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(54) **Automated parking debiting system**

(57) An automated payment, charging and verification system for parking areas comprises a service center (CS), including a main server computer (SP) capable of receiving, processing and storing in a database (D), for each parked vehicle, user messages sent via user terminals (TU1, TU2, TU3, ...) and verification messages originating from inspectors. A first user message, sent at the beginning of the parking period, contains a start-of-charging code and indications of the registration number of the vehicle and of the payment class, while a second user message, sent at the end of the parking period, contains the end-of-charging code and the indication of the registration number of the vehicle. The system further comprises verification terminals (TV1,

TV2, ...) provided with an identification code and with a telephone interface (TEL) for sending to the service center (CS), by the inspection personnel, a verification message containing an indication of the registration number of the vehicle and an optional fine request message, with an indication of the registration number and of the geographical position of the vehicle, affecting the owner of an irregularly parked vehicle. The main server (SP) communicates with a credit management server computer (SGC) in order to check the availability of credit of the user, debit the amount due for parking payment, and send to the user terminals (TU1, TU2, TU3, ...) and verification terminals (TV1, TV2, ...) respective confirmation and/or reply messages.

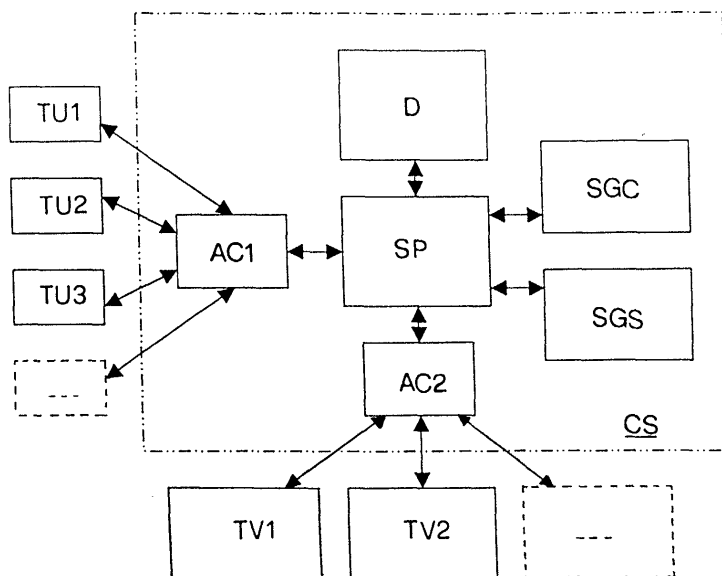


Fig.1

Description

[0001] This invention relates to an automated payment, charging and verification system for parking areas.

[0002] Most parking areas are currently served by parkmeters, whereby the user picks a ticket to be displayed inside the car and which is imprinted with the parking time allowed in relation to the amount paid into the parkmeter. Patrolling personnel assigned to check regular parking inspects the tickets and reports any violations.

[0003] While the above payment system may be effective, it still has drawbacks, a main drawback being that the user, at the start of parking, has to forecast a parking end time that is often difficult to predict with suitable precision.

[0004] Furthermore, the number of parkmeters located in the parking area is often small, thus forcing the user to leave his car for a length of time and to walk a sizable distance to the parkmeter, in order to pick a ticket and go back to his car for displaying it.

[0005] It is the main object of the present invention to overcome the above drawbacks by providing an automated system for carrying out payment, charging and verification operations that are easier and more straightforward than in the prior art, and which, at the same time, offers high safety and reliability.

[0006] Another object of the invention is to provide said automated system so that it has a low cost and is simple to implement by taking advantage of communication means that are widely used in different fields.

[0007] The above and other objects and advantages, such as will become apparent hereinafter, are achieved by an automated payment, charging and verification system for parking areas having the features recited in claim 1, while the dependent claims define other advantageous features.

[0008] The invention is described in greater detail below, with reference to a preferred but not exclusive embodiment, shown by way of non-limitative example in the accompanying drawings, wherein:

Figure 1 is a block diagram of an automated payment, charging and verification system for parking areas according to the invention;

Figure 2 is a block diagram of a verification terminal allowing verification personnel to check for correct parking in an automated system according to the invention.

[0009] With reference to the above Figures, the automated system according to the invention, generally referenced by the reference sign SA, comprises a service center CS, which includes a main server computer SP which is suitable to receive, process and store in real time in a database D messages arriving from users of

the parking area and from verification personnel. The main server SP communicates bidirectionally with a credit management server computer SGC, which stores the credit data of users, in order to check the availability of residual funds, deduct the amount due for parking payment, and send confirmation and/or reply messages to users and to the verification personnel, respectively.

[0010] User messages are sent to the service center CS by means of user terminals TU1, TU2, TU3, ..., such as GSM/GPRS/UMTS mobile telephones which can send and receive SMSs or establish data connections (for example in WAP/cHTML/HTML mode on an appropriately provided site), WAP mobile telephones and PDAs provided with wireless connectivity and/or public terminals connected by wireless or by wireline means, by SMS or WAP. User terminals also include, albeit as an accessory option of the system, public payment stations and call centers automated by means of voice commands given by the user.

[0011] By means of the generic user terminal TU, the user sends to the service center CS, at the beginning of the parking period, a first user message containing a charge start code and indications of the registration number of the vehicle and of the payment class,

<charge start, vehicle registration number, payment class>,

to which the service center CS, after storing the corresponding information in database D, replies with a first confirmation message indicating the charge start time, the vehicle registration number, the parking class and any auxiliary indications,

<charge start time, vehicle registration number, payment class, auxiliary indications>.

[0012] At the end of the parking period, the user sends a second user message containing a charge end code and the indication of the registration number of the vehicle,

<charge end, vehicle registration number>.

[0013] The service center CS performs a search in database D in order to determine the parking start time, stores the indication related to the end of the parking period, interfaces with the credit management systems, deducts the amount due for parking from the user's account, and finally replies with a second confirmation message that bears indication of the parking end time, of the charged amount and of the residual credit,

<charge end, charged amount, residual credit>.

[0014] The verification messages are preferably sent by means of mobile verification terminals TV1, TV2, ..., of the type shown schematically in Figure 2, which comprise a telephone interface TEL, in WAP mode with GSM/GPRS/UMTS technology, and with a keypad T, each provided with an identification code. Furthermore, the verification terminal is preferably provided with a bar-code reader LCB for purposes best explained below, and also, advantageously, with a GPS module capable of automatic position acquisition. In this regard,

the data related to the acquired geographical coordinates are entered automatically, on the inspector's command, into the penalty request message and sent in real time to the main server in order to determine the exact location where a violation has occurred, and which must be reported in monetary penalty documents. To this purpose, the main server SP communicates bidirectionally with a fine management server computer SGS, which acquires data concerning the penalties to be issued. The latter come from main server SP, which in turn receives them from the inspector. The location of the area associated with each fine is then determined by means of a dedicated subsystem included in the service center, which interfaces with the terminals available to the inspectors. This separation has the purpose of unifying the communication mechanisms and of isolating the fine management system, for reasons of security.

[0015] In consideration of the average response times required by the inspector and the security required in data transmission, the communication modes most suitable for large verification volumes among those currently in use are of the WAP type of the like, since they provide interaction response times that are much shorter than those offered by SMS and can take advantage of the secure communications mechanisms that are typical of virtual private networks. In this regard, a vertical portal of the Intranet type, dedicated to inspectors provided with advanced GSM/GPRS/UMTS terminals, offers a service for rapidly checking the validity of the parking of a vehicle (by simply entering its registration number) and for automatically inflicting fines for irregularly parked vehicles. The security of the GSM/GPRS/UMTS terminals is provided by authentication mechanisms that are typical of Internet/Intranet/VPNs, i.e., by means of a login-password, a smart card, a terminal network identifier, etc.

[0016] During the verification step, the inspector, by means of his generic mobile terminal TV, reports to the service center CS his current location, as detected by the integrated GPS module. When checking a parked car, the inspector approaches its windshield, where a special badge is displayed, containing a bar code of the vehicle registration number. The inspector acquires the bar code by means of the bar-code reader LCB of the terminal (or he enters that code on a keypad T associated with the terminal) and sends to the service center,

<vehicle registration number>,

thus requesting real-time information on payment status. Service center CS immediately sends a first reply message containing the requested information. In case of regular parking, the inspector moves on to check another vehicle, while, in case of irregular parking, he uses his terminal, provided with GPS positioning to determine the exact location where the violation occurred, which must be indicated in the documentation of the monetary penalties, to send the service center a request to fine to the owner of the irregularly parked vehicle, as follows:

<vehicle registration number, vehicle position>

or, where it is also necessary to provide an indication regarding the vehicle type,

<vehicle registration number, vehicle position, vehicle type>,

where the position data arriving from the GPS are entered automatically in the message on command of the inspector. As an alternative, the inspector can enter the vehicle position indication manually, by means of keypad T. The centralized apparatus replies with a second reply message, confirming that the penalty has been issued.

[0017] In addition to performing operational functions, the verification terminal can be used to notify events to assigned personnel (start/end of shift, change of patrolled area, administrative messages in general). These communications preferably travel over the same channel used by the terminal for inspection-related messages. Furthermore, the main server advantageously includes a module dealing with personnel management, which interfaces with subsystems for automatically locating the GPS terminals and with the terminals themselves by means of channels intended for administrative messages.

[0018] In order to allow user terminals and inspector terminals of different kinds to be used simultaneously, which send differently encoded messages, the service center CS is provided with communication adapters AC1, AC2 which are interposed between the user terminals and the inspector terminals, respectively, and main server SP. By these adapters, communications entering and leaving the main server can be unified.

[0019] Each user can choose among different payment methods, such as purchase of prepaid vouchers, charging to a credit/debit card, cash payment at automatic tellers. In the former two cases, the user obtains credit at the service center, by sending from his mobile telephone an SMS (or by entering data in WAP) containing the data of the prepaid card (for example the secret code of the scratch card that enables the preset value of the card) or the details of his bank credit card. In the case of payment in cash, a self-service teller can check and accept the bills and autonomously send a message to the centralized apparatus.

[0020] In order to protect users who may forget to report the end of the parking period, thereby continuing to pay indefinitely, the authority operating the parking areas preferably set an upper limit to chargeable hours or to the chargeable amount. Preferably, a logic system is created in the service center which terminates charging automatically when parking becomes free (for example at 7 PM) or, in the case of 24-hour paid parking, the maximum chargeable amount may be set to 24 hours. After this deadline, the vehicle is regarded as incorrectly parked. Expirations of maximum parking times may be reported to users by means of the communication system they use to send user messages.

[0021] In practice, it has been found that the invention fully achieves the intended aim, providing a system that

allows automatic payment, charging and verification operations to be carried out more easily and straightforwardly than known methods, and at the same time offers high safety and reliability.

[0022] Another advantage of the invention is that the automated system has low implementation costs and uses communication techniques that are widely used, especially in the field of mobile telephony.

[0023] The invention thus conceived is liable to many changes and variations, all of which are within the scope of the inventive concept. All the details may furthermore be replaced with other technically equivalent means. In practice, the materials used, so long as they are compatible with the specific use, as well as the contingent shapes and sizes, may be chosen at will depending on requirements.

Claims

1. An automated payment, charging and verification system for parking areas, **characterized in that** it comprises:

- a service center (CS), including a main server computer (SP) which is capable of receiving, processing and storing in a database (D), for each parked vehicle,

a first user message, at the start of the parking period, which contains a start-of-charging code, the indication of the registration number of the vehicle and the indication of a payment class (<charge start, vehicle registration number, payment class>), and

a second user message, at the end of the parking period, which contains an end-of-charging code and the indication of the registration number of the vehicle, (<charge end, vehicle registration number>), said first and second user messages being sent via a user terminal (TU1, TU2, TU3, ...)

- at least one verification terminal (TV1, TV2, ...) provided with an identification code and with a telephone interface (TEL) for sending to the service center (CS), by the inspection personnel, a verification message containing the indication of the registration number of the vehicle (<vehicle registration number>) and an optional message for requesting a fine, with the indication of the registration number and the indication of the geographic position of the vehicle (<vehicle registration number, vehicle position>), affecting the owner of an irregularly parked vehicle,

said main server computer (SP) communicating with a credit management server computer (SGC) in order to check the availability of credit of the user, debit the amount due for parking payment, and send to said user terminals (TU1, TU2, TU3, ...) and verification terminals (TV1, TV2, ...) respective confirmation and/or reply messages.

2. The system of claim 1, **characterized in that** the service center (CS) answers said first user message with a first one of said confirmation messages, bearing the indication of the start-of-charging time, the indication of the registration number of the vehicle, the indication of a parking class and optional auxiliary indications <charge start time, vehicle registration number, payment class, auxiliary indications> and the service center (CS) replies to said second user message with a second one of said confirmation messages bearing the indication of the parking end time, the indication of the charged amount and the indication of the residual credit of the user (<charge end, charged amount, residual credit>).

3. The system of any one of claims 1 or 2, **characterized in that** said verification terminal (TV1, TV2, ...) comprises a bar-code reader (LCB) for automatically acquiring the registration number of the vehicle from an appropriate badge displayed on the vehicle and bearing the bar code of the registration number.

4. The system of any one of the preceding claims, **characterized in that** said service center (CS) comprises a fine handling server computer (SGS), which communicates bidirectionally with said main server computer (SP), from which it acquires the data, sent by the inspector, concerning the penalties to be issued.

5. The system of any one of the preceding claims, **characterized in that** said verification terminal (TV1, TV2, ...) comprises a GPS module (GPS) capable of acquiring geographic coordinate data of the verification terminal and automatically enter said coordinate data, on command from the inspector, into the fine request message as an indication of the geographic position of the irregularly parked vehicle.

6. The system of any one of the preceding claims, **characterized in that** said user terminal (TU1, TU2, TU3, ...) is a mobile telephone of the GSM, GPRS or UMTS type, having the capability to send and receive SMS messages and/or perform data connections in WAP, cHTML and/or HTML mode.

7. The system of any one of the preceding claims, **characterized in that** said user terminal (TU1,

TU2, TU3, ...) is a WAP mobile telephone or a PDA having wireless connectivity.

8. The system of any one of the preceding claims, **characterized in that** said fine request message further contains information on the type of vehicle (<vehicle registration number, vehicle position, vehicle type>). 5
9. The system of any one of the preceding claims, **characterized in that** said user terminal (TU1, TU2, TU3, ...) is a public terminal connected by wireless and/or wireline technology by means of an SMS or WAP system. 10
10. The system of any one of the preceding claims, **characterized in that** said user terminal (TU1, TU2, TU3, ...) is a public payment teller. 15
11. The system of any one of the preceding claims, **characterized in that** said user terminal (TU1, TU2, TU2,...) is a call center that is automated by means of voice commands issued by the user. 20
12. The system of any one of the preceding claims, **characterized in that** said verification terminal (TV1, TV2, ...) comprises a WAP telephone interface in GSM, GPRS or UMTS technology. 25
13. The system of claim 11, **characterized in that** said verification terminals (TV1, TV2, ...) communicate with a dedicated Intranet vertical portal for quickly checking the validity of the parking of a vehicle by entering the registration number and for automatically issuing fines for irregularly parked vehicles, comprising authentication mechanisms using a login-password, smart card and/or terminal network identifier. 30 35
14. The system of any one of the preceding claims, **characterized in that** said service center comprises communication adapters (AC1, AC2) interposed between the user/inspector terminals and the main server computer (SP) in order to unify communications entering and leaving the main server computer (SP). 40 45
15. The system of any one of the preceding claims, **characterized in that** said payment is performed by purchasing prepaid cards, whereby a secret code obtainable from the prepaid card and enabling the preset value of the card is sent to the service center (CS), by means of an SMS or by entering data in WAP mode from the user terminal (TU1, TU2, TU3, ...). 50 55
16. The system of any one of the preceding claims, **characterized in that** said payment is performed

by charging to a credit/debit card, whereby details of the bank credit card are sent to the service center (CS) by means of an SMS or by entering data in WAP mode from the user terminal (TU1, TU2, TU3, ...).

17. The system of any one of the preceding claims, **characterized in that** said payment is made by cash payment at automatic tellers capable of verifying and accepting banknotes and of autonomously sending a message to the service center (CS).
18. The system of any one of the preceding claims, **characterized in that** the authority that manages the parking areas sets an upper limit of chargeable hours or of chargeable amount.

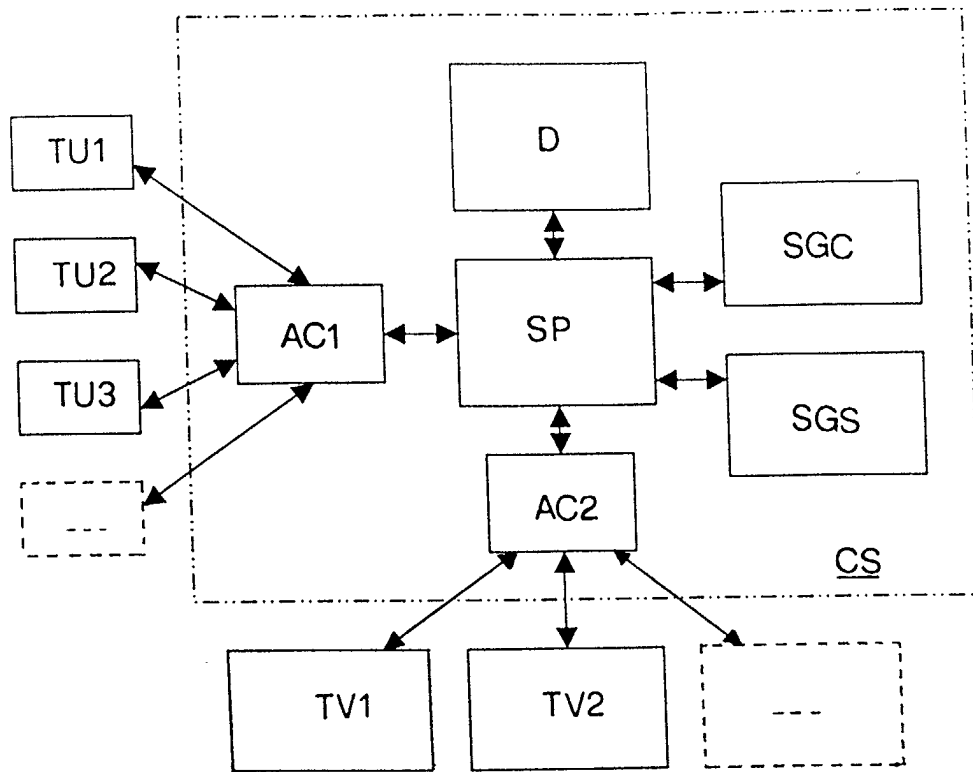


Fig.1

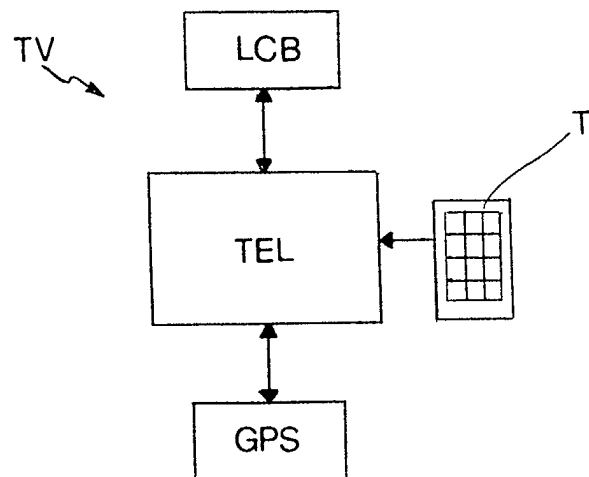


Fig.2



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 02 42 5065

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	US 6 243 029 B1 (TOMER NATAN) 5 June 2001 (2001-06-05) * column 3, line 1 - column 5, line 34 * ---	1,5-8, 12,16	G07B15/02 G07C1/30 G07F17/24
A	WO 01 16906 A (HJELMVIK TORBERNT ;MODUL SYSTEM SWEDEN AB (SE)) 8 March 2001 (2001-03-08) * page 4, line 13 - page 5, line 29 * * page 6, line 11 - page 8, line 21 * ---	1,3,4,6, 15,16	
A	EP 1 172 767 A (HECTRONIC GMBH) 16 January 2002 (2002-01-16) * paragraph '0009! - paragraph '0018! * ---	1,7,9,12	
A	WO 96 11453 A (ILEN TERO ;PARKIT OY (FI)) 18 April 1996 (1996-04-18) * page 3, line 17 - page 6, line 34 * ---	1,6,18	
A	FR 2 810 764 A (BOUYGUES TELECOM) 28 December 2001 (2001-12-28) * page 5, line 15 - page 7, line 18 * ---	1,12	
A	US 5 905 247 A (ILEN TERO) 18 May 1999 (1999-05-18) * column 3, line 33 - column 6, line 8 * ---	1,3,6,11	G07B G07C G07F
A	WO 99 10844 A (RISING ROLF) 4 March 1999 (1999-03-04) -----		
The present search report has been drawn up for all claims			
Place of search MUNICH		Date of completion of the search 25 July 2002	Examiner Bocage, S
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 02 42 5065

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
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25-07-2002

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 6243029	B1	05-06-2001	NONE	
WO 0116906	A	08-03-2001	SE 517129 C2	16-04-2002
			AU 7046600 A	26-03-2001
			EP 1216463 A1	26-06-2002
			NO 20021008 A	28-02-2002
			WO 0116906 A1	08-03-2001
			SE 9903086 A	02-03-2001
EP 1172767	A	16-01-2002	EP 1172767 A1	16-01-2002
WO 9611453	A	18-04-1996	FI 944738 A	08-04-1996
			AU 3655095 A	02-05-1996
			WO 9611453 A1	18-04-1996
FR 2810764	A	28-12-2001	FR 2810764 A1	28-12-2001
			AU 6922501 A	02-01-2002
			WO 0199066 A1	27-12-2001
US 5905247	A	18-05-1999	FI 950918 A	29-08-1996
			AU 4721396 A	18-09-1996
			EP 0812448 A1	17-12-1997
			WO 9627170 A1	06-09-1996
WO 9910844	A	04-03-1999	SE 507381 C2	25-05-1998
			AU 8754698 A	16-03-1999
			SE 9702925 A	25-05-1998
			WO 9910844 A1	04-03-1999