

REMOTE SIGNALLING SYSTEMTechnical Field

This invention relates to a remote signalling system which has particular but not exclusive application to the taxi or hire car industry or other mobile situations.

Background Art

Taxis and hire cars are used in many situations and often situations arise where ready access is not available to a telephone to summon a taxi or hire car to a particular location for collecting persons. This situation may occur, either because a public telephone is not available in a location where a taxi or hire car is required or may occur in situations where available public telephones are heavily used which may result in a person waiting for a considerable period of time before a call can be made to a taxi control station. Whilst taxis and hire cars may be available at taxi ranks, such ranks are not widely provided due to the traffic congestion which they cause.

International Patent Application No. PCT/SE91/00800 discloses a taxi calling method and system for connecting a stationary subscriber apparatus to a mobile subscriber apparatus, such as taxi carried telephone apparatus, through a telephone exchange. In this system, however, voice communication is made directly between a subscriber and the taxi vehicle which is identified by a computer as being in the appropriate geographical area relative to the location of the subscriber.

Japanese Patent Application No. 92295306 discloses a automatic taxi call system wherein cable or radio transmitters are arranged at predetermined locations and which when actuated, transmit location codes to a taxi dispatch centre. This system requires the input of a telephonist to enable a taxi to be informed of the call transmission from one of the locations. A further system is described in Japanese Patent Application No. 59015339 where a user operates an address code signal transmitter



for receipt by a receiver in a taxi.

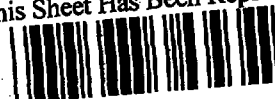
The above systems have a number of disadvantages. In particular, the first two described systems require speech input by a user or telephonist to enable identification of the address of the user or identification of an available taxi. Each of the above systems also have no means which enable the user to ascertain that his or her call has been received or that a free taxi is being dispatched.

10 Summary of the Invention

The present invention aims to provide in one aspect a remote signalling system for use primarily but not exclusively in the taxi or hire car industry which enables a taxi or hire car to be readily called or summoned to a number of geographical locations. The present invention in a further aspect aims to provide a signalling system which may be used in other paging or booking applications. Other objects and advantages of the invention will become apparent from the following description.

20 The present invention thus provides in a first preferred aspect, a remote signalling system for use with vehicles, said system comprising a base terminal, a plurality of input terminals adapted to be positioned in a plurality of geographical locations, each said input terminal including currency or card acceptor means, transmitter means adapted to be actuated directly or indirectly upon valid receipt of currency or a card by said acceptor means to transmit a signal from said input terminal, said base terminal having means for detecting directly or indirectly said signal transmitted by said transmitter means and identifying the geographical location of said input terminal, said base terminal further including means for transmitting geographical information concerning said input terminal to a said vehicle whereby
30 said vehicle may identify said input terminal.

The currency acceptor means of the input terminal may comprise means receiving coins, notes or tokens. The card acceptor means of the input terminal may comprise a



card reader mechanism for reading of credit or debit cards or the like.

The signally system of the present invention has particular application to use with current taxi or hire
5 car control computer systems involving mobile on-board computers and associated receivers and wherein visual displays are associated with the computers. In such conventional systems, a telephone call by a person who requires a taxi or hire car is received by a telephonist at
10 a base station who is then able to transmit to a taxi with the use of a keyboard the particular address of the person requiring the vehicle which is displayed on the visual display means.

In the present case, the signal transmitted by
15 the transmitter means of an input terminal may be detected by a receiver at the base terminal and the information received applied to a base computer associated with the above systems, the base computer. The computer may register or identify from the signal received, the
20 geographical location of the transmitter means which transmits the signal from the input terminal to thereby identify that terminal.

The input terminal may include a display to indicate to the user, that is the person who has actuated
25 the terminal, that the transmitted signal has been accepted by the base computer and that a taxi or other hire vehicle has been directed to the location of the input terminal from which the signal is transmitted. To this end, the base terminal may transmit a confirmation signal
30 for receipt by the input terminal upon receipt and identification of the signal transmitted by an input terminal. The input terminal also may include dispensing means adapted to dispense a ticket, token or other identification means to the user which is identified, by,
35 for example being numbered, to enable the user to be identified by the collecting vehicle. For this purpose, the ticket identification, such as the number, as well as the geographical location of the input terminal may be

displayed on the visual display carried by the taxi or other vehicle. In addition, the visual display of the taxi or other vehicle may display the geographical location of the input terminal.

5 The driver of the taxi or other vehicle being made aware of the location of the identified input terminal as displayed on his visual display may then proceed to that input terminal at the identified location to collect the person who activated the terminal and who can be identified
10 by the ticket or other identification means being held. The driver of the taxi or other vehicle may also actuate his transceiver to transmit an acknowledgment signal to indicate that he has accepted the reservation and is proceeding to the input terminal. The acknowledgment
15 signal may be received either at the activated input terminal or at the base terminal and transmitted to the input terminal.

 The input terminal may also include means for refunding the inserted coin or coins or crediting the debit
20 or credit card in the event that the signal transmitted by the input terminal transmitter means is not received at the base terminal or acted upon within a prescribed time.

 The input terminals may be arranged in any number of selected areas and may if desired be of a free standing
25 nature and as stated above include means to accept coins, cards or other form of currency. The transmitter means associated with the input terminal preferably transmits a signal over the digital cellular network, however, if desired the signal transmitter may transmit a signal over
30 other forms of communication network such as the analogue telephone network or alternatively through a satellite communications network.

 In a normal operation, the user may insert a coin (or card) into a receiving slot of the input terminal.
35 Sensing means, such as a light beam may be provided adjacent to the input slot, the light beam being broken or intercepted, or the sensing means being actuated, upon insertion of the card or coin. Breaking or intercepting of



the light beam, or actuation of the sensing means may result in a signal being sent to a control circuit within the terminal which activates in the case of coin deposit, a coin validator circuit. If the coin is a valid coin, as
5 detected by the coin validator circuit, it is accepted and held in escrow. If the coin is invalid, it is rejected.

Similarly in the case of a card reader, insertion of a debit or credit card into the reader may be sensed by sensing means which causes the card reader to read the
10 card.

Upon the coin being accepted, or the card being read, the control circuit may initiate operation of the transmitter means within the input terminal. The transmitter means suitably comprises part of a transceiver
15 within the input terminal. The transmitter means when operated transmits a signal for detection at the service provider's base terminal which may be located at the base station of a taxi company.

Upon the services providers terminal receiving
20 a signal from the transmitter means of an input terminal, the computer at the base terminal may cause a response signal, such as a DTMF tone, to be transmitted back to the transceiver of the input terminal from the base terminal to indicate that the base terminal is ready to receive the
25 input terminals information. The control circuit at the input terminal then may cause the input terminal transmitter means to transmit a unique identification code followed by status information. The identification code may comprise information concerning the geographical
30 location of the input terminal.

Upon receipt of this information, the service providers base terminal may cause the base terminal transmitter to transmit a confirmation signal back to the input terminal for receipt by the input terminal
35 transceiver to confirm the receipt of the reservation, or booking. The base terminal transmitter additionally may transmit a signal containing the geographical location of the activated input terminal and an identification number



to the mobile receiving equipment and associated computer carried by the vehicle for display and monitoring by the driver of the vehicle who can then acknowledge the booking. In the case where a credit card or debit card is used, the
5 card reader may debit the card upon the input terminal receiving the confirmation signal.

When the input terminal receives confirmation of the reservation request, as transmitted from the service providers base terminal, the escrow unit within the input
10 terminal may release the deposited coin into a receiving container, such as a cash box and the ticket dispenser may be operated to dispense a numbered or identifying ticket to the user. This will also occur when a credit or debit card (if used) is debited. The input terminal may additionally
15 include visual indicating means to indicate confirmation of the booking and to further indicate that the request is being acted upon. Such indicating means may include visual indicating means such as a light source which is illuminated to confirm the reservation of the vehicle.

20 If no confirmation signal is received by the input terminal, the control circuit of the terminal may automatically re-initiate the above procedure for a set number of times. If the repeated calls are unsuccessful, the control circuit may cause the customer's coin or note
25 to be refunded, or in the case of a debit or credit card eject the card.

The input terminal may be powered by a portable power supply, such as a battery or batteries which for example may be charged by solar charging means.

30 The present invention in a further aspect provides a remote signalling and identification system, including a plurality of fixed input terminals, a base terminal, each said input terminal including transmitter means for transmitting an identification signal, said base
35 terminal including means for receiving and identifying said input terminal from its transmitted identification signal and for transmitting a confirmation signal upon receipt and identification of said identification signal, said input



terminal being adapted to issue identification means upon receipt of a confirmation signal from said base terminal.

The base terminal may also transmit upon receipt of an identification signal from a said input terminal, a further signal to a mobile unit whereby said mobile unit may identify said input terminal and said identification means. The identification signal transmitted by the input terminal may comprise geographical location information whereby the input terminal may be identified. The input terminals may be selectively actuated to transmit an identification signal upon insertion of a coin or other currency, credit or debit card, token or ticket.

The systems described above may also optionally include a number of fault detecting and checking arrangements as referred to below.

A fatal fault occurs when the batteries of the input terminal are flat in which case no operation is possible. A fatal fault also occurs wherein coins are jammed. The input terminal thus cannot accept coins as the coin chute is jammed. A fatal fault also occurs where there is no communication network available diagnosed when a number of transmissions from the input terminal have failed. No requests will be accepted until the input terminal can communicate with the receiver of the base terminal. The input terminal transmitter may retry transmissions automatically at pre-determined intervals for as long as power is available in an attempt to communicate with the base terminal.

The input terminal may also be interrogated to provide or automatically provide status reports which may be as follows:

TICKETS LOW

The number of tickets left in the dispenser is below the threshold required.

TICKETS EMPTY

No more tickets are available but the terminal is still operational.



TICKET DISPENSER FAULT

A fault has been detected in the ticket dispenser which may be a ticket jam. The input terminal may still be operational in the event of a ticket dispenser fault although subsequent transmissions to the vehicle will not include a valid ticket number. A non-valid ticket number for example may comprise the code 00 indicating ticket dispenser fault.

CASH BOX FULL

10 The status of the cash box which receives the deposited coins is detected indicating that the cash box may be full for collection.

COINS JAMMED

The coin receiving chute/validator may be jammed.
15 The input terminal will then go into FAULT mode.

UPDATE

The terminal periodically on a pre-determined basis will transmit a status update to the receiver at the base terminal. Failure to receive any kind of transmission from an input terminal within a predetermined period of time indicates failure or possible vandalism of a terminal. The base terminal receiver is programmed to issue an alert on failure of an input terminal to report.

TAMPER ALARM

25 A tamper alarm signal will be generated where tampering has been detected in the coin chute or by the coin validator. In this instance, an operator alert is issued calling for immediate attention. The receiver unit at the base station may elect to transmit an automatic call to security with details of the location of the alarm.

LOW BATTERY

Battery voltage is dropping indicating battery replacement is necessary within a reasonable period of time.

35 TOO MANY TRANSMISSION FAILURES

The terminal has encountered too many transmission failures in proportion to the number of successful transmissions. This may be due to an antenna



problem or poor positioning of the input terminal. Transmission failures or even retries can prove to be frustrating to the customer leading to possible vandalism.

SELF-TEST

- 5 A self test will be performed automatically on power-up or reset/test. This will occur whenever the battery is replaced or an operator presses a test button located internally. The terminal will self-test and automatically transmit an UPDATE status to the base
- 10 terminal. Failure in this testing procedure will cause a red fail light on the input terminal to illuminate. A successful test will result in the green confirmation light illuminating. Further optional tests may include tests of the ticket dispensing mechanism.

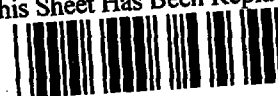
15 FAULT MODE

- When a fatal fault has been detected, that is one which prevents the booking reservation operation from being completed, the input terminal will go into fault mode disabling the coin mechanism and illuminating a red failure
- 20 light on the input terminal. Fault mode also initiates if possible, a transmission to the base station of current status information.

STATUS INFORMATION

- Whenever an input terminal apart from in normal
- 25 operation, transmits a signal to the base terminal, it provides in addition to the reasons for the transmission, additional information relating to its current status. If the terminal is being vandalised, then the base terminal can detect for example how much is in the cash box. This
- 30 may be the last time the input terminal is able to communicate such information to the base station before its failure.

- The system may also include portable operator control pads which may comprise hand held devices for
- 35 accessing functions and performing operations on an input terminal via infra-red communication. Each control pad is self-powered and may include sixteen character by two line LCD display and a numeric keypad. Such a control pad is



necessary when the front panel of the input terminal is removed or else an INTRUSION ALERT is transmitted to the base station. Only authorised personnel are equipped with such control pads, enabling them to clear the cash box, 5 refill the tickets, test the input terminal functions and change parameters.

When tickets are reloaded, the operator may press a reload button on the operator control pad. This will inform the input terminal's control circuit that there is a 10 full complement of tickets. Optionally, a number may be keyed in before the reload key is pressed to reset the input terminal to a specific ticket number.

Cash box clearance may be finalised with a 'CLEARED' command from the operator control pad. If this 15 operation is not performed, the input terminal may later on believe that the cash box is full causing the triggering of a false "CASH BOX FULL" transmission.

A self-test may be performed automatically on battery change-over or when requested to by the base 20 terminal. All possible tests may be performed and the result may be displayed on the operator control pad. Part of the self-test may include communicating with the base terminal to ensure that the cellular or other communications network is working and that DTMF tones or 25 other equivalent signals are being generated and detected correctly.

An operator may test a booking request after selecting a dummy booking function. By inserting a coin the input terminal may initiate a dummy booking request to 30 the vehicle although the information sent to the service provider base terminal will indicate that this is a test and that the request should not pass on to the base terminal equipment. All other facets of this operation, however, will proceed normally and a ticket will be issued 35 on successful completion. Being a dummy test, cash box totals are not updated.

A further dummy booking test may be transmitted to the operator's base terminal. Additional information



may then available at the base terminal regarding the dummy booking. Operators and manufacturers may use this function to test the booking terminal in the workshop.

The above testing and fault indicating

5 arrangements are only examples of what may be provided in the system and are not essential to the operation of the system. A system may include only some or all of the arrangements described and in various combinations.

Brief Description of the Drawings

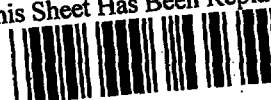
10 In order that the invention may be more readily understood and put into practical effect, reference will now be made to the accompanying drawings which illustrate a preferred embodiment of the invention and wherein:-

Fig. 1 illustrates schematically a remote
15 signalling system according to the present invention;
and

Fig. 2 illustrates in block diagram form, an
input terminal for use in the system.

Detailed Description of the Embodiment

20 Referring to the drawings and firstly to Fig. 1 there is illustrated a remote signalling/reservation system 10 according to the present invention which is designed primarily for use by taxis or other similar hire vehicles wherein a taxi base terminal or station 11 which includes a
25 base station computer and associated transceiver 12 provides signals to taxis or other vehicles 13 which have an on-board transceiver and associated computer for accepting signals from the base station computer 12 to identify the geographical location and other information
30 concerning a person object to be collected. The system 10 of the present invention, includes a number of input terminals 14 which are public booking terminals arranged at a number of different geographical locations and which may include a coin acceptor and/or card reader to initiate
35 operation of the terminal 14. When for example a valid coin is inserted into the input terminal 14, a signal is transmitted from a transmitter in the input terminal 14 through a mobile telephone network 15 to the base terminal



or station 11 where it is detected by a base terminal receiver. The computer 12 of the terminal 11 acknowledges receipt of the signal and causes its associated transmitter to transmit an acceptance code through the network 15 back to the input terminal 14 which causes an identification ticket to issue. In addition, the base station computer 12 causes its associated transmitter to transmit a message which is received and displayed by the on-board computer of the nearest available free taxi 13 which can then act upon the signal and advance to the activated terminal 14 for collection of a person at that terminal. The nearest available free taxi 13 can be identified by the computer and the driver of the taxi upon receiving the reservation message from the base terminal 11 can send an acknowledgment signal back to the base terminal 11 or input terminal 14. The person or object for collection is identified by the issued ticket, the number or identification of which is displayed on the taxi's on-board computer visual display.

As shown in Fig. 2, the input terminal 14 includes a coin slot 16 which may be arranged on the front panel 17 of the terminal 14 and which is connected to a coin validator 18. A photo-interrupter 19 is associated with the coin slot 16 to sense when coins or objects are inserted therein to discriminate the speed and direction of the object. The photo-interrupter 19 is connected to the main controller 20 which initiates operation of the coin validator 18 when the insertion of a coin or other object is detected by the photo-interrupter 19. The photo-interrupter 19 can also detect tampering with the coin slot 16 or slow objects or objects moving in the reverse direction through the slot 16.

When the operation of the coin validator 18 is initiated, the coins are validated as being either acceptable in which case the coins are directed to an escrow unit 21 or unacceptable where coins are directed to a refund unit 22 and refunded back to the user. A card reader 23 may be also associated with the controller 20 to



initiate operation of the controller 20.

Upon a coin being validated by the validator 18, or a card inserted into the reader 23 being read validly, the controller 20 initiates operation of a transceiver 24 which in this instance comprises a digital cellular telephone 25 which is adapted for external processor control. The signal transmitted by the telephone 25 over the mobile network 15 is received by the base station 11, causing the base station computer and associated transceiver 12 to transmit an acceptance code back to the terminal 14 which upon receipt of the signal causes the escrow unit 21 to deposit coins into a cash box 26 or the card reader 23 to debit the inserted card. In addition, a ticket dispenser 27 is actuated by the controller 20 to issue via a ticket feeder 28, a numbered ticket to the user. The front panel 17, additionally includes icons 29, 30 and 31, the icon 29 when lit, for example by a LED confirming that a signal transmitted from the terminal transceiver 25 has been detected at the base terminal 11 and is being acted upon. The icon 30 may be lit by a further LED to indicate failure of the call. The third icon 31 is lit when service to the terminal 14 is required.

The controller 20 suitably comprises a processor module and interface electronics which executes its software program in firmware. The controller 20 is preferably powered by a battery 32. Certain parameters are held in EPROM which is a memory chip capable of having its contents updated under software control and retained in the event of power loss. The controller 20 also may be provided with an infra-red communication port 33 to enable monitoring of the terminal in the manner described above by an operators console.

Whilst the means for transmitting signals is preferably over a telephone network, signals may also be transmitted by other communication means, such as radio communications or microwave communications. The geographical location of vehicles 13 may be established from the base terminal 11 using satellite communications



such as global positioning systems (GPS). The base terminal 11 thus is able to determine the vehicle 13 which is closest to the activated input terminal 14.

In addition, whilst the system of the present invention is particularly suited to the taxi and hire car industry for collection of persons, it may also be applied to other situations where remote signalling is required. Other applications include applications in the courier or parcel collection field where collection of articles from certain geographical locations is required.

The input terminal 11 may be of any form such as a simple upstanding pedestal formed of vandal resistant and tamperproof material such as stainless steel. The input terminals 11 may be located along roadways or footpaths or alternatively may be located within a building such as in the lobby of an hotel. The display means for the input terminal 11 may be any suitable display device such as a liquid crystal display (LCD).

The system of the invention thus enables a taxi or other vehicle to be reserved automatically without the need for telephone communications or the need for a switchboard operator to answer telephones. The system may be used in a simple manner merely by inserting a coin, note or card into the input terminal. There is therefore no necessity for a person to seek the use of a telephone for reserving such a vehicle.

Whilst the above has been given by way of illustrative embodiment of the invention, all such modifications and variations thereto as would be apparent to persons skilled in the art are deemed to fall within the broad scope and ambit of the invention as herein defined in the appended claims.



CLAIMS

1. A remote signalling system for use with vehicles, said system comprising a base terminal, a plurality of input terminals adapted to be positioned in a plurality of geographical locations, each said input terminal including currency or card acceptor means, transmitter means adapted to be actuated directly or indirectly upon valid receipt of currency or a card by said acceptor means to transmit a signal from said input terminal, said base terminal having means for detecting directly or indirectly said signal transmitted by said transmitter means and identifying the geographical location of said input terminal, said base terminal further including means for transmitting geographical information concerning said input terminal to a said vehicle whereby said vehicle may identify said input terminal.

2. A system according to Claim 1 wherein said currency acceptor means of said input terminal comprises means receiving coins, notes or tokens.

3. A system according to Claim 1 wherein said card acceptor means of said input terminal comprises a card reader mechanism for reading of credit or debit cards.

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4. A system according to Claim 1 wherein said signal transmitted by said transmitter means of a said input terminal may be detected at said base terminal, said base terminal being adapted to identify the geographical location of said input terminal from said transmitted signal.

5. A system according to Claim 4 wherein said input terminal is adapted to receive a confirmation signal from said base terminal upon detection and identification by said base terminal of a signal transmitted from said input terminal.



6. A system according to Claim 5 wherein said input terminal includes means for indicating receipt by said input terminal of said confirmation signal.
- 5 7. A system according to Claim 5 or Claim 6 wherein said input terminal includes dispensing means adapted to dispense a identification ticket, token or other identification means upon receipt of said confirmation signal.
- 10 8. A system according to claim 7 wherein said vehicle includes means for displaying information relating to said dispensed identification means.
- 15 9. A system according to Claim 7 or Claim 8 wherein said vehicle includes means for displaying the geographical location of said input terminal.
- 10 10. A system according to Claim 9 wherein said input terminal includes means for refunding inserted coin or coins when the signal transmitted by the input terminal transmitter means is not received at said base terminal or acted upon within a prescribed time.
- 25 11. A remote signalling and identification system, including a plurality of fixed input terminals, a base terminal, each said input terminal including transmitter means for transmitting an identification signal, said base terminal including means for receiving and identifying said input terminal from its transmitted identification signal and for transmitting a confirmation signal upon receipt and identification of said identification signal, said input terminal being adapted to issue identification means upon receipt of a confirmation signal from said base terminal.
- 30 35 12. A remote signalling and identification system according to Claim 11 where said base terminal is adapted to transmit, upon receipt of an identification signal from



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a said input terminal, a further signal to a mobile unit whereby said mobile unit may identify said input terminal and said identification means.

- 5 13. A remote signalling and identification system according to Claim 12 wherein said identification signal transmitted by said input terminal comprises geographical location information whereby the input terminal may be identified.

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14. A remote signalling and identification system according to Claim 13 wherein said input terminals are selectively actuated to transmit an identification signal responsive to currency or card validation means.

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