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(54) **Management system for a fleet of taxis**

(57) Management system for a fleet of taxis, comprising a control centre for receiving service requests, each of which is associated with a departure point, and means of communication (220i) between the control centre and the taxis, wherein each taxi comprises means (225i) for detecting a current position of the taxi and means (230i) for setting a destination point of a service in progress, the means of communication (220i) transmitting an indication of the current position and an

indication of the destination point from the taxi to the control centre, and wherein the control centre comprises processing means which are capable, for each service request, of estimating a travelling time for each taxi along a route from the current position to the departure point, via the destination point if the taxi is in service, and of selecting one of the taxis according to the estimated time, the means of communication (220i) transmitting a service request signal from the control centre to the selected taxi.

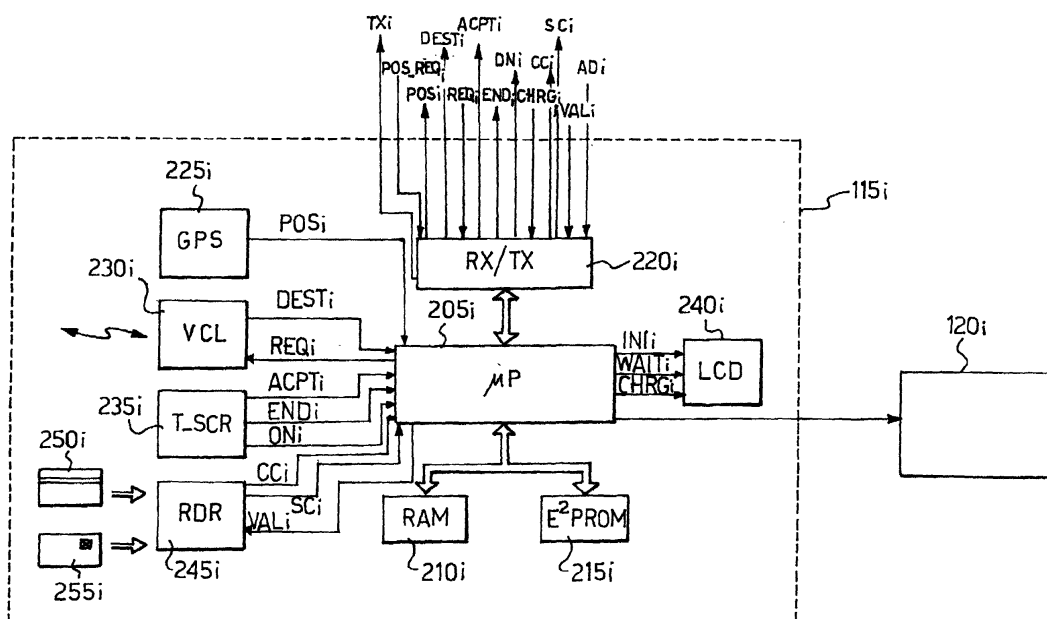


FIG.2

Description

[0001] The present invention relates to a management system for a fleet of taxis.

[0002] Taxis are generally combined into fleets, each of which is controlled by a corresponding control centre connected to the taxis by radio. The control centre is provided with various telephone stations, at each of which there is an operator. The operator continually receives telephone requests for service from customers; each operator asks the customer to state the departure point of the service request and notifies it to all the taxis by radio. If a taxi driver is available to accept the service request, he tells the control centre the estimated time required to reach the departure point. The operator selects one of the available taxis (according to the notified waiting time); the operator then confirms the service request to the selected taxi driver and notifies the waiting time to the customer.

[0003] A disadvantage of the system described above lies in the fact that messages which identify the departure point of each service request are transmitted continually by the control centre to all the taxis in the fleet; this causes a considerable disturbance to the passengers in the taxis.

[0004] This system requires continual attention by the taxi drivers, who must mentally estimate the distance of the departure point of each service request to decide whether or not to accept the request.

[0005] Moreover, the control centre requires particularly quick and careful operators; the work of these operators is extremely stressful, and therefore very short working shifts have to be arranged, with frequent replacements.

[0006] The object of the present invention is to overcome the aforesaid drawbacks. To achieve this object, there is proposed a management system for a fleet of taxis as described in the first claim.

[0007] Briefly, there is provided a management system for a fleet of taxis comprising a control centre for receiving service requests, each of which is associated with a departure point, and means of communication between the control centre and the taxis, wherein each taxi comprises means for detecting a current position of the taxi and means for setting a destination point of a service in progress, the means of communication transmitting an indication of the current position and an indication of the destination point from the taxi to the control centre, and wherein the control centre comprises processing means which are capable, for each service request, of estimating a travelling time for each taxi along a route from the current position to the departure point, via the destination point if the taxi is in service, and of selecting one of the taxis according to the estimated time, the means of communication transmitting a service request signal from the control centre to the selected taxi.

[0008] The present invention also proposes a corresponding method for managing a fleet of taxis.

[0009] Further features and the advantages of the management system for a fleet of taxis according to the present invention will appear in the following description of a preferred embodiment thereof, given purely by way of a non-restrictive indication, with reference to the attached figures, wherein:

Fig. 1 shows schematically the management system for the fleet of taxis;

Fig. 2 shows a schematic block diagram of a control unit of a taxi;

Fig. 3 is a schematic block diagram of a data processing system of a control centre;

Fig. 4 shows the content of a working memory of the processing system;

Fig. 5 shows in a flow chart a method used for managing the fleet of taxis.

[0010] With reference to Fig. 1 in particular, a management system 100 for a fleet of taxis 105_i (where $i=1...N$, equal to 100 for example) is shown. The taxis 105₁-105_N communicate by radio with a control centre 110 which is provided with a data processing system 113, consisting for example of a PC (personal computer).

The control centre 110 continually receives telephone requests for service from customers, with each of which a departure point is associated. Each taxi 105_i consists of a motor vehicle provided with a control unit 115_i; an external electronic panel 120_i is also provided on a roof of the motor vehicle to display variable messages.

[0011] Similar considerations are applicable in cases in which there is a different number of taxis, the taxis consist of minibuses or motorcycles, or are not provided with any electronic panel, the taxis and the control centre communicate by cellular telephones (using text messages, for example) or other equivalent means, or the processing system of the control centre consists of a network of PCs, a mini-computer, or other equivalent processing means, and the like.

[0012] In the management system 100 according to the present invention, as described in detail below, each control unit 115_i detects a current position of the taxis 105_i and enables a taxi driver to set a destination point of a service in progress; the control unit 115_i transmits an indication of the current position and an indication of the destination point to the processing system 113. For each service request, the processing system 113 estimates a travelling time for each taxi along a route from the current position to the departure point of the service request, via any destination point if the taxi is in service, and selects one of the taxis 105₁-105_N according to the estimated time. The processing system 113 then transmits a corresponding service request signal to the control unit 115_i of the selected taxi.

[0013] This solution enables the service request message to be transmitted only to the selected taxi, without disturbing the passengers with continual service request messages transmitted from the control centre.

[0014] The management system according to the present invention drastically reduces the interactions of each taxi driver with the control centre; the taxi drivers can thus concentrate to a greater extent on their driving, reducing the risks of road accidents.

[0015] The solution described above considerably lightens the workload of each operator at the control centre; it is also possible to automate (at least partially) the operation of the control centre. This enables the costs of managing the fleet of taxis to be drastically reduced.

[0016] With reference now to Fig. 2, the control unit 115i comprises a microprocessor (μ P) 205i connected to a working memory 210i of the RAM type and to a non-volatile memory 215i of the E²PROM type. A transceiver (RX/TX) 220i, capable of receiving from the control centre and transmitting to the control centre digital data in point-to-point mode (according to a standard communication protocol), is connected to the microprocessor 205i. A value TXi identifying the i-th taxi is stored in the E²PROM 215i; a corresponding signal TXi is supplied through the microprocessor 205i to the transceiver 220i, which transmits this signal to the control centre.

[0017] The transceiver 220i receives from the control centre a signal POS_REQi indicating a request for the detection of the position of the i-th taxi; this position request signal POS_REQi is input to the microprocessor 205i. The control unit 115i is provided with a position detector 225i of the GPS (Global Positioning System) type. The position detector 225i determines (with an accuracy of approximately 90 m) the current position of the taxi and generates a corresponding signal POSi, consisting, for example, of a pair of spatial coordinates (latitude and longitude); the position signal POSi is supplied through the microprocessor 205i to the transceiver 220i, which transmits this signal to the control centre.

[0018] A voice unit (VCL) 230i comprises a voice recognition device (with a corresponding microphone) and a voice synthesizer (with a corresponding loudspeaker). The voice recognition device of the unit 230i receives as an input the name of the destination point of the service in progress (for example, the street and number), and generates a corresponding signal DESTi; the destination signal DESTi is supplied through the microprocessor 205i to the transceiver 220i, which transmits this signal to the control centre. The transceiver 220i receives from the control centre a signal REQi indicating a service request. The service request signal REQi is supplied through the microprocessor 205i to the voice synthesizer of the voice unit 230i.

[0019] The control unit 115i comprises a touch screen (T_SCR) 235i, programmed in such a way as to display an acceptance key and a rejection key for the service request, a key for signalling the completion of the service in progress, an on key and an off key. A control unit of the touch screen 235i generates a signal ACPTi indicating the fact that the acceptance key or the rejection key has been touched, a signal ENDi indicating the fact

that the service completion key has been touched, and a signal ONi indicating the fact that the on key or the off key has been touched. The acceptance signal ACPTi, the service completion signal ENDi and the activation signal ONi are supplied through the microprocessor 205i to the transceiver 220i, which transmits these signals to the control centre.

[0020] The microprocessor 205i generates a signal INli indicating the departure point of the service request, and a signal WAITi indicating an estimated waiting time for the customer who has made the service request. The departure signal INli and the waiting signal WAITi are supplied to a display 240i of the LCD (liquid crystal display) type. The display 240i also receives from the transceiver 220i, through the microprocessor 205i, a signal CHRGi indicating a current charge for the service in progress.

[0021] The control unit 115i is also provided with a multiple reader (RDR) 245i for credit cards 250i and for smart cards 255i. The reader 245i generates a signal CCI representing identification parameters of the credit card 250i (number, name of holder and expiry date), and an identification signal SCi of the smart card 255i (taxi driver code). The credit card identification signal CCI and the smart card identification signal SCi are supplied through the microprocessor 205i to the transceiver 220i, which transmits these signals to the control centre. The transceiver 220i receives from the control centre a signal VALi indicating the validity of the credit card 250i; the validity signal VALi is supplied through the microprocessor 205i to the reader 245i.

[0022] Finally, the transceiver 220i receives from the control centre a signal ADi representing an advertising message. The advertising message ADi is supplied through the microprocessor 205i to the panel 120i.

[0023] With reference now to Fig. 3, the processing system 113 comprises a central processing unit (CPU) 305 associated with a working memory 310 of the DRAM type and a backing memory 315, consisting of a magnetic hard disc, an optical disc (CD-ROM) reading drive and a floppy disc reading and writing drive.

[0024] The CPU 305 is connected to a transceiver (RX/TX) 320 (similar to the transceiver of the control unit of each taxi); the transceiver 320 receives from the control unit of every i-th taxi the signals TXi, POSi, DESTi, ACPTi, ENDi, ONi, CCI and SCi (represented in cumulative form by TX, POS, DEST, ACPT, END, ON, CC and SC respectively) and sends to the control unit of the i-th taxi the signals POS_REQi, REQi, CHRGi, VALi and ADi (represented in cumulative form by POS_REQ, REQ, CHRg, VAL and AD respectively).

[0025] The CPU 305 is connected in a conventional way to an input unit (IN) 325, consisting of a keyboard with a mouse, and to an output unit (OUT) 330, consisting of a monitor and a printer.

[0026] The processing unit 113 comprises various telephone units (TEL) 335j (four in the illustrated example, with j=1...4), each of which is connected to the CPU 305.

Each telephone unit 335j is provided with an answering machine, a voice recognition device and a voice synthesizer.

[0027] A management program (GEST) 340 is stored in the backing memory 315, and is loaded into the working memory 310 at the time of running.

[0028] Part of the content of the working memory 310 during the running of the management program 340 is shown in Fig. 4. In the working memory 310 there is a table 405 having N rows, each of which is associated with one taxi. A generic row 405i comprises a field 405ai which contains the identification value TXi of the i-th taxi, and a field 405bi which contains a value FUNCi indicating various functionalities of the taxi (such as the type of vehicle, the number of seats, the presence of an air-conditioning system or a roof rack); the values TXi and FUNCi are loaded into the working memory 310 from the backing memory.

[0029] The row 405i additionally comprises a field 405ci in which the activation signal ONi is stored, a field 405di in which the position signal POSi is stored, a field 405ei in which the destination signal DESTi is stored, a field 405fi in which the acceptance signal ACPTi is stored, a field 405gi in which the current charge signal CHRGi is stored, and a field 405hi in which the smart card identification signal SCi is stored.

[0030] A record 410, containing one or more pricing conditions (such as a fixed service charge, a cost per unit time, or an extra price for particular destinations such as airports), is also loaded into the working memory 310.

[0031] In the working memory 310 there is another table 415 having 4 rows, each of which is associated with a telephone unit of the processing system. A generic row 415j comprises a field 415aj which contains the name of the departure point INIj associated with the service request received by the j-th telephone unit, and a field 415bj which contains a value R_FUNCj indicating any requests by the customer relating to the functionality of the taxi. The row 415j then comprises N fields 415cji (one for each taxi); the generic field 415cji contains a value T_ESTji indicating the estimated travelling time required by the i-th taxi to reach the departure point INIj.

[0032] Finally, a table 420, comprising a plurality (for example several tens) of rows 420k, is loaded into the working memory 310 (from the backing memory). A generic row 420k comprises a field 420ak which contains an area identifier SECTk (consisting of the limits of a corresponding range of values of the spatial coordinates) and a field 420bk which contains a time band identifier TIMEk (consisting of the limits of a corresponding time interval); a field 420ck contains a parameter TRAFk indicating the traffic (for example, an average travelling time) in the area SECTk during the time band TIMEk, a field 420dk contains a value VAK indicating a corresponding average actual speed of the taxis, and a field 420ek contains the corresponding advertising message ADk.

[0033] When the processing system is initialized, the record 410 and part of the tables 405, 420 are loaded into the working memory 310. The field 405ci of each row 405i is deasserted (to indicate that the i-th taxi is not active). The fields 405di-405hi of each row 405i and all the fields of each row 415j are set to zero. The field 420dk of each row 420k is set to be equal to the corresponding field 420ck.

[0034] With reference now to Figs. 2-5 taken together, when the i-th taxi starts a shift, the taxi driver touches the on key of the touch screen 235i, so that the activation signal ONi is asserted; at the end of the shift, the taxi driver touches the off key of the touch screen 235i, so that the activation signal ONi is deasserted. The activation signal ONi is transmitted to the processing system 113 and is stored in asynchronous mode in the corresponding field 405ci.

[0035] The processing system 113 polls the various taxis, sending the corresponding position request signal POS_REQi. When the control unit 115i of the i-th taxi receives the position request signal POS_REQi, it sends the corresponding position signal POSi to the processing system 113. The position signal POSi is stored in the corresponding field 405di.

[0036] The management program 340, when run on the processing system 113, implements (in parallel for each telephone unit 335j) a method 500 which starts in block 505 and then moves to block 510 in which a check for the presence of an incoming telephone call is made. If the outcome is negative, the method returns to block 510 in an idle loop.

[0037] Otherwise, the method proceeds to block 515, in which the telephone unit 335j answers the call; the voice synthesizer of the telephone unit 335j invites the customer to state the name of the departure point of the service request and to communicate (by means of guided menus) any required functionality of the taxi. The telephone unit 335j consequently generates the departure signal INIj and the required functionality signal R_FUNCj, which are stored in the fields 415aj and 415bj respectively.

[0038] The method continues to block 520 in which is calculated, for every i-th taxi, the estimated time T_ESTji required to reach the departure point INIj which is stored in the corresponding field 415cji. If the i-th taxi is not active (signal ONi deasserted), does not have the functionality required by the customer (in other words, the value FUNCi does not meet the value R_FUNCi), or has already accepted a service request (signal ACPTi asserted), the estimated time T_ESTji is set to a non-valid value (for example -1). If the i-th taxi is active (signal ONi asserted), has the functionality required by the customer and has not accepted any service request (signal ACPTi deasserted), the length of the route from the current position POSi to the departure point INIj, via the destination point DESTi, if any, is determined. In particular, if the destination point DESTi is zero (no service in progress), the length of the route is set to be equal to

the geometrical distance between the departure point INI_j and the current position POS_i. In the opposite case, the geometrical distance between the departure point INI_j and the destination point DEST_i is calculated, together with the geometrical distance between the destination point DEST_i and the current position POS_i; the length of the route is set to be equal to the sum of these distances. At this point, several traffic parameters TRAF_k (stored in the fields 420ck) are extracted; one of these corresponds to a current time of day (determined from a system time generated by a clock signal of the processing system 113), and the others correspond to the current position POS_i, the destination point DEST_i (if not zero), and the departure point INI_j, respectively; an average of these traffic parameters is then calculated. The estimated time T_EST_{ji} is set to be equal to the product of the length of the route and the average of the traffic parameters.

[0039] Proceeding to block 525, the i-th taxi having the corresponding minimum estimated time T_EST_{ji} is selected (the first being selected, for example, if there is a plurality of equal values). The departure point INI_j and the estimated time T_EST_{ji} are used to form the service request signal REQ_i, which is transmitted to the control unit 115_i of the selected taxi. The service request signal REQ_i is stored in the RAM 210_i and is supplied to the voice synthesizer of the unit 230_i, which emits a corresponding message.

[0040] If the taxi driver decides to accept the service request, he touches the acceptance key of the touch screen 235_i, so that the signal ACPT_i is asserted; otherwise (for example because he is just finishing his shift), the taxi driver touches the rejection key of the touch screen 235_i, so that the signal ACPT_i is deasserted (the signal ACPT_i is deasserted in all cases after a predetermined maximum time). If the acceptance signal ACPT_i is asserted, the microprocessor 205_i extracts the corresponding departure signal INI_j from the service request signal REQ_i (stored in the RAM 210_i); the microprocessor 205_i also calculates the corresponding estimated wait time from the service request signal REQ_i and sets the wait signal WAIT_i to be equal to this value. The microprocessor 205_i decreases the signal WAIT_i periodically (for example every second) according to the time elapsed (measured by an internal clock signal). The signals INI_j and WAIT_i are supplied to the display 240_i, which displays a corresponding message to the taxi driver. At the same time, the acceptance signal ACPT_i is transmitted to the processing system 113 and is stored in the corresponding field 405_{fi}.

[0041] The method then checks, in block 530, whether the i-th taxi has accepted the service request. If the acceptance signal ACPT_i is not asserted, the method moves on to block 535, in which the estimated time T_EST_{ji} is set to the invalid value (-1), in such a way as to exclude the i-th taxi from a subsequent selection; the method then returns to block 525.

[0042] If the acceptance signal ACPT_i is asserted, the

method proceeds to block 540, in which the voice synthesizer of the telephone unit 335_j notifies to the customer the identification value TX_i of the selected taxi and the estimated wait time T_EST_{ji}; the telephone unit 335_j then terminates the telephone call. The method returns to block 510 to continually repeat the operations described above.

[0043] The embodiment of the present invention described above is extremely simple and economical. The control unit of the taxi is quite user-friendly and enables the taxi driver to know at any instant the remaining wait time to reach the departure point of the service request; additionally, the control centre is fully automated.

[0044] Similar considerations are applicable in cases in which the control unit and the processing system have a different structure, use other equivalent components or signals, the service requests are received over the Internet, a different number of telephone units (down to a minimum of one) is provided, the management program uses another method or uses equivalent storage structures. Alternatively, the taxi drivers can set the destination point by means of the touch screen or a keyboard, no internal display for the destination point and the wait time is provided, the service request signal is sent to the control units of all the taxis (and is accepted only by the control unit which recognizes that it is the addressee of the signal), the service requests are controlled by operators, connected to the processing system by terminals, each of whom sends a spoken service request message to the taxis, or the like.

[0045] The particular mechanism used for selecting the taxis is extremely flexible; additionally, the method of estimating the travelling time is very simple although it is sufficiently precise. In a different embodiment of the present invention, no facility is provided for rejecting the service request or for selecting the taxi according to its functionalities, the taxi is selected by means of more sophisticated algorithms (which, for example, minimize an overall wait time); similarly, the route length is determined in a more precise way by using a road map read from a CD-ROM, the current value of the traffic parameter is determined differently (for example solely as a function of the current time of day, as a function of one or more points along the route, down to the departure point only), or a single predetermined value of the traffic parameter (for all areas and for all times of day) is provided.

[0046] Preferably, whenever the processing system 113 receives the position signal POS_i (from a taxi in service), it calculates the geometrical distance travelled by the i-th taxi between the preceding position (stored in the field 405_{di}) and the current position POS_i; it is then possible to calculate a speed of the i-th taxi, by dividing the distance travelled by the predetermined interval at which the position request signals POS_REQ_i are transmitted (for example, 10 seconds). If the speed of the i-th taxi is less than the average actual speed VAK (stored in the field 420dk) corresponding to the current

time of day and to the current position POS_i, the average actual speed VAK is decreased by a predetermined value (for example 1 km/hr); otherwise, the average actual speed VAK is incremented by the same predetermined value. Periodically (every 5 minutes, for example), the traffic parameter TRAF_k of each row 420_k is set to be equal to the corresponding average actual speed VAK.

[0047] The structure described above can be used to modify the values of the traffic parameter in a dynamic way in real time, according to the actual road conditions; the method used provides a filter function which makes it possible to disregard variations of speed due to transient disturbances (for example, when the taxi is halted to take the customer on board). Alternatively, the average actual speed is calculated by using one position signal out of every two, three, or more position signals received, the distance travelled is determined by using a road map stored in the processing system, or no mechanism for dynamically modifying the values of the traffic parameter is provided.

[0048] Whenever a generic i-th taxi (having reached the destination point IN_{li}) starts the requested service, the taxi driver switches on the voice recognition device of the unit 230_i and speaks the name of the destination point. The voice unit 230_i generates the corresponding signal DEST_i, which is transmitted to the processing system 113; the destination signal DEST_i is stored in asynchronous mode in the corresponding field 405_{ei}. At the same time, the acceptance signal ACPT_i (stored in the field 405_{fi}) is deasserted, and the current charge CHRG_i (stored in the field 405_{gi}) is set to be equal to the fixed service rate, with the addition of an extra charge if necessary, based on the destination point DEST_i (read from the record 410). The current charge CHRG_i is incremented periodically, every second for example, by the cost per unit time (read from the record 410); at the same time, the signal CHRG_i is transmitted continuously to the control unit 115_i; this signal is supplied to the display 240_i, which acts as a taximeter.

[0049] When the i-th taxi finishes the service in progress, the taxi driver touches the service completion key of the touch screen 235_i, and therefore the signal END_i is asserted. The service completion signal END_i is transmitted to the processing system 113. Consequently, the destination point DEST_i (stored in the field 405_{ei}) and the current charge CHRG_i (stored in the field 405_{gi}) are reset to zero.

[0050] This structure acts as a centralized taximeter; this enables the pricing conditions applied by the taxis of the fleet to be modified extremely quickly and at negligible cost.

[0051] If the customer wishes to pay for the service with a credit card, the credit card 250_i is inserted into the reader 245_i. The reader 245_i reads the identification parameters of the credit card 250_i and generates the corresponding signal CCI, which is transmitted to the processing system 113. The processing system 113 checks the validity of the credit card 250_i, for example

by making a telephone call to a company which has issued it (by means of one of the telephone units 335_j). If the credit card 250_i is valid, the signal VAL_i is asserted, while if the credit card 250_i is invalid (or if the management company does not reply within a predetermined maximum time) the signal VAL_i is deasserted. The validity signal VAL_i is transmitted to the control unit 115_i; this signal is supplied to the reader 245_i, which prints a corresponding receipt for the customer.

[0052] This enables the validity of the credit card to be checked in a very simple and rapid way; this solution makes the acceptance of credit card payments by taxi drivers highly secure. Similar considerations are applicable in cases in which a debit card, or any other payment instrument, is used.

[0053] Additionally, when the processing system 113 receives the position signal POS_i, it extracts the advertising message AD_k (stored in the field 420_{ek}) corresponding to the current time of day and to the current position POS_i. This advertising message is transmitted to the control unit 115_i; the corresponding advertising signal AD_i is stored in the RAM 210_i. The advertising signal AD_i is supplied continuously to the panel 120_i for display on the exterior of the taxi.

[0054] This characteristic is particularly advantageous, since it can be used to create a selective advertising system (for each area and time of day); for example, when a taxi is in a particular area, the corresponding panel displays the advertising message of a gymnasium in the area during the day, of a self-service restaurant during the lunch hour, of a pizza restaurant at dinner time, and of a discotheque at night. Similar considerations are applicable in cases in which the panel is of a different type or is positioned on a rear window of the taxi, the advertising message depends only on the current position of the taxi (and not on the time of day) or vice versa, the advertising message is identical for all the taxis, or similar.

[0055] Preferably, each taxi driver has an identification smart card 255_i. When the taxi driver starts an engine of the taxi, the taxi identification signal TX_i (stored in the E²PROM 215_i) is sent to the processing system 113. The microprocessor 205_i continually checks whether the smart card 255_i is inserted in the reader 245_i. If so, the smart card identification signal SCI is sent to the processing system 113. On the contrary, if the smart card 255_i is not inserted into the reader 245_i within a predetermined maximum time by the starting of the engine (for example 2 minutes), the microprocessor 205_i switches on an alarm signal (for example a siren, not shown in the figure).

[0056] At the same time, when the processing system 113 receives the taxi identification signal TX_i, the management program 340 activates in asynchronous mode a process which goes into a cycle of waiting for the smart card identification signal SCI. As soon as the processing system 113 receives the smart card identification signal SCI, this signal is stored in asynchronous mode in the

corresponding field 405hi. If the processing system 113 does not receive the smart card identification signal SCi within the aforesaid predetermined maximum time, the management program 340 switches on an alarm signal (notifying an operator, for example, or notifying a police station directly by means of one of the telephone units 335j).

[0057] This makes it possible to provide a centralized anti-theft function, which simply and effectively identifies each anomalous situation in which the taxi is used by an unauthorized person (with the further possibility of monitoring the position of the taxi in real time by means of the corresponding signal POSi). This solution also makes it possible to associate the various services performed by the i-th taxi with the taxi driver (identified by the corresponding smart card 255i) who is using it. This characteristic is particularly advantageous in the case in which the various taxis can be used in rotation by a plurality of taxi drivers. Similar considerations are applicable in cases in which the predetermined maximum time has another value, no alarm signal is provided in the taxis, the smart card is replaced by a different hardware key, each taxi driver is associated with a password input by means of a keyboard, or any other access key is provided.

[0058] The additional functions described above (centralized taximeter, credit card checking, selective advertising, anti-theft) make the management system according to the present invention particularly advantageous. Moreover, the various data used by the management program 340 are suitable for storage in an appropriate data base for use in subsequent processing, for example of the statistical, accounting or similar type.

[0059] Alternatively, only some of these functions (or even none of them) are provided, or functions of another type are provided, such as signalling hold-ups or shorter or quicker routes to the taxis, automatic printing of receipts for customers (by providing each taxi with a printer connected to the microprocessor), telephone services for the customers managed by the control centre, provision of estimates, signalling of alarm situations, or similar. Conversely, these additional functions can be used (separately or together) even without the taxi selection function described above.

[0060] For example, in a particular embodiment of the present invention, only the selective advertising function is provided. In fact, there has been a recent trend towards the use of various categories of vehicle, such as taxis in the present example, to display advertising messages. Typically, the advertising messages are provided in the form of adhesive films which are stuck on the bodywork of the motor vehicle or in the form of plastic panels which are placed on its roof.

[0061] A disadvantage of this known solution lies in the fact that the modification of the advertising messages is rather slow and laborious. This makes the known structure described above extremely inflexible, and does not enable the potential offered by the taxis to be

exploited to the full.

[0062] To overcome these disadvantages, the present invention proposes a management system for a fleet of vehicles, comprising a control centre and means of communication between the control centre and the vehicles, each vehicle being provided with means for displaying advertising messages, in which each vehicle comprises means for detecting a current position of the vehicle, the means of communication transmitting an indication of the current position from the vehicle to the control centre, and wherein the control centre comprises means capable of storing a structure which associates a corresponding advertising message with a set of points and of determining, for each vehicle, a current advertising message according to the current position, the means of communication transmitting the current advertising message from the control centre to the vehicle and the display means of the vehicle displaying the current advertising message.

[0063] With reference in particular to Figs. 2-3 described above, the control unit 115i of each taxi comprises only the microprocessor 205i (with the corresponding RAM 210i and E²PROM 215i), the transceiver 220i, and the position detector 225i, while the processing system 113 is not provided with any telephone unit; consequently, the transceiver 220i receives only the messages POS_REQi, ADi from the processing system 113, and sends only the message POSi to the processing system 113. When the processing system 113 receives the position signal POSi, it only determines the advertising message corresponding to the current position of the taxi. This advertising message is transmitted to the control unit 115i to be displayed on the electronic panel 120i.

[0064] Similar considerations are applicable in cases in which the panel is of a different type, or is positioned on a rear window of the taxi, or similar. Alternatively, minibuses of a carrier, motor lorries of a distribution company, minibuses of a postal service, or more generally any fleet of vehicles suitable for transporting persons or objects, are used.

[0065] The structure according to the present invention makes it possible to provide an advertising system which is selective (by area). This solution is also suitable for implementation with an advertising message which varies according to both the current position of the taxi and the time of day, and in combination with one or more of the functionalities described above.

[0066] Clearly, a person skilled in the art may, in order to meet contingent and specific requirements, make numerous modifications and variations to the management system for a fleet of taxis described above, all these modifications and variations being contained within the scope of protection of the invention, as defined by the following claims.

Claims

1. Management system (100) for a fleet of taxis (105i), comprising a control centre (110) for receiving service requests, each of which is associated with a departure point, and means of communication (220i, 320) between the control centre (110) and the taxis (105i),
characterized in that
each taxi (105i) comprises means (225i) for detecting a current position of the taxi and means (230i) for setting a destination point of a service in progress, the means of communication (220i, 320) transmitting an indication of the current position and an indication of the destination point from the taxi (105i) to the control centre (110), and wherein the control centre (110) comprises processing means (113) which are capable, for each service request, of estimating a travelling time for each taxi (105i) along a route from the current position to the departure point, via the destination point if the taxi (105i) is in service, and of selecting one of the taxis according to the estimated time, the means of communication (220i, 320) transmitting a service request signal from the control centre (110) to the selected taxi.
2. Management system (100) according to Claim 1, wherein the processing means (113) determine, for each taxi (105i), a value indicating a length of the route and a parameter indicating a traffic condition along the route, the estimated time being a function of the value of the length of the route and the traffic parameter.
3. Management system (100) according to Claim 2, wherein the processing means (113) comprise means (310, 315) for storing a structure (420) which associates a corresponding value of the traffic parameter with a set of points and times of day, the processing means (113) determining, for each taxi (105i), a current value of the traffic parameter as a function of at least one point along the route and of a current time of day.
4. Management system (100) according to Claim 3, wherein the processing means (113) are further capable of determining, for each taxi in service, a value indicating a distance travelled between two current positions detected at two different instants, and of calculating a speed equal to the ratio between the value of distance travelled and a time interval elapsed between the two instants of detection, the stored values of the traffic parameter being modified as a function of the calculated speed.
5. Management system (100) according to any one of Claims 1 to 4, wherein the processing means (113) comprise means (310, 315) for storing a value (405ai) of at least one functional characteristic of each taxi (105i) and wherein each service request is associated with a possible requested value of the at least one functional characteristic, the selected taxi being selected only from the taxis (105i) having the stored value of the at least one functional characteristic which meets the possible requested value.
6. Management system (100) according to any one of Claims 1 to 5, wherein the means of communication (220i, 320) transmit an indication of the departure point and an indication of the estimated time from the control centre (110) to the selected taxi, and wherein each taxi (105i) includes means (205i, 240i) for displaying the indication of the destination point and an indication of a wait time, the wait time being set to be equal to the estimated time and being decreased as time passes.
7. Management system (100) according to any one of Claims 1 to 6, wherein the processing means (113) select the taxi with which is associated a minimum value of the estimated time, and wherein each taxi (105i) comprises means (235i) for accepting or rejecting the service request, the means of communication (220i, 320) transmitting a signal accepting or rejecting the service request from the selected taxi to the control centre (110) and the processing means (113) selecting in sequence further taxis, with each of which the next higher value of the estimated time above the minimum value is associated, until they receive the acceptance signal.
8. Management system (100) according to any one of Claims 1 to 7, wherein the processing means (113) comprise means (310, 315) for storing at least one pricing condition (410), the processing system (113) calculating, for each taxi in service, a current charge for the service in progress and the means of communication (220i, 320) transmitting the current charge from the control centre (110) to the taxi in service, and wherein each taxi (105i) comprises means (240i) for displaying the current charge.
9. Management system (100) according to any one of Claims 1 to 8, wherein each taxi (105i) comprises a reader (245i) of a payment instrument (250i), the means of communication (220i, 320) transmitting a value identifying the payment instrument (250i) from the taxi (105i) to the control centre (110), and wherein the processing means (113) comprise means (335j) for checking a validity of the payment instrument (250i), the means of communication (220i, 320) transmitting an indication of the validity of the payment instrument (250i) from the control centre (110) to the taxi (105i).

10. Management system (100) according to any one of Claims 1 to 9, wherein each taxi (105i) comprises a reader (245i) of an access key (255i) associated with a taxi driver, the means of communication (220i, 320) transmitting a value identifying the taxi (105i) at an instant of starting of the taxi (105i) and a value identifying the access key (255i) from the taxi (105i) to the control centre (110), and wherein the processing means (113) comprise means (335j) for emitting an alarm signal if the value identifying the access key (225i) is not received within a pre-determined time following an instant of reception of the value identifying the taxi (105i). 5
11. Management system (100) according to any one of Claims 1 to 10, wherein the processing means (113) comprise means (310, 315) for storing a further structure (420) which associates a corresponding advertising message with a set of points and times of day, the processing means (113) determining, for each taxi (105i), a current advertising message according to the current position and the current time of day, and the means of communication (220i, 320) transmitting the current advertising message from the control centre (110) to the taxi (115i), and wherein each taxi (105i) comprises means (120i) for displaying the current advertising message. 10 20 25
12. Method for managing a fleet of taxis (105i), comprising the step of receiving, at a control centre, service requests with each of which a departure point is associated, the method being characterized by the steps of: 30
- detecting a current position of each taxi (105i), 35
 setting a destination point of a service in progress in each taxi,
 transmitting an indication of the current position and an indication of the destination point from the taxi (105i) to the control centre (110), 40
 and repeating, for each service request, the steps of:
 estimating a travelling time for each taxi (105i) along a route from the current position to the departure point, through the destination point if the taxi (105i) is in service, 45
 selecting one of the taxis (105i) according to the estimated time, and
 transmitting a service request signal from the control centre (110) to the selected taxi (105i). 50
13. Management system (100) for a fleet of vehicles (105i) comprising a control centre (110) and means of communication (220i, 320) between the control centre (110) and the vehicles (105i), each vehicle (105i) being provided with means (120i) for displaying advertising messages, characterized in that each vehicle (105i) comprises means (225i) 55

for detecting a current position of the vehicle, the means of communication (220i, 320) transmitting an indication of the current position from the vehicle (105i) to the control centre (110), and wherein the control centre (110) comprises means (113) capable of storing a structure (420) which associates a corresponding advertising message with a set of points, and of determining, for each vehicle (105i), a current advertising message according to the current position, the means of communication (220i, 320) transmitting the current advertising message from the control centre (110) to the vehicle (105i) and the display means (120i) of the vehicle (105i) displaying the current advertising message.

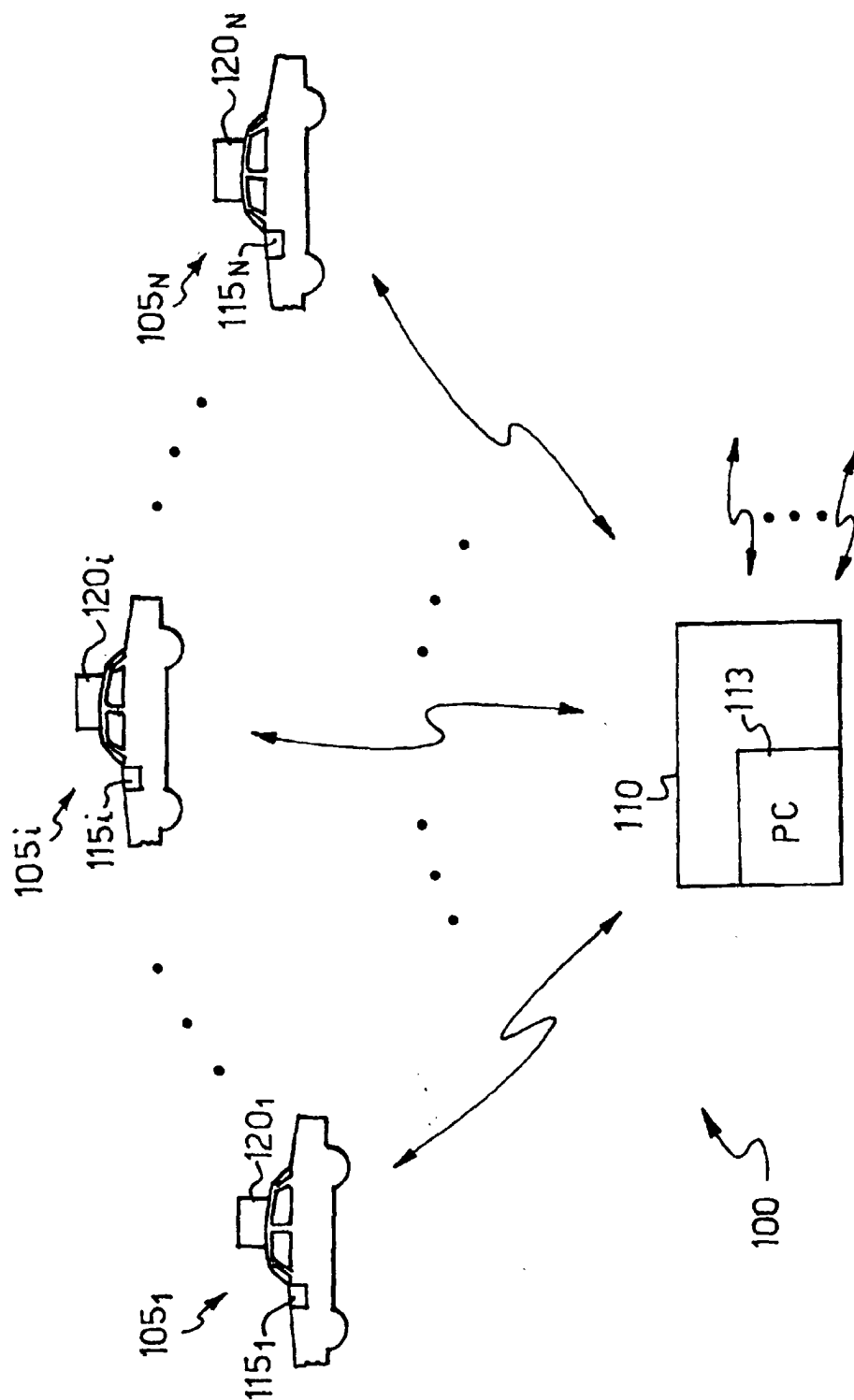


FIG.1

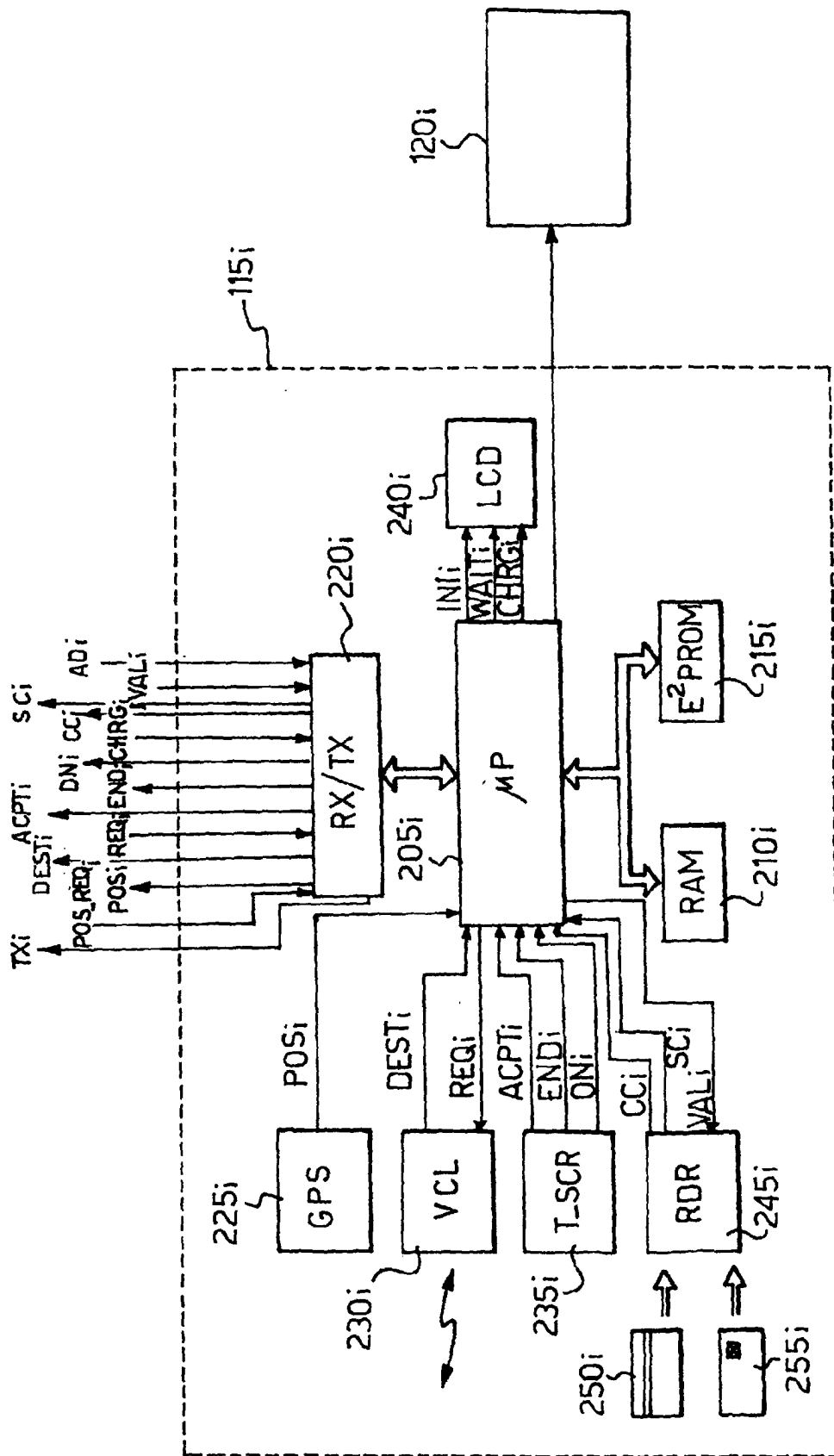


FIG. 2

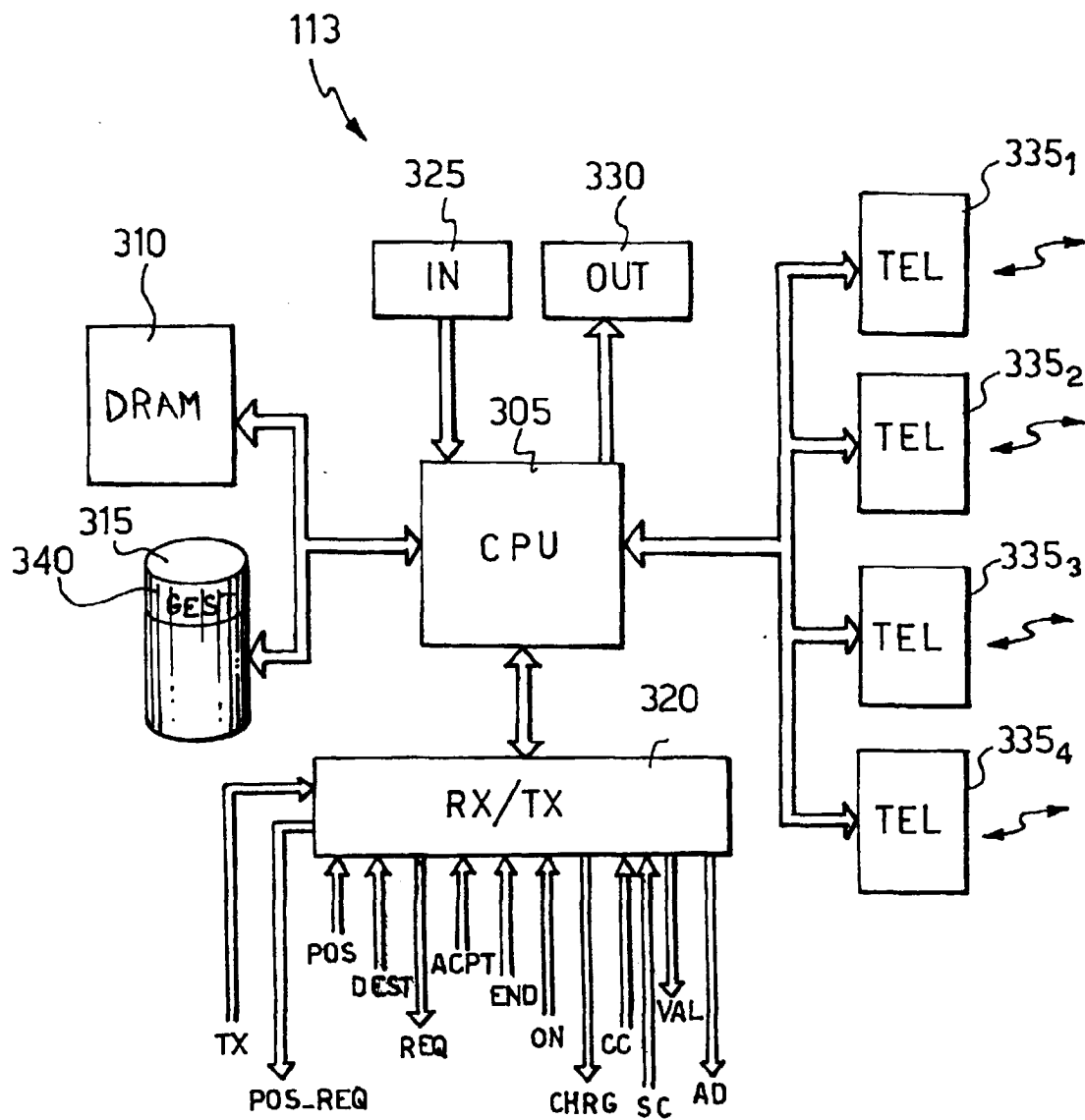


FIG.3

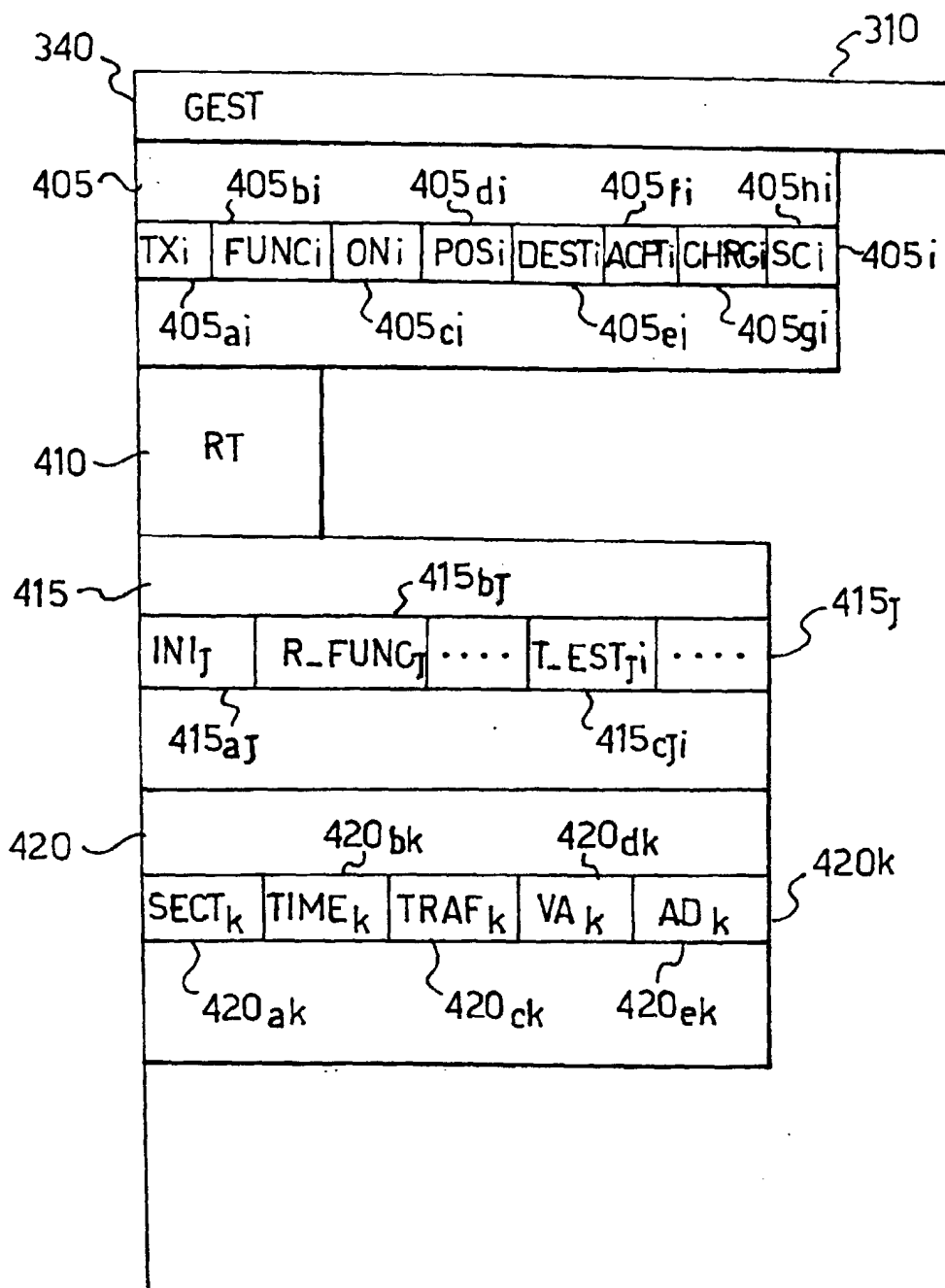


FIG. 4

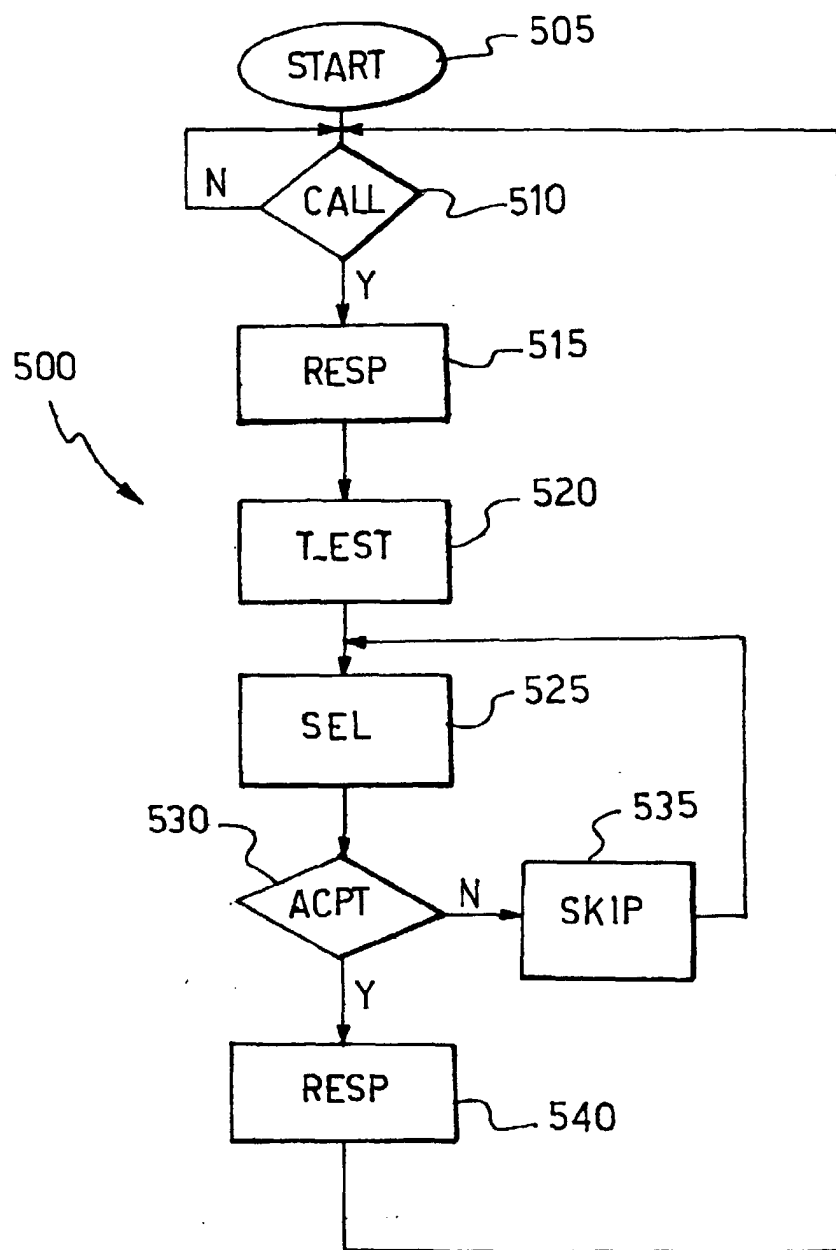


FIG. 5



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 99 83 0698

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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			

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