vehicles 3 parked in the places 2 of the parking 1. Preferably, the numberplate detector is designed to not detect the number plates of moving vehicles. Preferably, the numberplate detector is designed to detect the numberplate of stationary vehicles (i.e. not moving), more preferably of vehicles parked for at least a predetermined time interval (for example five minutes).

[0021] The system 10 further comprises a control unit 5 designed to receive the numberplate 8 read by the numberplate detector 4 and transmit it to a parking recording server S. The servers S can be a local or remote server. In case of local server S, the control unit 5 is preferably connected directly to the server S by means of cables (for example by means of one or more LAN cables). In case of remote server S, the unit 5 and the server S communicate preferably through the Internet.

[0022] The control unit 5 is further designed to transmit an end-of-parking message to the server S when the (previously detected) numberplate 8 of a vehicle 3 is no longer detected by the numberplate detector 4.

[0023] In this way it is possible to calculate the real parking time per every vehicle 3 parked inside the parking 1, i.e. the time interval during which the vehicle 3 is parked, i.e. stays still inside a place 2 of the parking 1. The system 10 allows always keeping open the entrance and exit ways of the parking 1 or, alternatively, regulating the parking bay not having entrance/exit ways such as car parks at the street side. In particular, thanks to the present invention, there is no need of opening and closing an entrance or exit way of the parking each time a vehicle 3 is entering the parking or exiting therefrom.

[0024] In this way, users have not to make any operation at an entrance or exit way of the parking, so that the flow of vehicles 3 entering the parking 1 and exiting the parking 1 is smoother than that in case of conventional managing system.

[0025] The numberplate detector 4 preferably comprises at least one video camera 6 arranged to frame the places 2 of the parking 1. The video camera 6 is communicating with the image unit processing 7. Images ac-

quired by the video camera 6 are then sent to the processing unit 7 designed to recognize the characters included in the afore said images. Preferably, the image processing unit runs an algorithm for the optical character recognition (OCR) allowing the detection of the number plates 8 of the vehicles 3 parked inside the places 2 of the parking 1. In other words, the images acquired by the video camera 6 will include the characters of the number plates 8 of the vehicles 3 parked inside the places 2 framed by video camera 6. The images of the numberplate are preferably processed by the image unit processing 7 (for example by applying digital filters for adjusting image contrast and/or brightness) and are preferably converted to coded characters (for example in ASCII ones).

[0026] Preferably, all places 2 of the parking 1 are framed by the video camera 6. Therefore, in case in which the image processing unit does not detect any number plates (i.e., the processing unit 7 does not recognize even a character sequence associable with a numberplate 8) from the images acquired by the video camera, this will mean that there are no vehicles 3 parked inside the parking 1.

[0027] Preferably, all the number plates 8 detected by the numberplate detector 4 are received by the controlling unit 5. The control unit 5 transmits the number plates 8 coded by the processing unit 7 to the server S for the parking registration. Preferably, the control unit 5 can be provided with a database in which all the number plates detected by the detector 4 are stored.

[0028] Preferably, the control unit 5 is designed to receive an enabling message from the server S, confirming that the detected numberplate is allowed parking. Such a characteristic allows simplifying the parking payment for the users who have previously registered themselves in the server, for example by providing personal data to be associated with one or more number plates 8 and the modes for automatically paying the parking.

[0029] Preferably, the control unit 5 is further designed to transmit the time of the first and the last detections of the numberplate 8 to the server S. Therefore, per every detected numberplate, a real parking time is determined, during which the vehicle 3 makes use of the parking 1. Depending on the parking time, it is therefore possible to impose a determined rate in order to calculate the amount the user will have to pay.

[0030] In another embodiment of the present invention, the system 10 can provide for at least one payment point being present inside the parking 1, for example in order to allow the parking payment to users non-previously registered in server S. Preferably, the payment point is provided with at least one interface (for example a display and/or a keyboard and/or a touch-screen) by which the user can input the numberplate 8 of his own vehicle and end the parking time to pay. In this case, the parking time will be the time interval intervening between the first detection of the numberplate 8 and the payment acknowledgment. Preferably, the rate imposed to non-registered

users could be different with respect to the rate imposed to users previously registered in server S.

[0031] In the embodiments shown in figures 1-3, the video camera 6 is communicating with the processing unit 7 by means of a radio communicating module 6a, 7a. In particular, the communicating module comprises a transmitter 6a connected to the video camera 6 and designed to transmit the images acquired by the video camera 6, and a receiver 7a connected to the image processing unit. Additional embodiments can anyway provide for the video camera 6 and the processing unit 7 being communicating one another through communication cables (for example of RCA type), still falling in the protection scope of the present invention. In figures 1 to 3 it should be noted that the places 2 of the parking 1 are arranged in a herringbone pattern, i.e. with the longitudinal axis of each single place 2 of the parking 1 not coincident one another.

[0032] Referring to figure 2, the system 10 comprises a plurality of video cameras 6 arranged so that all the places 2 of the parking 1 are framed. Such a characteristic allows a more reliable detection of all the number plates 8 also in large car parks in which there are a high number of places 2.

[0033] Preferably, each video camera 6 is provided with a radio transmitter 6a designed to send the acquired images to a radio receiver 7a. In this case, each transmitter 6a is preferably designed to transmit the images on a respective radio communication channel. In this way, all the images acquired by the plurality of video cameras 6 can be sent to the receiver 7a with no mutual interference.

[0034] Referring to figure 3, the system 10 is provided with at least one video camera 6 movable along at least one path 9 between the places 2 of the parking 1. Preferably, the path 9 is arranged so that the video camera can frame all the places 2 of the parking. The path can comprise straight and/or curved stretches. For example, the path can be closed so that one or more video cameras 6 moving along the path 9 would cover cyclically the path without inverting the movement direction. In the particular embodiment shown in figure 3, the path 9 is straight and the video camera is moved in the two movement directions denoted by the arrow F. The video camera 6 is preferably moved by carrying out a succession of quick movements. More preferably, the video camera is moved from a first position, in which part of the places 2 of the parking are framed by the video camera, to at least one second position, in which the video camera frames at least one place different from places framed in the first position. The video camera 6 is preferably kept stationary between a movement and the other one, for a given interval time (for example 10 seconds). Further embodiments can anyway provide for at least one video camera 6 being moved along the path 9 continuously, preferably at moderate speed, or in general at speed suitable for acquiring images correctly, i.e. so that the characters of the number plates 8, included in the images, can be cor-

rectly recognized.

[0035] The movement of the video camera 6 can be carried out, for example, by means of one or more linear electric motors driven by the control unit 5. Preferably, the path 9 (for example a track) is provided with proximity sensors (for example ultrasound sensors, photocells or additional proximity sensors known in the art) to detect the presence of the video camera and/or detect the position of the video camera along the path 9.

[0036] Hereinafter the main steps of a method for the management of a parking 1, preferably carried out by means of the system 10, are reported. The method comprises the steps of:

- a) reading the numberplate 8 of the vehicles 3 parked in a plurality of places 2 of the parking 1 by means of a numberplate detector 4;
- b) transmitting the numberplate 8 read in the step a) to a parking recording server S;
- c) transmitting an end-of-parking message to the server S when the numberplate 8 is no longer detected by the numberplate detector 4.

[0037] Preferably, the step a) is carried out by means of at least one video camera 6 arranged to frame a plurality of places 2 (preferably all the places 2) of the parking 1. Preferably, the step a) comprises a step of a1) moving the video camera 6 along at least one path 9 between the plurality of places 2.

[0038] Preferably, during the step b) the time of the first detection of the numberplate 8 is transmitted to the server S, and during the step c), the time of the last detection of the numberplate 8 is transmitted to the server S.

Claims

1. System (10) for the management of a parking (1) comprising a plurality of parking places (2) for vehicles (3), and a numberplate detector (4) designed to read the numberplate (8) of vehicles (3) parked in said plurality of places (2), said system further comprising a control unit (5) designed to receive said numberplate (8) read by said numberplate detector (4) and transmit it to a parking recording server (S), said control unit (5) being further designed to transmit an end-of-parking message to said server (S) when said numberplate (8) is no longer detected by said numberplate detector (4).
2. System (10) according to claim 1, wherein said numberplate detector (4) comprises at least one video camera (6) arranged to frame said plurality of places (2) of said parking (1).
3. System (10) according to claim 2, wherein said at least one video camera (6) is movable along at least one path (9) between said plurality of places (2).

4. System (10) according to claim 2 or 3, wherein said at least one numberplate detector (4) comprises a processing unit (7) to process the images acquired by said at least one video camera (6), said image processing unit (7) being designed to optically recognize the characters included in said acquired images.

5. System (10) according to claim 4, wherein said at least one video camera (6) is connected to said at least one image processing unit (7) by means of at least one radio communicating module (6a, 7a).

6. System (10) according to any one of the preceding claims, wherein said control unit (5) is further designed to transmit the time of the first and the last detections of said numberplate (8) to said server (S).

7. Method for the management of a parking provided with a plurality of parking places (2) for vehicles (3), comprising the steps of:

- a) reading the numberplate (8) of the vehicles (3) parked in said plurality of places (2) by means of a numberplate detector (4);
- b) transmitting said numberplate (8) read in said step a) to a parking recording server (S);
- c) transmitting an end-of-parking message to said server (S) when said numberplate (8) is no longer detected by said numberplate detector (4).

8. Method according to claim 7, wherein said step a) is carried out by means of at least one video camera (6) arranged to frame said plurality of places (2) of said parking (1).

9. Method according to claim 8, wherein said step a) comprises a step of a1) moving said at least one video camera (6) along at least one path (9) between said plurality of places (2).

10. Method according to any one of claims 7 to 9, wherein during said step b) the time of the first detection of said numberplate (8) is transmitted to said server (S), and during said step c), the time of the last detection of said numberplate (8) is transmitted to said server (S).

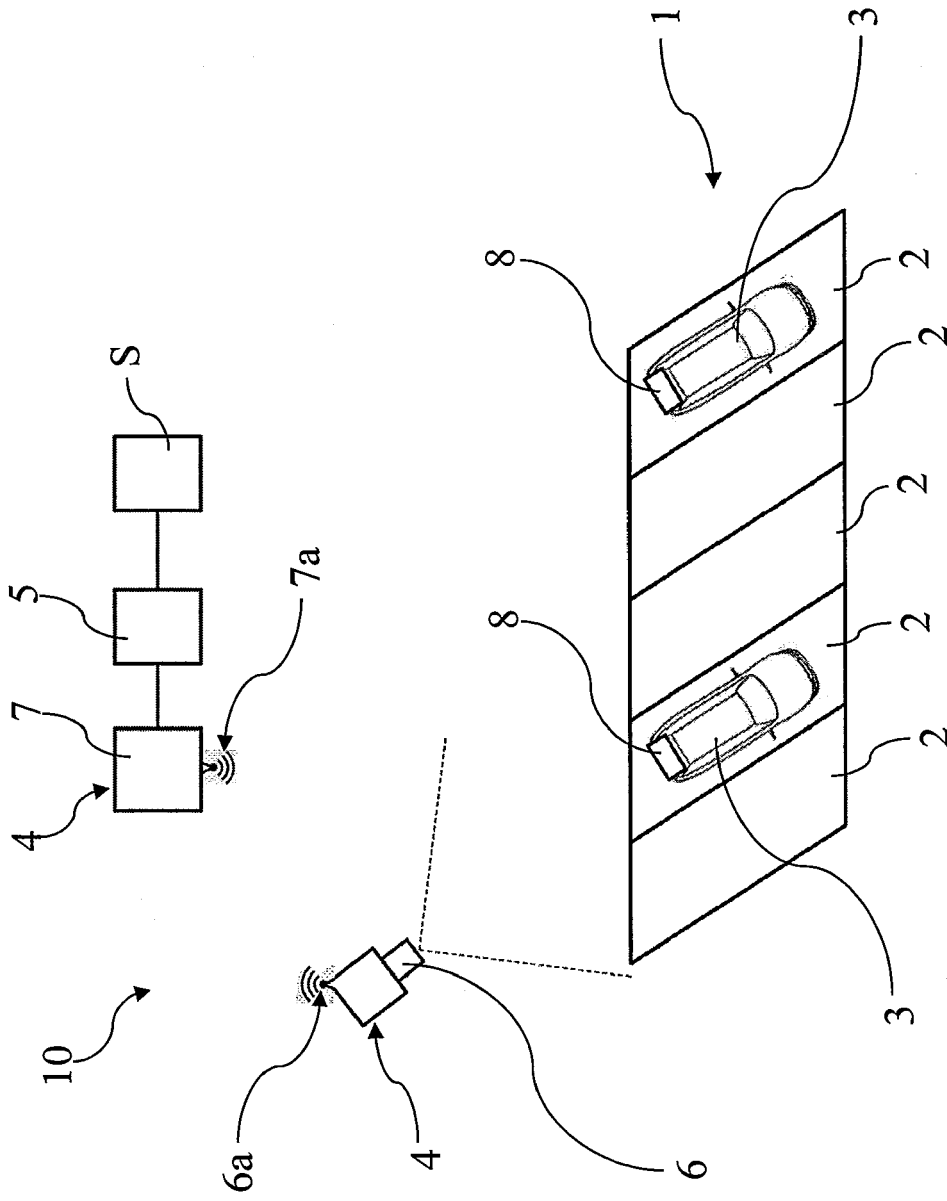


Fig. 1

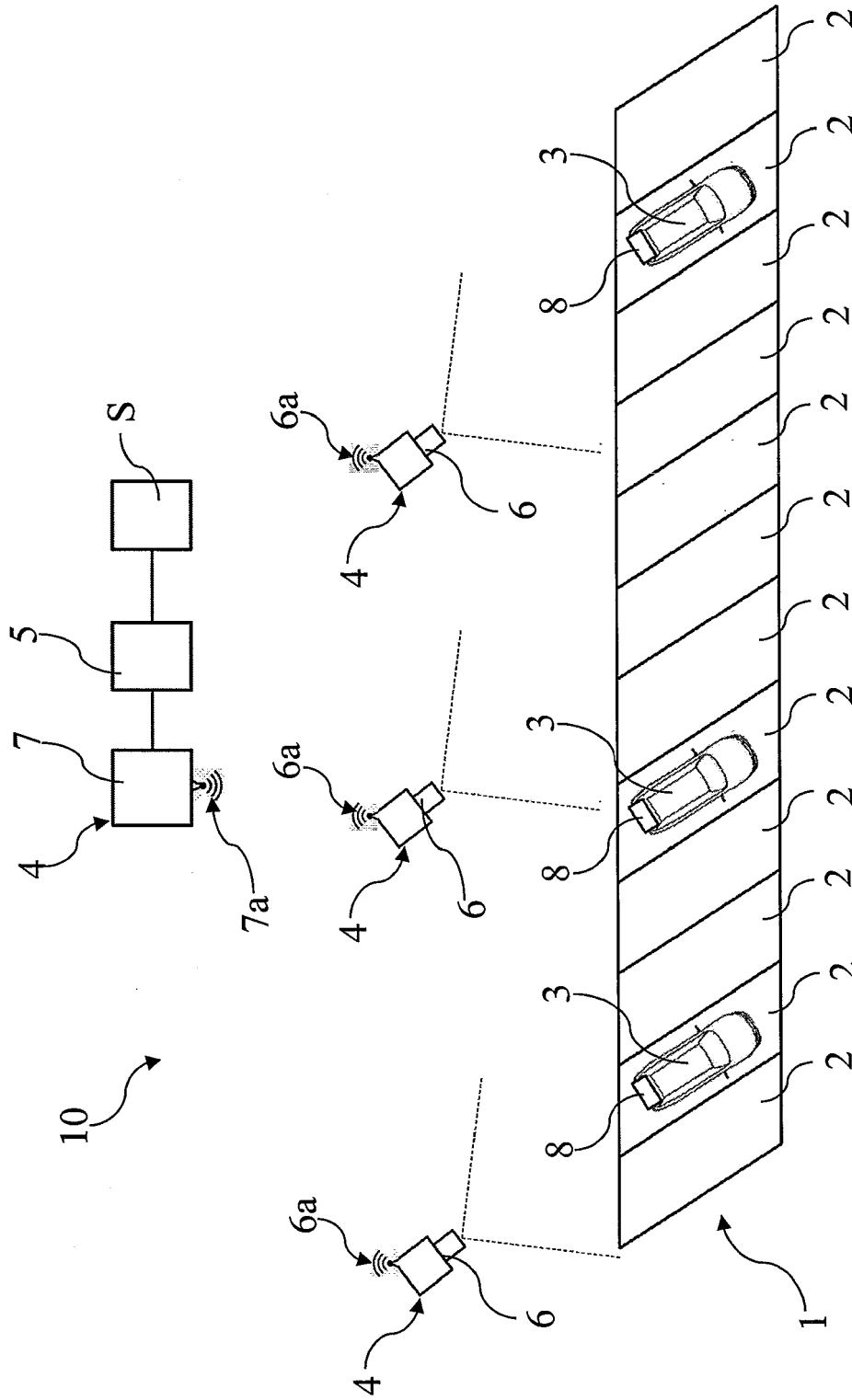


Fig. 2

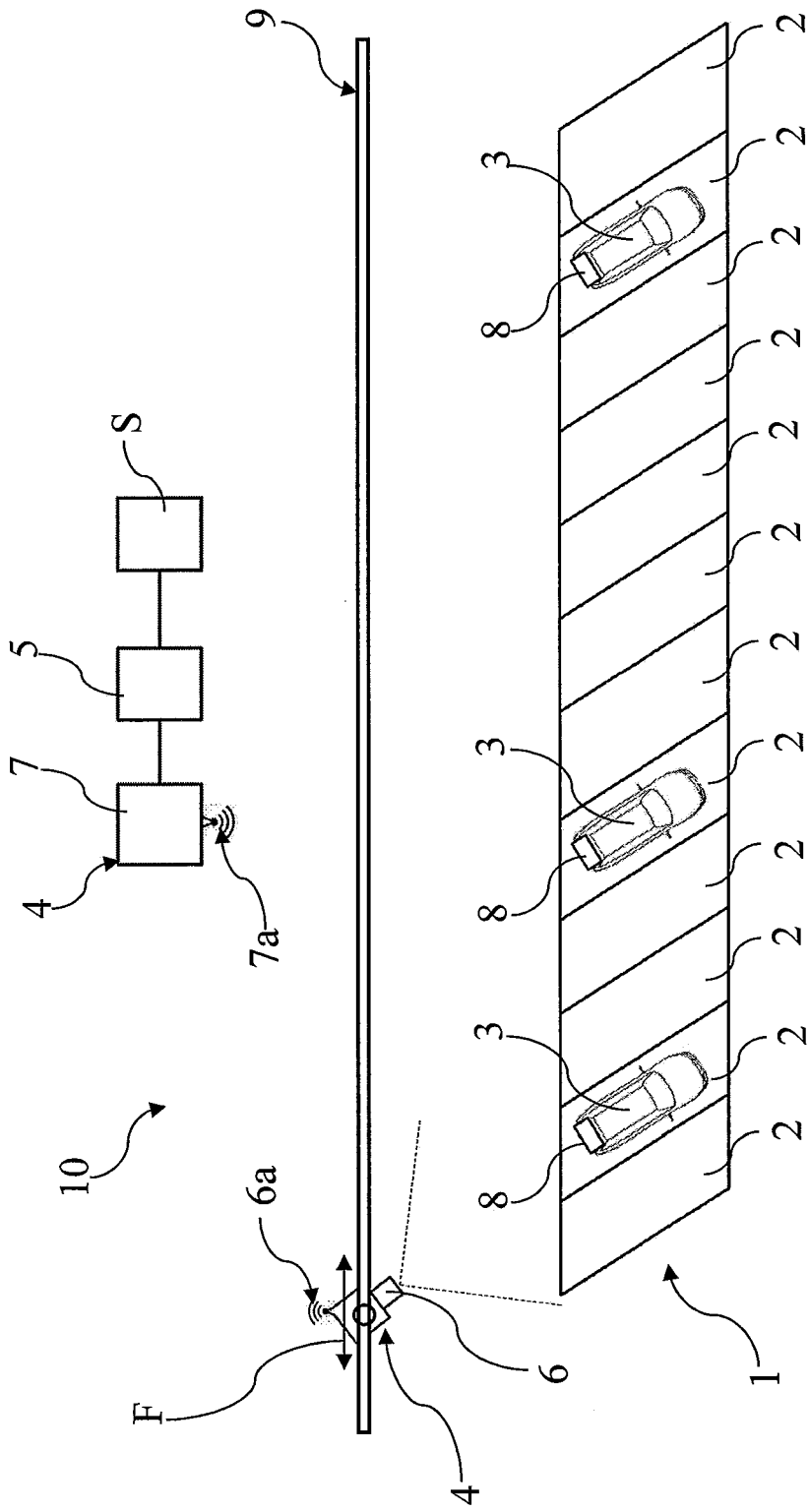


Fig. 3



EUROPEAN SEARCH REPORT

Application Number
EP 16 16 1342

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