

(19)



(11)

**EP 1 898 360 B1**

(12)

## EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention  
of the grant of the patent:  
**20.02.2013 Bulletin 2013/08**

(51) Int Cl.:  
**G07B 15/02** <sup>(2011.01)</sup> **G07F 17/24** <sup>(2006.01)</sup>  
**G08G 1/14** <sup>(2006.01)</sup>

(21) Application number: **07110760.1**

(22) Date of filing: **21.06.2007**

### (54) **System for registration and payment of parking time**

System zur Erfassung und Bezahlung von Parkzeiten

Système d'enregistrement et de paiement d'heure de parking

(84) Designated Contracting States:  
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR  
HU IE IS IT LI LT LU LV MC MT NL PL PT RO SE  
SI SK TR**

(30) Priority: **21.06.2006 NL 1032040**

(43) Date of publication of application:  
**12.03.2008 Bulletin 2008/11**

(73) Proprietor: **Flo Solutions b.v.**  
**7461 CL Rijssen (NL)**

(72) Inventors:  
• **Bosman, Sal Jua**  
**6521 MB, NIJMEGEN (NL)**

• **Lonsain, Johannes Albertus Hendrikus**  
**1091 BK, AMSTERDAM (NL)**

(74) Representative: **Van Breda, Jacobus**  
**Octrooibureau Los & Stigter B.V.,**  
**Weteringschans 96**  
**1017 XS Amsterdam (NL)**

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## Description

**[0001]** The invention relates to a system for registration and payment of parking time.

**[0002]** Such a system is known from practice. In its simplest form, such a system comprises individual parking meters positioned at parking spaces. By inserting money into the parking meters one is authorized to make use of the parking space to which the parking meter pertains. Practice has shown this known system to have major drawbacks. For example, in order to induce the public to actually use the parking meters, it is necessary to carry out a labour-intensive check. On the other hand, the money inserted into the parking meters has to be collected periodically, which is also labour-intensive but in addition entails the risk of theft.

**[0003]** From the Dutch patent application NL-A-1025264 an apparatus is known for the automatic computation of payable parking monies based on predetermined tariffs, which device may be installed in a person's car. By activating time registration means, locating means may be activated for locating a parking site to be used. From a memory, arithmetic means obtain tariff information relating to the parking space, wherein the locating means serve to determine the parking site to be used. The arithmetic means are further designed to multiply the tariff of the parking site with the parking time, in order to determine or to compute the payable parking fees. As such, the apparatus known from NL-A-1025264 relates to not much more than a simple computer system for monitoring the payable parking fees. How payment of the payable parking tariffs is finally to be secured, remains unclear.

**[0004]** The international patent application WO 02/063570 relates to a parking management system comprising a sensor for the detection of the presence of a vehicle in a parking space, as well as a parking meter that is associated with the parking space. The parking meter is designed to receive payment and comprises a clock unit that monitors a permitted parking time on the basis of a received payment. Further provided is a host computer, coupled via a communication channel with the presence sensor and the parking meter. This communication is wireless. The host computer is designed to monitor the sensor and the parking meter and to establish whether a parking space is occupied without payment. In that case, the host computer emits a warning signal to a car park attendant and possibly to the user of the vehicle parked without authorization.

**[0005]** The international patent application WO 99/30290 relates to an automatic management system for a pay car park and comprises, coupled with each parking space, at least one organ for detecting the presence of a vehicle, identification means for the vehicle and a pay facility for paying for the parking time of the vehicle. Via an input unit provided on site, the user is further obliged to provide data relating to the parking space taken, the time of arrival and the estimated time of departure

and, on the basis of these, to effect payment.

**[0006]** Document WO 98/17073 describes a vehicular transceiving installation that is designed as a router for receiving and forwarding information from other transceiving installations (mobile or fixed) located in its vicinity.

**[0007]** A system according to the preamble of claim 1 is known from the American patent application US 2002/109610.

**[0008]** The object of the invention is to provide a system for the registration and payment of parking time with which various problems and drawbacks of the prior art systems are avoided or remedied, and in general, to provide an alternative for these known systems.

**[0009]** A further object is the possibility of preventing the theft of parking monies.

**[0010]** Still a further object is to relate the payable parking fees precisely to the parking time used, so as to avoid the prior art problem of payment being possible only for large units of time, such as a quarter of an hour, half an hour or an hour.

**[0011]** Still a further object of the invention is to simplify, and as much as possible automate the rightful occupation of parking spaces.

**[0012]** These objectives and further advantages that will become apparent from the following are achieved with a system for the registration and payment of parking time, characterized by one or several of the appended claims.

**[0013]** The system for the registration and payment of parking time is provided with an organ for the detection of the presence of the vehicle, which organ comprises a sensor and a transmitter, and identification means comprising a signal emitter installed in the vehicle for identifying that vehicle. The pay facility of this system comprises a central computer that is coupled with the sensor and, via a communication channel, can be coupled with the signal emitter, wherein the central computer holds data concerning:

- the parking tariff applying to the parking space
- a subscription parking license or a monetary balance linked to the signal emitter.

**[0014]** In the absence of a subscription parking license, the central computer is further designed to adjust the balance linked to the signal emitter in accordance with a period of time during which the signal emitter was activated by the transmitter of the parking space, and based on the parking tariff applicable to that parking space.

**[0015]** It is observed that the number of organs for the detection of presence may vary per parking space. Per parking space several organs may be used for the detection of presence, but it is also possible to use one organ for the detection of presence covering several parking spaces.

**[0016]** With this system, the financial streams connected with the use of parking spaces are completely separate from the location where parking takes place, allowing

the financial proceedings to take place completely electronically. The user who has installed such a signal emitter in his car, has obtained this from an issuing authority based on a specific tariff to be paid. This tariff may, for example, be related to the use anticipated for a particular period in the future (advance payment), or may be based on a payment afterwards on the basis of actual use, that is to say the charge may be based both on advance payment as well as payment afterwards, and may optionally be coupled with a direct debit. It is also conceivable that the signal emitter is coupled with a license requiring periodic but fixed-term payment, for example, a fixed amount monthly, quarterly, half-yearly or annually.

**[0017]** In a first aspect of the invention, the transmitter and the signal emitter are designed to cooperate and the signal emitter is only operational when it receives an activating signal from the transmitter of the organ for detecting the presence of a vehicle, whereby the signal emitter of the vehicle is designed as first router for receiving and forwarding information from another signal emitter located in another vehicle in a nearby parking space and/or information from a transmitter of such a neighbouring parking space. In this way at least a part of the communication channel between the central computer and an active signal emitter may be formed by other signal emitters and even by the transmitters located at the parking spaces. This allows the infrastructure to be provided for rendering the parking system of the invention operational to be kept very much within limits. It is thus also possible to save on energy consumption of routers installed outside the vehicle.

**[0018]** Another important advantage of the system according to the invention is that this automatically ensures that the payable parking fees are in strict concurrence with the parking time used.

**[0019]** It should be noted, that the signal emitter in the vehicle and identifying said vehicle, may also be used for tollage, in traffic regulation systems, garages and the like.

**[0020]** In order to reduce the dependency of the signal emitters and transmitters to be used, it is preferred that locally in the vicinity of a number of parking spaces a base station, coupled with the central computer and designed for forming a communication path with at least one signal emitter is provided.

**[0021]** The robustness of the communication channel between the central computer and the activated signal emitter may be further improved by embodying the system such that the organ for detecting the presence of the vehicle is additionally equipped with a receiver and that this receiver, together with the transmitter of that organ, forms a second router for receiving and forwarding information from one or several neighbouring signal emitters and/or from a transmitter of a neighbouring parking space.

**[0022]** A very advantageous aspect of the invention relates to the embodiment of the system in which the organ for detecting the presence of a vehicle is equipped

with a receiver and that a mobile control terminal is provided, which is designed to cooperate with the transmitter and receiver in order to obtain information on whether a parked vehicle possesses a signal emitter.

**[0023]** With this system the task of controlling can be simplified significantly because only those vehicles need to be checked for which the mobile control terminal indicates that no signal emitter, on the basis of which the parking tariff to be paid is computed, is present.

**[0024]** Another aspect of the system according to the invention is that the transmitter functions subject to a vehicle present signal from the sensor.

**[0025]** Another important advantage of the system according to the invention is that the facilities to be provided to the traffic infrastructure are kept within limits; more than the installation at the parking spaces of organs for detecting the presence of vehicles is not necessary. These organs that comprise at least a sensor and a transmitter may be installed both above- or underground. The latter is possible because the transmitter to be used may be very low-powered so that it can work many years on a battery.

**[0026]** The system for registration and payment of parking time according to the invention affords a very favourable possibility for further extension into a system in which optimal road use is possible. To this end the system according to the invention is in a further aspect characterized by the measure that the central computer holds data relating to whether or not the parking space is occupied, and is coupled with an information system equipped for informing road users about traffic-related matters.

**[0027]** Such an information system may, for example, be the RDS-information system that provides the road user with traffic information via radio. Via this system it is possible to feed a navigation system, which navigation system is able to direct the road user to the available parking spaces near the road user's position or final destination. This effectively avoids futile searches for available parking spaces, preventing much wasting of time, annoyance and burden on the environment.

**[0028]** Hereinafter the invention will be further elucidated by way of an exemplary embodiment and with reference to the drawing.

**[0029]** The drawing shows in:

- Fig. 1 a section of the road with parking spaces equipped in accordance with the system of the invention, and
- Fig. 2 and Fig. 3 a schematic top view of a car park provided with a system for registration and payment of parking time in accordance with the invention.

**[0030]** Identical reference numerals used in the figures refer to similar components.

**[0031]** With reference first to Fig. 1, a car 1 is shown provided with a signal emitter 3 that identifies the vehicle 1.

**[0032]** As clearly shown in Fig. 1, the car 1 occupies a parking space 4. In the ground under the parking space 4 an organ 5 is provided for detecting the presence of the vehicle 1, for which purpose this organ 5 comprises a sensor 5'. As soon as the sensor 5' detects the vehicle, it activates a sender 5" also provided in the organ 5. This sender of the organ 5 for detecting the presence of the vehicle 1 cooperates with the signal emitter 3 as symbolized by the transmission signal indicated with arrow A.

**[0033]** Referring now to Fig. 2, the system will be further elucidated.

**[0034]** Fig. 2 shows a number of parking spaces 4, each provided with an organ 5 for registering the presence of a vehicle 1. Fig. 2 shows that two parking spaces 4 are occupied by such vehicles 1 and that this has been detected by the sensor 5' of said organ 5. Sensor 5' has subsequently activated the associated transmitter 5", which is designed to cooperate with the signal emitter 3 installed in the vehicle 1. The payment of parking time is based as explained hereinafter on the signal from the signal emitter 3.

**[0035]** Via RF-communication a communication path 6 is provided by which the signal emitters 3 that are built into the vehicles 1 communicate with a local base station 7, which is coupled by conventional wiring or wirelessly with a central computer 8.

**[0036]** This base station 7 may also serve for coupling the organs 5 for detecting the presence of vehicles, in particular their sensors 5', with this central computer 8.

**[0037]** Within the frame of the invention, the design of the above-mentioned central computer 8 is such that it holds data concerning the parking tariff applicable to the parking spaces 4. With respect to the signal emitters 3 issued, the central computer 8 monitors whether they relate to a subscription parking license and, if not, the computer 8 monitors the balance in monetary terms, associated with each signal emitter 3.

**[0038]** If no subscription parking license is involved, the central computer 8 is further equipped to adjust the above-mentioned balance associated with the signal emitter 3 pro rata a period of time during which the signal emitter 3 was activated by the transmitter 5" of the parking space 4 with an amount that depends on a parking tariff applicable to that parking space 4. Thanks to the above explanation, the manner in which this may be realized is perfectly clear to the person skilled in the art so that further elucidation is unnecessary.

**[0039]** As is clear from the above, the signal emitter 3 is preferably only operational when it receives an activating signal from the transmitter 5" of the organ 5 for detecting the presence of a vehicle 1.

**[0040]** It is further advantageous for the signal emitter 3 of the vehicle 1 to be designed as first router for receiving and forwarding information from another signal emitter located in another vehicle in a neighboring parking space and/or information from a transmitter 5" of such a neighboring parking space 4.

**[0041]** It may also be advantageous for the organ 5 for

detecting the presence of the vehicle 1 to be additionally equipped with a receiver 5'" and for this receiver 5'" to form a second router together with the transmitter 5" of the organ 5, for receiving and forwarding information from one or several neighboring signal emitters 3 and/or from a transmitter of a neighboring parking space. These aspects are schematically shown in Fig. 3.

**[0042]** As will also be clear from the foregoing, the central computer 8 holds data with respect to whether or not the parking spaces 4 are occupied. In an advantageous embodiment, this central computer 8 is coupled with an information system designed for advising road users with regard to traffic matters, so that these road users can be informed of those vacant parking spaces that are located near their current position or their final destination.

## Claims

1. A system for registration and payment of parking time comprising at least one organ (5) linked to a parking space (4) for detecting the presence of a vehicle (1), identification means (3) for a vehicle (1), and a pay facility (8) for paying for the parking time of the vehicle (1), which organ (5) for detecting the presence of a vehicle (1) comprises a sensor (5') and a transmitter (5"), and which identification means (3) comprise a signal emitter (3) installed in the vehicle for identifying that vehicle (1), wherein the transmitter (5") and the signal emitter (3) are designed to cooperate, and wherein the pay facility comprises a central computer (8) that is coupled with the sensor (5') and that is adapted to be coupled via a communication channel (6) with the signal emitter (3) and wherein the central computer (8) holds data concerning:

- the parking tariff applying to the parking space (4)
- a subscription parking license or a monetary balance linked to the signal emitter (3)

and, if no subscription parking license is involved, the central computer (8), is equipped to adjust said balance associated with the signal emitter (3) pro rata a period of time during which the signal emitter (3) was activated by the transmitter (5") of the parking space (4) with an amount that depends on the parking tariff applicable to that parking space (4), **characterized in that** the signal emitter (3) is only operational when it receives an activating signal from the transmitter (5") of the organ (5) for detecting the presence of a vehicle (1), and wherein the signal emitter (3) of the vehicle (1) is designed as first router for receiving and forwarding information from another signal emitter located in another vehicle in a neighboring parking space and/or information from a transmitter (5") of such a neighboring parking space

- (4).
2. A system according to claim 1, **characterised in that** locally, in the vicinity of a number of parking spaces a base station (7) is provided, coupled with the central computer (8) and designed for forming a communication path (6) with at least one signal emitter (3).
3. A system according to claim 1 or 2, **characterised in that** the organ (5) for detecting the presence of a vehicle (1) is also equipped with a receiver (5'') and that a mobile control terminal is provided, which is designed to cooperate with the transmitter (5'') and receiver (5'') in order to obtain information on whether a parked vehicle (1) possesses a signal emitter (3).
4. A system according to claim 3, **characterised in that** the receiver (5''), together with the transmitter (5'') of the organ (5), forms a second router for receiving and forwarding information from one or several neighbouring signal emitters (3) and/or from a transmitter of a neighbouring parking space.
5. A system according to one of the claims 1-4, **characterised in that** the transmitter (5'') functions subject to a vehicle present signal from the sensor (5').
6. A system according to one of the preceding claims, **characterised in that** the central computer (8) holds data relating to whether or not the parking space (4) is occupied, and is coupled with an information system equipped for informing road users about traffic-related matters.

#### Patentansprüche

1. System zum Registrieren und zur Bezahlung der Parkzeit, das mindestens einen Mechanismus (5) umfasst, welcher mit einem Stellplatz (4) verbunden ist, zum Feststellen des Vorhandenseins eines Fahrzeugs (1), Identifizierungsmittel (3) für ein Fahrzeug (1) und eine Bezahleinrichtung (8) zum Bezahlen für die Parkzeit des Fahrzeugs (1), wobei der Mechanismus (5) zum Feststellen des Vorhandenseins eines Fahrzeugs (1) einen Sensor (5') und einen Sender (5'') umfasst, und wobei das Identifizierungsmittel (3) einen Signalemitter (3) umfasst, der im Fahrzeug zum Identifizieren dieses Fahrzeugs (1) installiert ist, wobei der Sender (5'') und der Signalemitter (3) dafür ausgelegt sind, miteinander zu kooperieren, und wobei die Bezahleinrichtung einen Zentralcomputer (8) umfasst, der mit dem Sensor (5') verbunden ist und der dafür ausgelegt ist, über einen Kommunikationskanal (6) mit dem Signalemitter (3) verbunden zu werden, und wobei der Zentralcomputer (8) Daten verwaltet, die Folgendes betreffen:

- den Parktarif, der für den Stellplatz (4) gilt,
- eine Dauerparkerlaubnis oder einen finanziellen Saldo, der mit dem Signalemitter (3) verbunden ist,

und wenn keine Dauerparkerlaubnis vorhanden ist, ist der Zentralcomputer (8) so ausgestattet, dass er den Saldo, der mit dem Signalemitter (3) verknüpft ist, anteilig pro Zeiteinheit, während der der Signalemitter (3) durch den Sender (5'') des Stellplatzes (4) aktiviert war, mit einem Betrag anpasst, der vom Parktarif abhängt, welcher für diese Parklücke (4) gilt, **dadurch gekennzeichnet, dass** der Signalemitter (3) nur in Betrieb ist, wenn er ein Aktivierungssignal vom Sender (5'') des Mechanismus (5) zum Feststellen des Vorhandenseins eines Fahrzeugs (1) empfängt, und wobei der Signalemitter (3) des Fahrzeugs (1) als erster Router zum Empfangen und Weiterleiten von Informationen von einem anderen Signalemitter, der sich in einem anderen Fahrzeug in einer benachbarten Parklücke befindet, und/oder von Informationen von einem Sender (5'') einer solchen benachbarten Parklücke (4) ausgelegt ist.

2. System nach Anspruch 1, **dadurch gekennzeichnet, dass** lokal, in der Umgebung einer Reihe von Stellplätzen, eine Basisstation (7) vorgesehen ist, die mit dem Zentralcomputer (8) verbunden ist und die zum Bilden eines Kommunikationsweges (6) mit mindestens einem Signalemitter (3) ausgelegt ist.
3. System nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** der Mechanismus (5) zum Feststellen des Vorhandenseins eines Fahrzeugs (1) auch mit einem Empfänger (5''') ausgestattet ist und dass eine mobile Leitdatenstation vorgesehen ist, die zum Kooperieren mit dem Sender (5'') und Empfänger (5''') ausgelegt ist, um Informationen darüber zu erhalten, ob ein geparktes Fahrzeug (1) einen Signalemitter (3) besitzt.
4. System nach Anspruch 3, **dadurch gekennzeichnet, dass** der Empfänger (5''') zusammen mit dem Sender (5'') des Mechanismus (5) einen zweiten Router zum Empfangen und Weiterleiten von Informationen von einem oder mehreren benachbarten Signalemittern (3) und/oder von einem Sender eines benachbarten Stellplatzes bildet.
5. System nach einem der Ansprüche 1-4, **dadurch gekennzeichnet, dass** der Sender (5'') in Abhängigkeit von einem Fahrzeug-vorhanden-Signal von Sensor (5') funktioniert.
6. System nach einem der vorherigen Ansprüche, **dadurch gekennzeichnet, dass** der Zentralcomputer (8) Daten verwaltet, die sich darauf beziehen, ob der Stellplatz (4) belegt ist oder nicht, und mit einem In-

formationssystem verbunden ist, das zum Informieren von Straßenverkehrsteilnehmern über Verkehrsangelegenheiten ausgestattet ist.

## Revendications

1. Système d'enregistrement et de paiement de durée de stationnement comprenant au moins un élément (5) lié à une place de stationnement (4) destiné à détecter la présence d'un véhicule (1), un moyen d'identification (3) pour un véhicule (1), et une borne de paiement (8) pour le paiement de la durée de stationnement du véhicule (1), lequel élément (5) destiné à détecter la présence d'un véhicule (1) comprend un capteur (5') et un émetteur (5''), et lequel moyen d'identification (3) comporte un émetteur de signaux (3), installé dans le véhicule, destiné à identifier ce véhicule (1), dans lequel l'émetteur (5'') et l'émetteur de signaux (3) sont conçus pour coopérer, et dans lequel la borne de paiement comprend un ordinateur central (8) qui est couplé au capteur (5') et qui est apte à être couplé, par l'intermédiaire d'un canal de communication (6), à l'émetteur de signaux (3), et dans lequel l'ordinateur central (8) détient des données concernant:

- le tarif de stationnement applicable à la place de stationnement (4) ;
- une autorisation de stationnement sur abonnement ou une solde monétaire connexe à l'émetteur de signaux (3) ; et,

si aucune autorisation de stationnement sur abonnement n'est impliquée, l'ordinateur central (8) est équipé pour ajuster ledit solde connexe à l'émetteur de signaux (3), au prorata d'une période de temps au cours de laquelle l'émetteur de signaux (3) a été activé par l'émetteur (5'') de la place de stationnement (4), d'un montant qui dépend du tarif de stationnement applicable à cette place de stationnement (4), **caractérisé en ce que** l'émetteur de signaux (3) n'est opérationnel que lorsqu'il reçoit un signal d'activation en provenance de l'émetteur (5'') de l'élément (5) destiné à détecter la présence d'un véhicule (1), et dans lequel l'émetteur de signaux (3) du véhicule (1) est conçu en qualité de premier routeur destiné à recevoir et à acheminer des informations provenant d'un autre émetteur de signaux situé dans un autre véhicule stationné sur une place de stationnement voisine et/ou des informations provenant d'un émetteur (5'') d'une telle place de stationnement voisine (4).

2. Système selon la revendication 1, **caractérisé en ce que** localement, à proximité d'un nombre de places de stationnement, une station de base (7) est fournie, couplée à l'ordinateur central (8) et conçue

pour former une voie de communication (6) avec au moins un émetteur de signaux (3).

3. Système selon la revendication 1 ou 2, **caractérisé en ce que** l'élément (5) destiné à détecter la présence d'un véhicule (1) est également équipé d'un récepteur (5'''), et **en ce qu'**un terminal de commande mobile est fourni, lequel est conçu pour coopérer avec l'émetteur (5'') et le récepteur (5''') afin d'obtenir des informations indiquant si un véhicule stationné (1) possède un émetteur de signaux (3).
4. Système selon la revendication 3, **caractérisé en ce que** le récepteur (5''') forme, avec l'émetteur (5'') de l'élément (5), un second routeur destiné à recevoir et à acheminer des informations provenant d'un ou plusieurs émetteurs de signaux voisins (3) et/ou d'un émetteur d'une place de stationnement voisine.
5. Système selon l'une des revendications 1 à 4, **caractérisé en ce que** émetteur (5'') opère sous réserve d'un signal de présence de véhicule en provenance du capteur (5').
6. Système selon l'une des revendications précédentes, **caractérisé en ce que** l'ordinateur central (8) détient des données relatives à l'occupation ou à l'absence d'occupation de la place de stationnement (4), et est couplé à un système d'information équipé pour informer les usagers de la route sur des événements liés à la circulation.

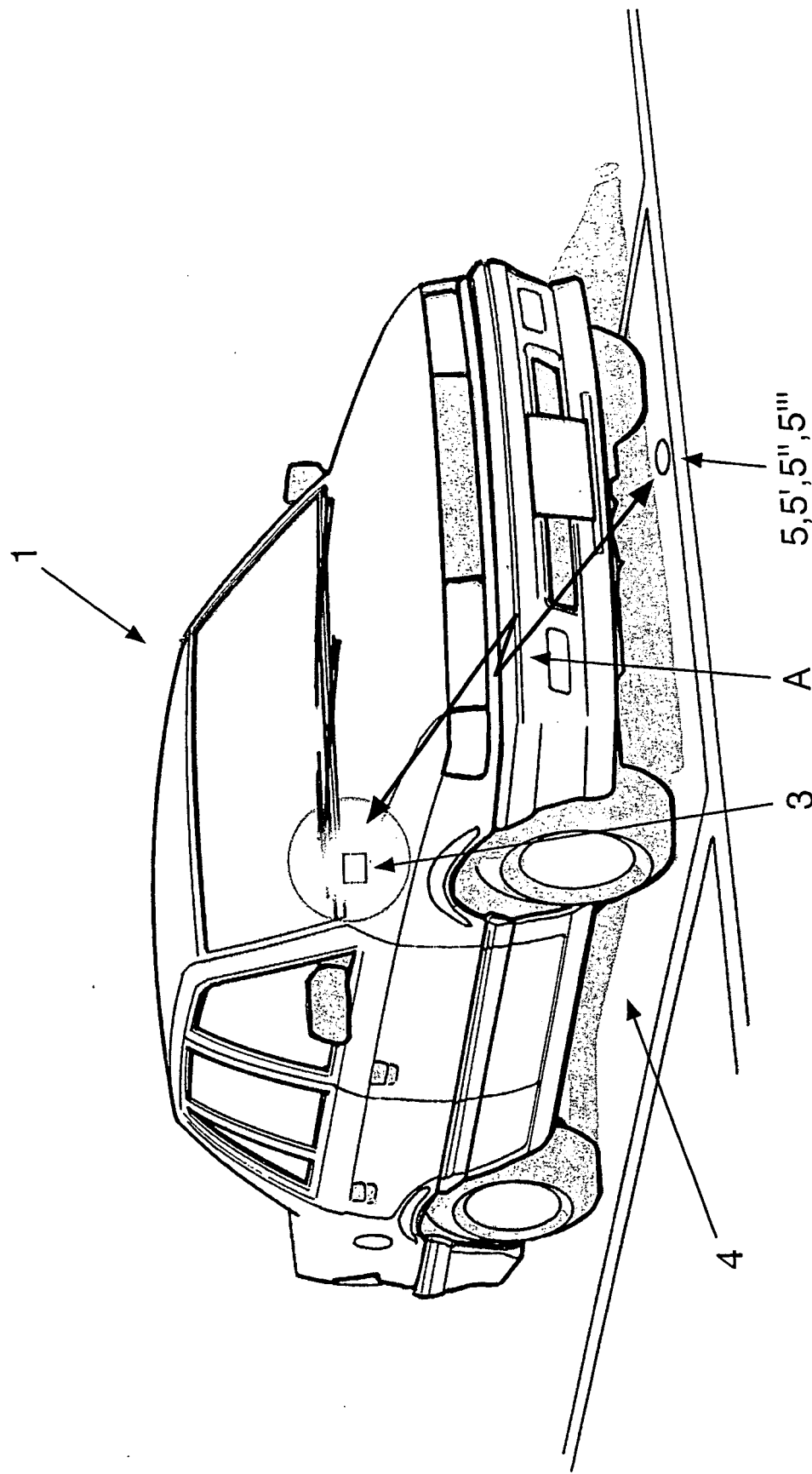
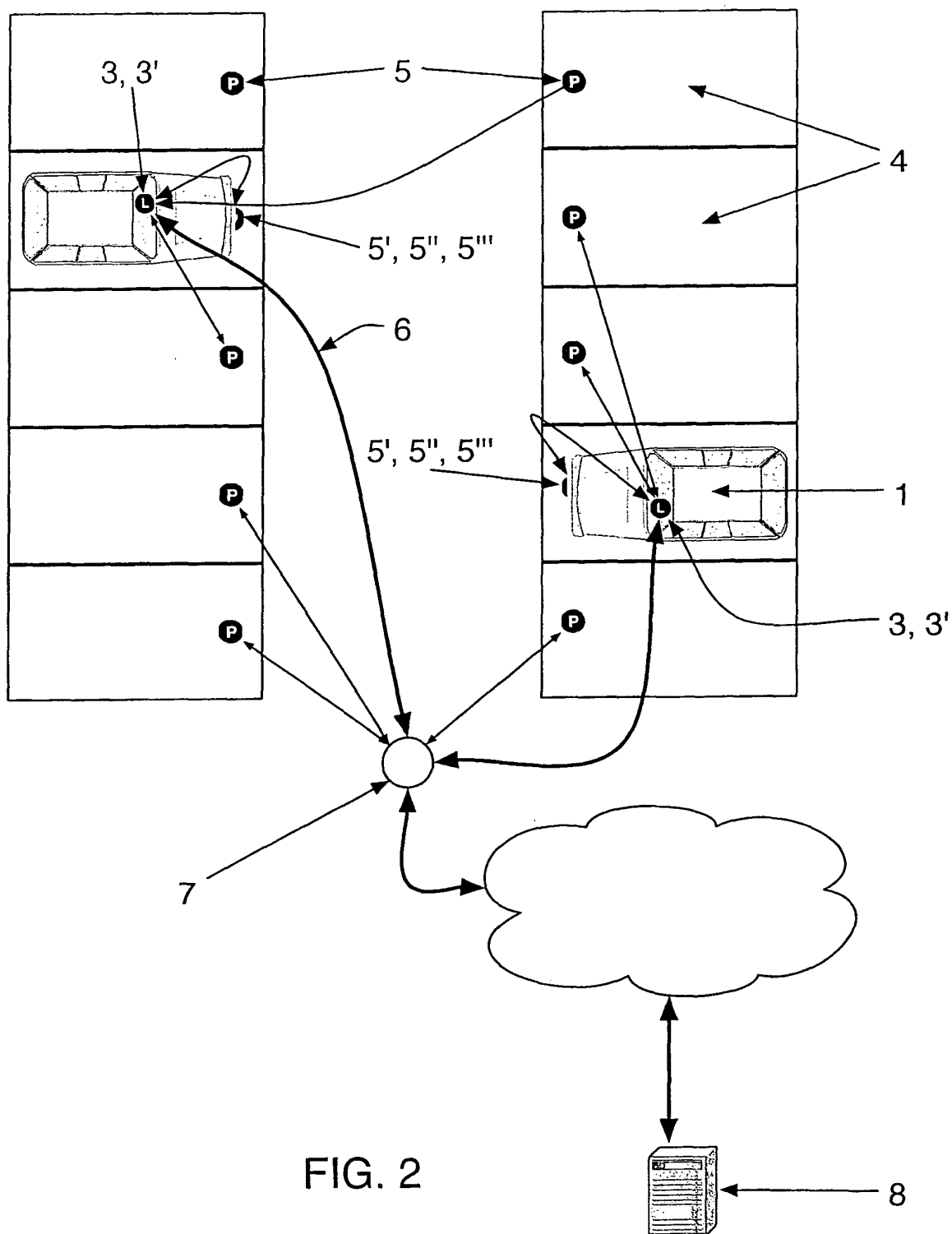
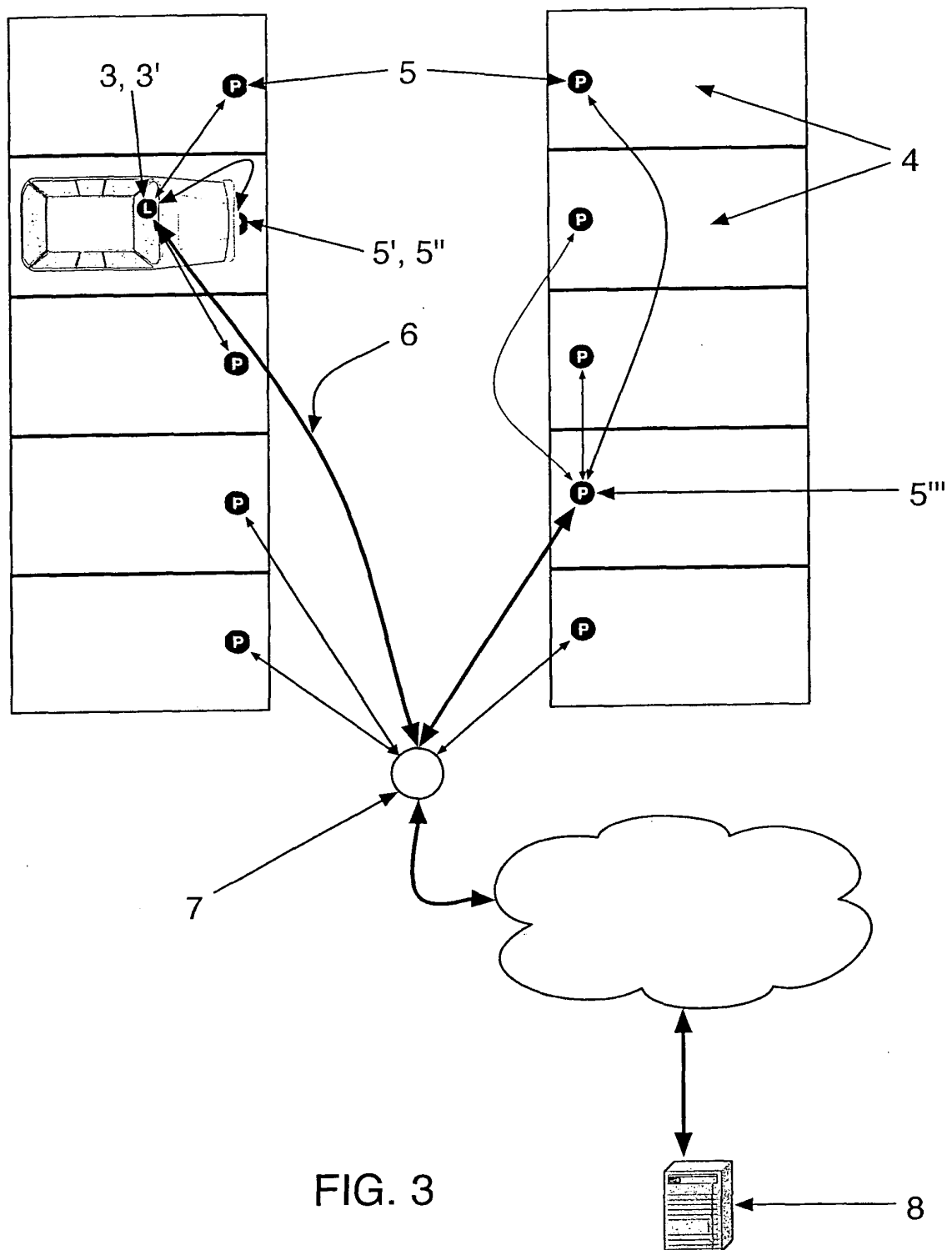


FIG. 1







**REFERENCES CITED IN THE DESCRIPTION**

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