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REPLACE	SG
✓ Description : paged ...1... to paged ...10...	
✓ Title(s) : paged ...11... to paged ...12...	
✓ Drawing(s) : paged ...13... to paged ...14...	
✓ Abstract : paged ...15... to paged ...16...	
DATE OF RECEIPT	

TELECOMMUNICATIONS SYSTEM

This invention relates to a telecommunications system. In particular, but not exclusively, it relates to a mobile communications system such as a cellular mobile radio or telephone system.

A recent innovation in such systems has been the introduction of Subscriber Identity Modules (SIM cards). These are integrated circuit cards which can be releasably inserted into a mobile telephone and which contain in memory the subscriber's identity, i.e. his telephone number. These known SIM cards also have a rolling buffer which can store a certain number of alphanumeric characters. The buffer facilitates the so-called Short Message Service (SMS) in which a message for a subscriber or for a specified group of subscribers can be broadcast over the air, as an advanced form of radiopaging. Messages can be received by a mobile telephone whenever it is idle or on stand-by. However, if a message is received which would overflow the buffer, data is lost on a first-in-first-out basis.

It is an object of the invention to provide a more efficient and remotely reconfigurable SIM card.

From one aspect, the present invention consists in a telecommunications system comprising at least one host station and a plurality of subscriber units, the or each host station being operable to transmit a message to at least one of the subscriber units, and each subscriber unit having a multiplicity of fixed memory locations and means responsive to the detection of the message to store the message in a selected one of the fixed memory locations which can not be overwritten from the subscriber unit, but which can be accessed from the subscriber unit when required.

In this description and the accompanying claims, a "fixed" memory location means a location into which data can be written, and excludes first-in-first-out or circular



buffers. Overwriting of all the data in certain "fixed" memory locations may occur in contrast to the first-in-first-out loss of data experienced with current SMS buffers.

5 Thus, for example, a set of telephone numbers, each with an identifying alphanumeric tag, can be transmitted to the SIM card, allowing users easy access to commonly used services such as hotels, car hire or airline reservations. This feature is known as a Value Added Service Directory.

10 A message may be retrievable by the subscriber on the entry of simple, short codes into the subscriber unit, each memory location corresponding to a particular code. A message may include a telephone number and, once stored, may be able to be overwritten over the air. Preferably, the
15 or each host station is operable to transmit a request for information stored in a subscriber unit. The information may be included in a message and it may also include information which is stored in a secure memory location, accessible only when the subscriber enters a personal
20 identification number (PIN number). The information may include credit details relevant to the subscriber, for example, a credit card number or credit status, thus greatly facilitating credit card transactions carried out over the telephone. Using this feature of the invention,
25 a credit account holder avoids having to dictate his account details and need only enter the mandatory PIN number.

 The host station may be operable to transmit instructions to lock and/or unlock a memory location at the
30 subscriber unit. It may be operable to transmit instructions to run a program stored in memory locations at the subscriber unit. The host station may be operable to transmit files containing functional data and/or files containing non-functional data to the subscriber unit.

35 The messages, requests for information and the instructions being transmitted may be in a specific format which the subscriber unit is able to distinguish from other



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formats. The specific format may be made secure against interception.

5 In a preferred embodiment, the subscriber unit comprises a mobile radio or telephone and an integrated circuit card which can be removably connected to the radio/telephone. The integrated circuit card may contain the memory locations and may contain means for distinguishing the specific format from other formats. The card may contain means for distinguishing between the messages,
10 requests for information and instructions. The card may also contain the means for storing the messages and means for acting on the requests and instructions.

From another aspect, the invention consists in a module for controlling a subscriber unit in a
15 telecommunications system, comprising a multiplicity of fixed memory locations and means responsive to the detection of a message transmitted remotely thereto to store the message in a selected one of the fixed memory locations, and being adapted for removable connection to a
20 transceiver of the subscriber unit.

At least one of the fixed memory locations may be protected from overwriting by the subscriber. The module or card may include means for rendering any or all of said fixed memory locations accessible or inaccessible by either
25 the subscriber or the host station. The card may include a directory structure within which files can be stored.

The invention is particularly applicable to global telecommunication systems in which the mobile cellular telephone networks of various countries or areas
30 communicate using a common standard. An example of such a global system is GSM (Global System for Mobile Communications) currently operating in Europe. However the invention is not limited to global systems and could be applied to a single national cellular network or even to a
35 fixed land-linked network.

An embodiment of the invention will now be described by way of example with reference to the accompanying



drawings in which:-

Figure 1 shows the transmission of messages to a subscriber unit in a system according to the invention;

5 Figure 2 shows a process in which a subscriber unit transmits a message and requested information;

Figure 3 is a block diagram showing elements of a module shown in figures 1 and 2;

Figure 4 shows details of one of the blocks shown in figure 3; and

10 Figure 5 is a flowchart showing the operation of the module shown in figures 1 to 4.

Figure 1 illustrates an SMS distribution path according to the invention. In the prior art, the short messages have usually been directed to a single subscriber or a specified group of subscribers such as a sales team.

15 However, GSM also supports a feature known as Cell Broadcast in which messages can be sent to all the subscribers in a particular area. In the embodiment of the invention illustrated, a message consists of the telephone number of an advertiser and an alphanumeric tag to identify the advertiser.

20 An operator enters the message into a terminal 1. The message is then coded into a secure format known as an Embedded Command Stream (ECS) and sent via a modem 2 and a fixed line 3 to a local GSM switch 4. According to its delivery address, the message is delivered to any or all of the other switches within that network, or even across networks.

25 The switch 4, which in this example is in the geographical area to which the message is to be transmitted, delivers the message to a number of cellsites 5. The cellsites 5 are the base transceiver stations of the GSM network.

30 Each cellsite 5 then broadcasts the message to a group of transceivers or mobile telephones, hereinafter referred to as "mobiles". If Cell Broadcast is used, the group consists of all mobiles within the geographical area at the



time of the broadcast.

A selected mobile 6 receiving the message transmits a confirmation of receipt back to its respective cellsite 5. From now on, until an update situation, the system will not contact this mobile 6 again.

The mobile 6 recognises the message as SMS data and passes it to a SIM card 7, which is a small self-contained microprocessor, held in a slot in the mobile 6. The SIM card 7 in turn recognises the ECS using special hardware and software and stores the message in memory in such a way that it may not be overwritten by the subscriber. Known SIM cards contain a large number of fixed memory locations in which the subscriber can store frequently dialled numbers and corresponding alphanumeric tags. The SIM card 7 of the invention stores the message in one of these locations, and then carries out a write protect operation. The locations dedicated to storing write protected messages may be designated by code numbers relating to a particular category of advertiser. Thus, for example, car hire company telephone numbers can be stored in location 01, hotel reservations in location 02 and so on.

Figure 2 shows a call placing process in which a subscriber communicates with an advertiser. The subscriber, remembering that the car hire company's number is in location 01 as shown at 8, keys in a short code corresponding to the location, such as 01#. The mobile 6 then interrogates the SIM card 7 to retrieve the telephone number from the location. The SIM card 7 provides both the number and the alphanumeric tag giving the company's name and displays it to the subscriber. The user confirms that he wishes to proceed by pressing SEND.

Next, the mobile obtains a voice channel through which the call proceeds to the dialled number. The GSM system automatically handles intra-network and inter-network hops. At this point the subscriber can hold a voice conversation with the company.

Providing the correct equipment has been installed at

the company, as soon as the call is answered, subscriber identity information read from the SIM card 7 gives the company immediate customer billing details such as a name and address.

5 The SIM card 7 also contains information detailing the subscriber's credit account. This information is held in a separate, secure memory location, accessible only when the subscriber enters a mandatory PIN number, known only to himself, thus confirming that the mobile has not been
10 stolen or lost. When the subscriber has confirmed his car hire deal, he enters the PIN number into the mobile 6, requesting the credit information from the SIM card 7. The SIM card 7 supplies the information and the mobile uses
15 existing voice/data techniques to transmit the information to the company, in a format secure against detection by fraudsters. The sale is confirmed by the company or its equipment and the call is terminated.

 In this example, it is also possible to obtain a telephone or fax number from the operator-assisted
20 directory enquiries system without the subscriber having to manually enter the number into the communications terminal which he desires to use.

 To use this feature, the subscriber calls network directory enquiries and gives the name of the person,
25 company or service of which he wishes to ascertain the telephone number, as well as any additional information requested by the operator answering the call. The operator then locates the number, confirms it and enquires as to whether the number is to be transmitted verbally,
30 transferred over SMS into a given memory location of the subscriber's SIM card or both.

 If the subscriber chooses a SIM update, the voice call is terminated and the operator initiates the SMS process by entering a sequence into a computer or pressing a dedicated
35 button. The telephone number is then encoded into an ECS message at the despatch centre and is posted across the network to the subscriber's communications terminal, which



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transmits a confirmation to the despatch centre. Thus the retry mechanism, which operates until such a confirmation is received, is suspended.

5 The communications terminal recognises the message as SMS data, passes it to the SIM card, and if capable, displays a "message received" banner. The SIM card in turn recognises the ECS using special hardware and software, and decodes it accordingly. The number, and any associated alphanumeric tag, which would normally consist of the name
10 of the person or company, are recovered together with the memory location in which they are intended to be stored. The number and name-tag are then written to that location and are write-protected if requested by the subscriber, the overwrite protection being encoded into the message at
15 source.

Subsequently, the subscriber attempts to place a call to the number in the known memory location by keying in the memory location number. The SIM card passes the telephone or fax number to the communications terminal on demand, and
20 upon receipt of the subscriber's confirmation, the communications terminal sets up the call to the desired number.

Figure 3 shows the electronic structure of the SIM card 7. The card communicates with the mobile to which it is connected via an input/output (I/O) manager 15,
25 preferably using the protocol ISO 7816 T=0. A filter 16 receives incoming data from the I/O manager and detects any ECS messages from among the short messages received. The ECS messages are sent directly to an extended erasable read only memory (E²ROM) 17, which is preferably a "flash"
30 E²ROM. Data can also be output from the E²ROM directly to the I/O manager 15. The remaining blocks shown in figure 3 are standard components of a SIM card.

Figure 4 shows how the E²ROM is organised. A root
35 directory 18 contains a SIM administration and identifier 19, a GSM directory and network data 20, and a telecom directory 21.



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The telecom directory in turn contains memory locations as follows: "abbreviated dial numbers" 22, "capability configuration" 23, "short messages" 24, "fixed dial numbers" 25, and "charging counter" 26. Each block represents a plurality of memory locations. The frequently dialled numbers and corresponding alphanumeric tags are stored at locations 22.

The "abbreviated dial numbers" locations 22 and the "short messages" locations 24 each have an associated locking control file 27, 28 respectively. The locking control files constitute means for read/write protecting and removing read/write protection from their associated memory locations. The locking control files 27, 28 will typically be in the telecom directory 21 as shown, however they can be located elsewhere such as in an administration directory.

Figure 5 is a flowchart illustrating the operation of the SIM card 7, which uses the specially fabricated hardware and software which has been described above to implement the operations illustrated. At lozenge 9, messages, requests, and instructions having ECS are distinguished from those without. Each of these ECS types consists of a data stream headed by a command which is one of at least four types: write commands for the messages, read commands for the requests for information, attribute commands for lock or unlock instructions and run commands for instructions to run a program.

The command and data types are decoded at box 10 and acted on in one of the four paths 11-14.

Path 11 handles the write commands to store messages starting at a location specified therein. Path 12 handles the read commands; again, the requests for information contain a location to be accessed first. Successive locations are read and the data stored in a buffer until the required amount of data has been read. The data in the buffer is then encoded into the ECS format and despatched from the mobile using SMS to the calling party.



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In path 13, attribute commands are used to lock or unlock specified memory locations and render them accessible or inaccessible, either to calling parties or to the subscriber. In path 14, run commands cause a program stored in the SIM card to be run.

The basic ECS system is expandable to up to 255 internal shell commands of which write, read, lock/unlock and run are four examples. The specific protocol used for the transfer of information is not fixed and could be ISO7816 T=0 or any other suitable protocol.

The internal shell commands are a supplement to the ability of the system to create external file objects within the SIM card 7. The file objects are of two types: Application Data File Programs (ADFP's) containing functional data which can be executed by the SIM card processor and can self modify if required and Application Data Files (ADF's) containing non-functional data which does not have these capabilities. Existing ADF(P)'s can be modified over-the-air enabling advanced facilities such as personalisation, re-personalisation or downloadable phone book.

The SIM card 7 has a directory structure, similar to that of a computer disk, and new ADF(P)'s can be downloaded into any directory over the air. Also over the air, directories can be created, deleted and modified, multiple tree directory operations can be carried out and ADF(P)'s that are no longer required can be deleted. The amount of ADF(P) data which can be downloaded is limited only by the size of the E²ROM memory of the card.

The invention, as described, greatly extends the applications of SIM cards. For example, using the Value Added Services Directory, subscribers can book hotels and airline seats over their mobiles quickly and easily.

An additional advantage of this feature of invention is that the geographical distribution of messages to cards in a specific area such as the South of France is facilitated. Thus advertisers can direct their messages to



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all mobile subscribers in the specific area. This is particularly useful when subscribers "roam" from one area to another and have no knowledge of local services.

5 The directory enquiries download enables contact telephone or fax numbers to be delivered to a subscriber's communications terminal without any intervention by the subscriber. The process of manually entering a number whilst engaged in a call to the operator is often dangerous, especially when the subscriber is driving.

10 The ability of the system to download ADF(P)'s means that additional services can be added to the SIM card over the air while maintaining total compatibility with the existing cellular system. Thus the SIM card could acquire the functions of a credit card, passport, driving licence,
15 car park pass, membership card and so on, becoming a multi-service card. Also, dynamically updatable services can be added which require a different process to be run each time a service is accessed.

20 Once the card has extra services on it, it can be used outside of the mobile phone environment if desired as a standalone item. This can be read from or written to by a dedicated piece of hardware, such as a point of sale machine. If desired, the new services can be deleted, however the card will never lose its mobile phone SIM
25 capability. In addition, if the card has extra services, they will continue to function even if the subscriber has been disconnected from the mobile phone network, unless otherwise desired.

30 Modifications are possible without departing from the scope of the invention.

For example, the SIM card can be trained only to receive messages detailing services relevant to the subscriber's needs.



CLAIMS

1. A telecommunications system comprising at least one host station (1) and a plurality of subscriber units (6,7),
5 the or each host station being operable to transmit a message to at least one of the subscriber units, and each subscriber unit (6,7) having a multiplicity of fixed memory locations (22) and means responsive to the detection of the message to store the message in a selected one of the
10 fixed memory locations which can not be overwritten from the subscriber unit (6,7), but which can be accessed from the subscriber unit when required.

2. A system as claimed in claim 1, wherein at least one of the subscriber units (6,7) comprises a transceiver
15 (6) and an integrated circuit card (7) or other module having the fixed memory locations (22), and means responsive to the detection of a message by the transceiver to route it to the selected fixed memory location, said module being removably connected to the transceiver.

3. A system as claimed in claim 1 or 2, wherein each memory location (22) is associated with a simple, short code, and the subscriber unit (6,7) includes means
20 responsive to the entry into the unit of each code to retrieve data from the associated memory location.

4. A system as claimed in any preceding claim, wherein
25 the or each host station (1) is operable to overwrite the message stored in the fixed memory location (22) at each subscriber unit (6,7).

5. A system as claimed in any preceding claim, wherein
30 the or each host station (1) is operable to transmit a request for information stored in a fixed memory location (24) within a selected one of the subscriber units (6,7), and each subscriber unit contains means responsive to such a request for retrieving and transmitting the information.

6. A system as claimed in claim 5, wherein the means
35 responsive to the request is actuated only on the entry of a personal identification number (PIN number) into the



subscriber unit (6,7).

7. A system as claimed in any preceding claim, wherein the subscriber unit (6,7) has a multiplicity of further fixed memory locations which can be overwritten from the subscriber unit (6,7).

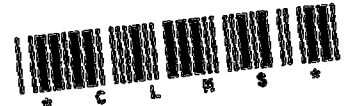
8. A system as claimed in any preceding claim, wherein each subscriber unit (6,7) includes means (27, 28) responsive to an instruction transmitted from the or each host station (1) selectively to enable or prohibit said further fixed memory locations to be overwritten from the or each host station (1) or from the subscriber unit (6,7).

9. A system as claimed in any preceding claim, wherein each subscriber unit (6,7) includes means responsive to an instruction transmitted from the or each host station (1) to run a program stored in said fixed or further fixed memory locations at the subscriber unit (6,7).

10. A system as claimed in claim 8 or 9, when dependent upon claim 5, wherein the or each message, request for information and instruction transmitted is in a specific format, and the subscriber unit (6,7) includes means (16) for recognising the specific format.

11. A system as claimed in one of claims 3 to 10, when dependent upon claim 2, wherein the module (7) includes the means responsive to the detection of a message to store the message in a selected one of the fixed memory locations, and/or the means responsive to the entry of a simple short code to retrieve data from the associated memory location, and/or the means responsive to a request for information to retrieve and transmit the information, and/or the multiplicity of further fixed memory locations which can be overwritten by the subscriber, and/or the means for selectively enabling or prohibiting said further fixed memory locations to be overwritten, and/or the means for running a program, and/or the means for recognising the specific format.

12. A module (7) for controlling a subscriber unit in a telecommunications system, being removably connected to



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a transceiver (6) of the subscriber unit, and comprising a multiplicity of fixed memory locations (22, 24), and means responsive to the detection of a message transmitted remotely thereto to store the message in a selected one of the fixed memory locations.

5

13. A module (7) as claimed in claim 12, wherein at least one of the fixed memory locations (22, 24) is protected from overwriting from the subscriber unit.

14. A module (7) as claimed in claim 12 or 13, including means (27, 28) for rendering any or all of said fixed memory locations accessible or inaccessible from either the subscriber unit or the host station.

10

15. A module (7) as claimed in claim 12, 13 or 14, including a directory structure (21) within which files can be stored.

15

16. A module (7) as claimed in any one of claims 12 to 15, wherein the module is in the form of an integrated circuit card.

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ABSTRACT

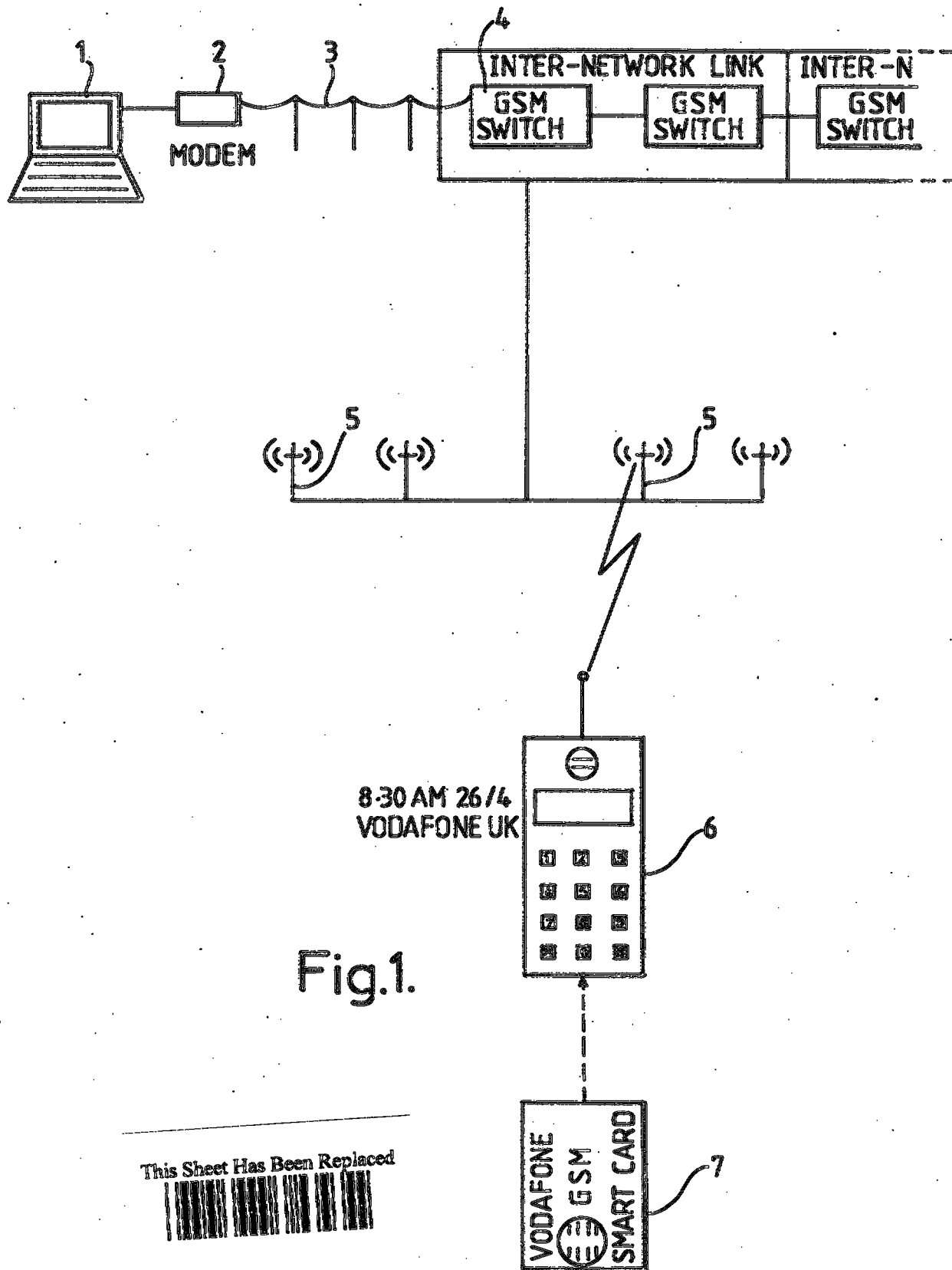
TELECOMMUNICATIONS SYSTEM

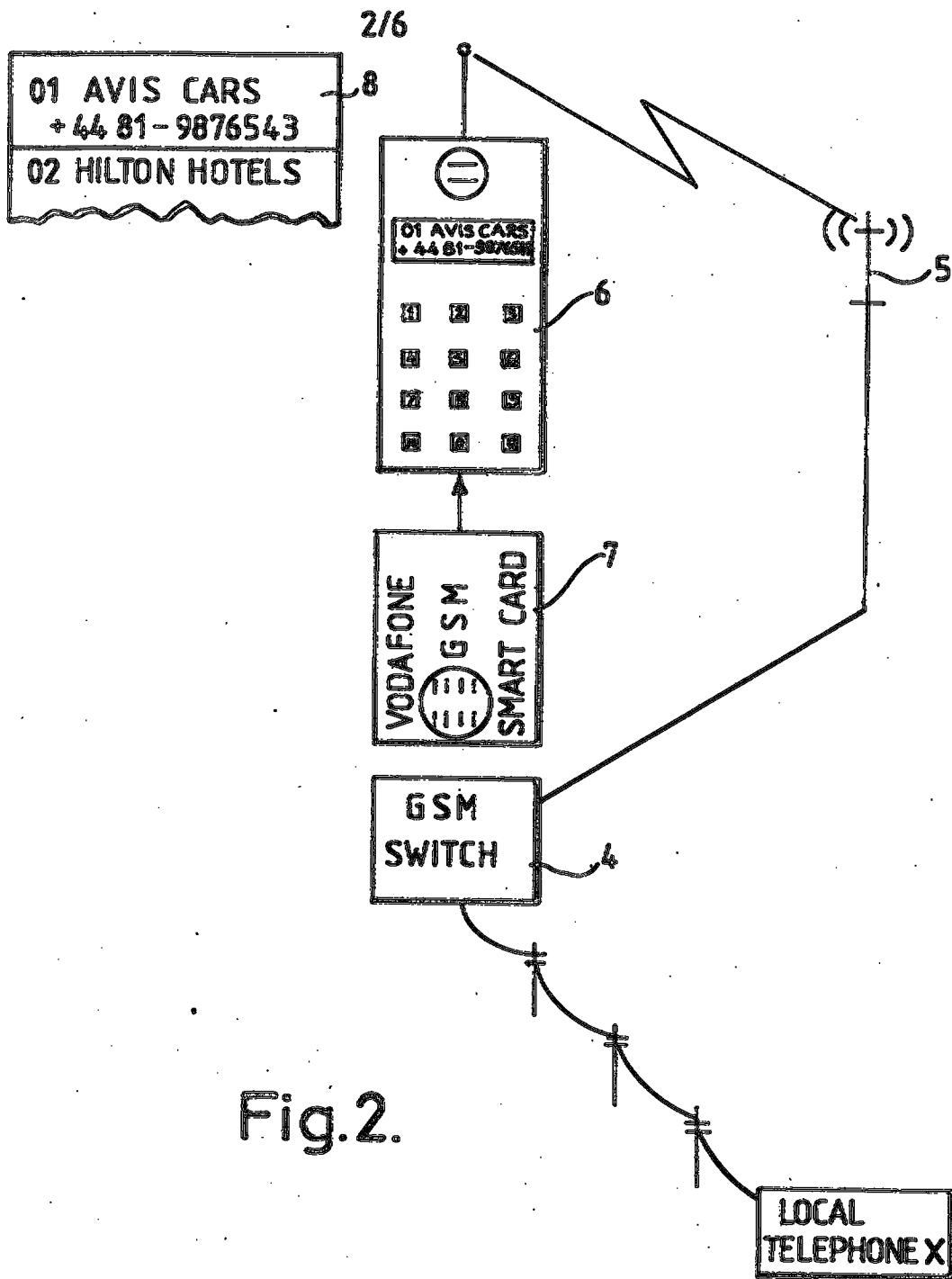
5 In a telecommunications system such as a global mobile
telephone network in which each subscriber unit includes a
Subscriber Identity Module (SIM card), each SIM card has
fixed memory locations 22, to which data can be addressed
over the air. Some of the locations 22 can not be
10 overwritten from the subscriber unit but can be accessed
therefrom on the entry of short simple codes, each
associated with one of the locations. Further fixed memory
locations 24 can be read over the air only when the
subscriber enters a personal identification number.
15 Locking control files 27, 28 are used to control read/write
access to the locations 22, 24 respectively.

(Fig. 4)

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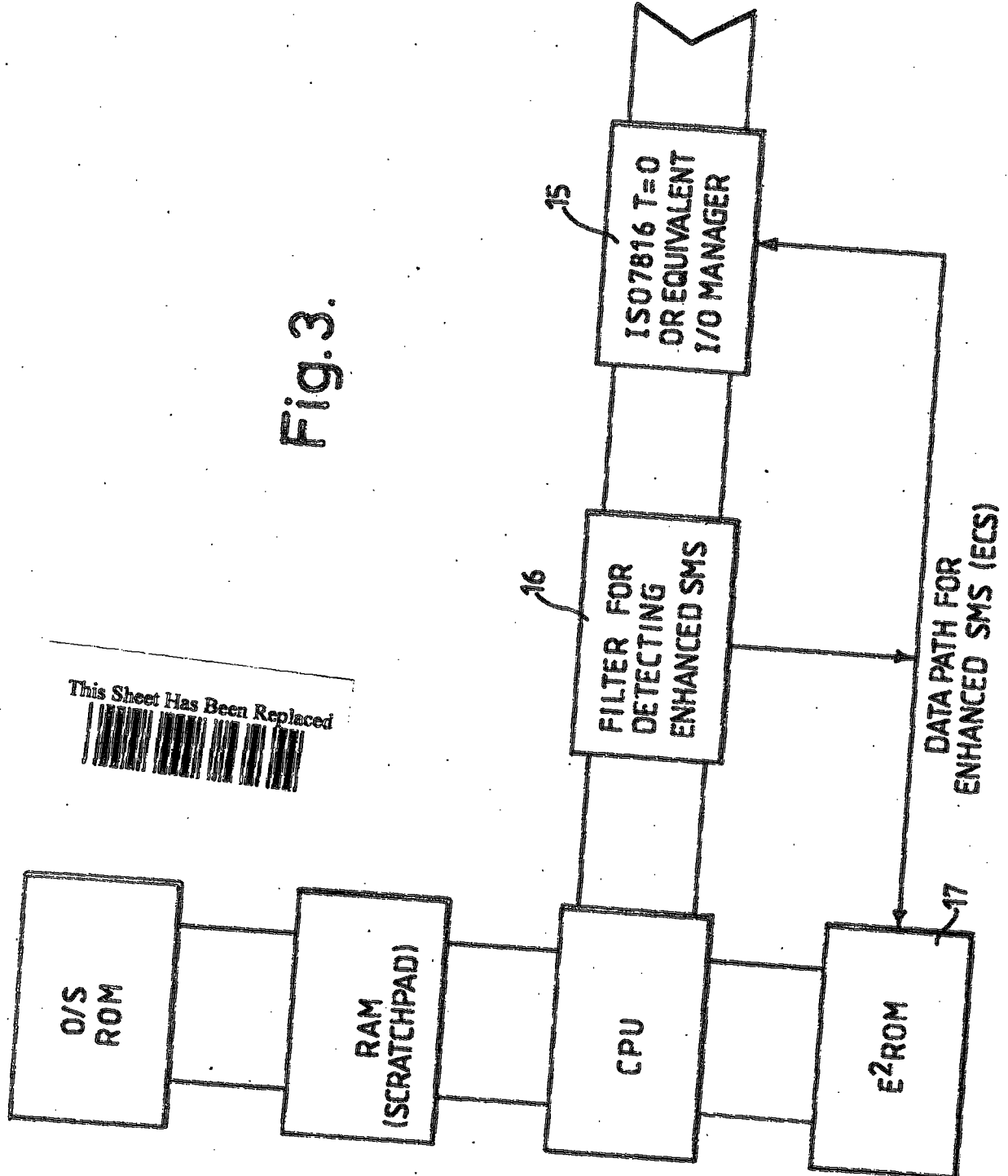


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VOICE SERVICES

DATA SERVICES



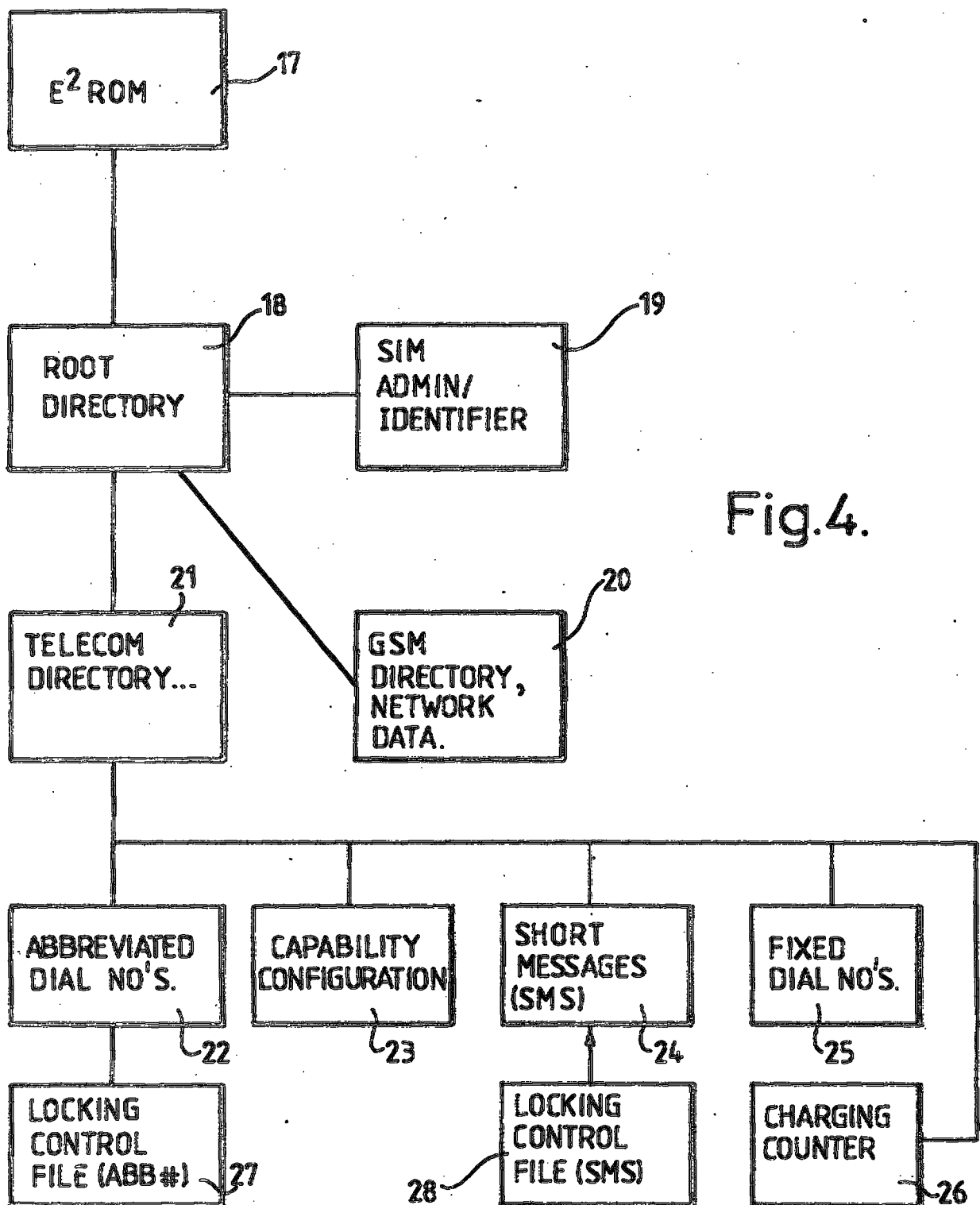


Fig.4.



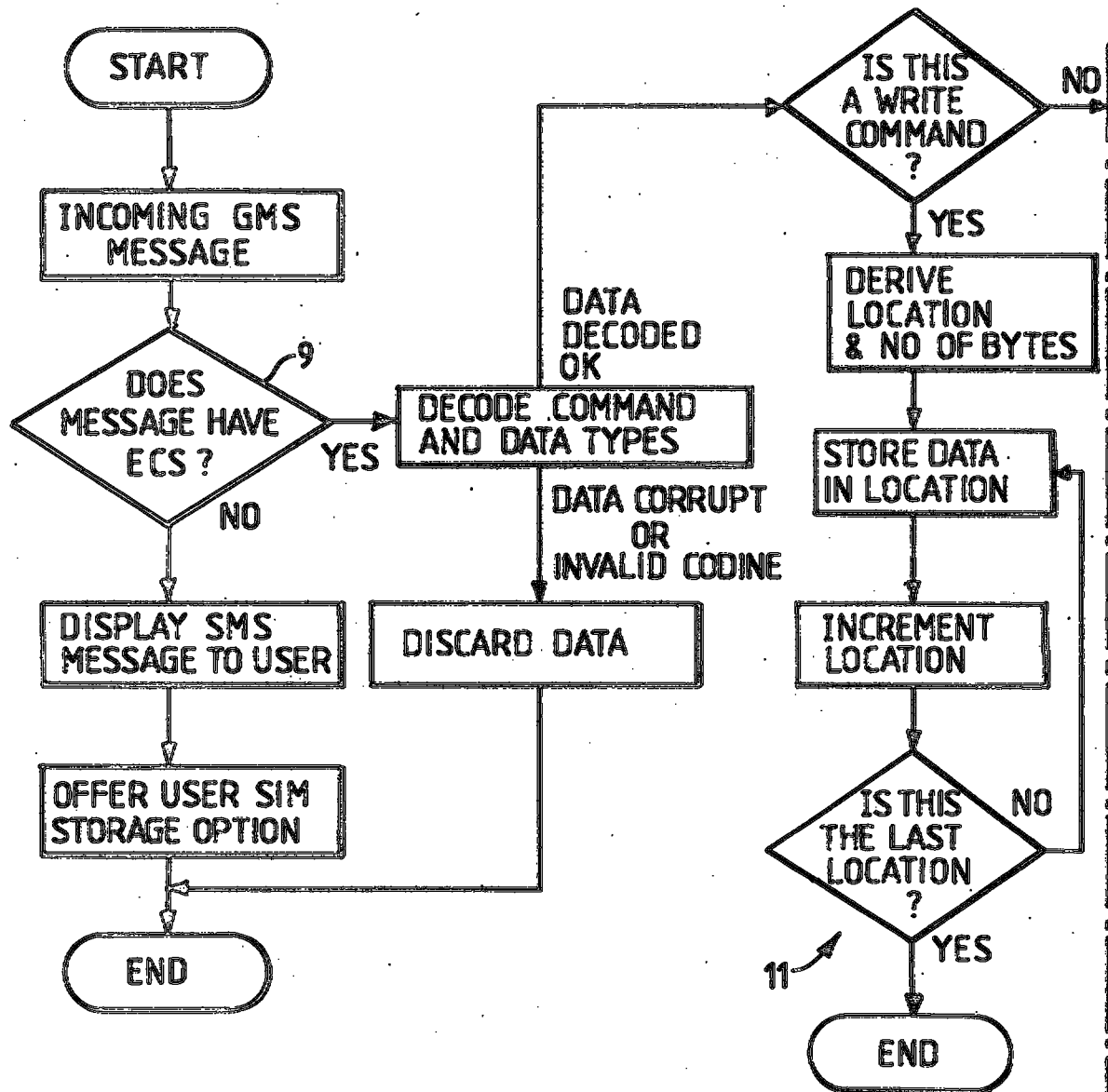


Fig.5.

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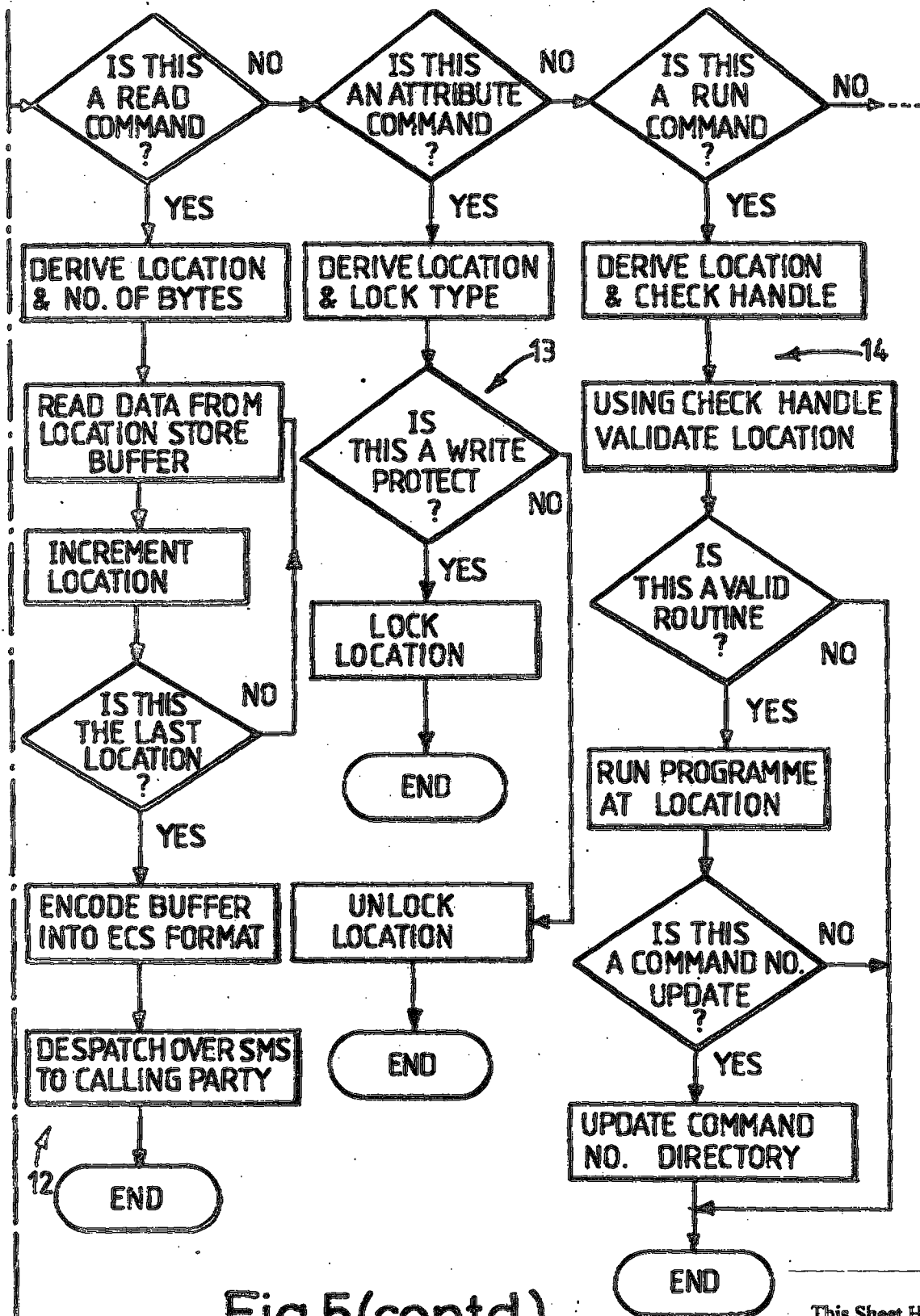
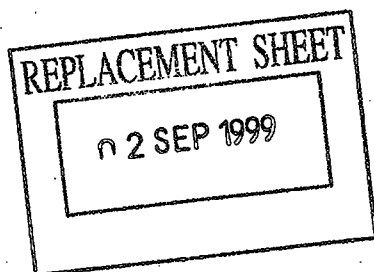


Fig.5(contd.)





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✓ Description : page 1. to page 15.

✓ (1) : page 16. to page 22.

✓ (2) : page 23. to page 44.

✓ (3) : page 45. to page 66.

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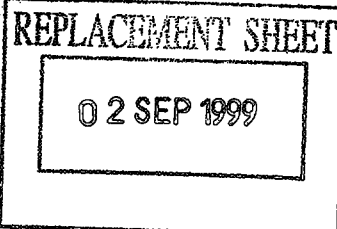
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TELECOMMUNICATIONS SYSTEM

This invention relates to a telecommunications system. In particular, but not exclusively, it relates to a mobile communications system such as a cellular mobile radio or telephone system.

A recent innovation in such systems has been the introduction of Subscriber Identity Modules (SIM cards). These are integrated circuit cards which can be releasably inserted into a mobile telephone and which contain in memory the subscriber's identity, i.e. his telephone number. These known SIM cards also have a memory area which can store a certain number of alphanumeric characters. The memory area facilitates the so-called Short Message Service (SMS) in which a message for a subscriber or for a specified group of subscribers can be broadcast over the air, as an advanced form of radiopaging. Messages can be received by a mobile telephone whenever it is idle or during a call. However, if a message is received which would overflow the memory area, data is held at the host station until such time as the subscriber manually clears a space for it.

According to one aspect of the present invention there is provided a telecommunications system comprising at least one host station and a plurality of subscriber units, each subscriber unit having a multiplicity of memory locations adapted to be selectively accessible from said at least one host station and the subscriber unit, means at said host station operable to transmit to at least one of the subscriber units first messages coded

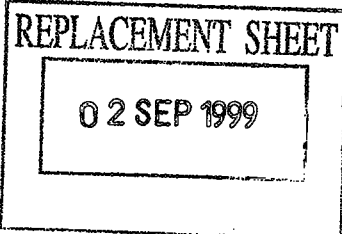


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in a predetermined first format, means at said host station operable to transmit to said at least one subscriber unit preselected second messages coded in a second format which is distinguished from said first format, said second format comprising a data-stream having an embedded command, and each subscriber unit having means for receiving said transmitted first and second messages, means for distinguishing said formats, means connected to said distinguishing means for decoding said second messages transmitted in said second format, means for detecting when a decoded second message comprises an embedded command which is an attribute command selectively identifying at least one of said memory locations which is to be locked or unlocked so as to render said at least one memory location accessible or inaccessible to at least one of said host station and said subscriber unit, and means for processing the attribute command to lock or unlock said at least one memory location, whereby to control access to said at least one memory location from at least one of said host station and said subscriber unit.

One embodiment of the invention, for example, enables a set of telephone numbers, each with an identifying alphanumeric tag, to be transmitted to SIM cards installed in the subscriber units, allowing users easy access to commonly used services such as hotels, car hire or airline reservations. This feature is known as a Value Added Service Directory.

A message may be retrievable by the subscriber on the entry of simple, short codes into the subscriber

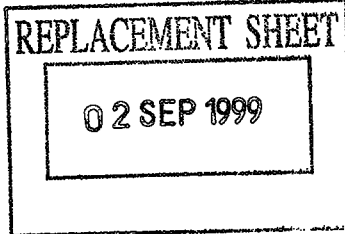


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unit, each memory location corresponding to a particular code. A message may include a telephone number and, once stored, may be able to be overwritten over the air. Preferably, the or each host station is operable to transmit a request for information stored in a subscriber unit. The information may be included in a message and it may also include information which is stored in a secure memory location, accessible only when the subscriber enters a personal identification number (PIN number). The information may include credit details relevant to the subscriber, for example, a credit card number or credit status, thus greatly facilitating credit card transactions carried out over the telephone. Using this feature of the invention, a credit account holder avoids having to dictate his account details and need only enter the mandatory PIN number.

The or each host station is operable to transmit instructions to lock and/or unlock a memory location at the subscriber unit. It may also be operable to transmit instructions to run a program stored in memory locations at the subscriber unit. Moreover, the or each host station may be operable to transmit files containing functional data and/or files containing non-functional data to the subscriber unit.

The messages, requests for information and the instructions are transmitted in a specific second format which the subscriber unit is able to distinguish from other formats. The specific format may be made secure against interception.



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In a preferred embodiment, the subscriber unit comprises a mobile radio or telephone and an integrated circuit or SIM card or module which can be removably connected to the radio-telephone. The integrated circuit card may contain the memory locations and may contain means for distinguishing the specific format from other formats. The card may contain means for distinguishing between the messages, requests for information and instructions. The card may also contain the means for storing the messages and means for acting on the requests and instructions.

According to another aspect of the present invention there is provided a module for controlling a subscriber unit in a telecommunications system including at least one host station, said module being adapted to be removably connected to the subscriber unit, and said module comprising a multiplicity of memory locations adapted to be selectively accessible from said at least one host station and the subscriber unit, means for detecting first and second messages transmitted thereto from said at least one host station, said first message being coded in a predetermined first format and said second message being coded in a second format which is distinguished from said first format, said second format comprising a data stream having an embedded command, said module further comprising means for detecting received first and second messages, means for distinguishing said formats, means connected to said distinguishing means for decoding said second messages coded in said second format, means for detecting when a decoded second message

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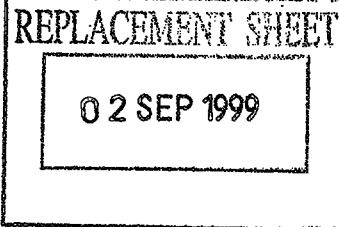
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comprises an attribute command selectively identifying at least one of said memory locations which is to be locked or unlocked so as to render said at least one memory location accessible or inaccessible to at least one of the host station and subscriber unit and means for processing the attribute command to lock or unlock said at least one memory location, whereby to control access to said at least one memory location from at least one of the host station and subscriber unit.

The module may include a directory structure within which files can be stored.

The invention is particularly applicable to global telecommunication systems in which the mobile cellular telephone networks of various countries or areas communicate using a common standard. An example of such a global system is GSM (Global System for Mobile Communications) currently operating in Europe. However the invention is not limited to global systems and could be applied to a single national cellular network or even to a fixed land-linked network.

According to yet a further aspect of the invention there is provided a method of operating a telecommunications system in which a host station is operable to transmit, to at least one of a plurality of subscriber units of the system, a first message coded in a predetermined first format which is adapted to be received and displayed by said at least one subscriber unit, comprising the steps of coding a preselected second message in a second format distinguished from said first format, said second format comprising a data stream



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having an embedded command, transmitting said coded second message from said host station to said at least one subscriber unit, receiving said coded second message at said at least one subscriber unit, causing said at least one subscriber unit to distinguish said coded second message from said first message coded in said predetermined first format, routing said second message coded in said second format to decoding means, decoding said second message, and processing said decoded second message as dictated by said embedded command.

Throughout the description and claims of this specification, the word "comprise" and variations of the word, such as "comprising" and "comprises" are not intended to exclude other components or integers.

An embodiment of the invention will now be described by way of example with reference to the accompanying drawings in which:-

Figure 1 shows the transmission of messages to a subscriber unit in a system according to the invention;

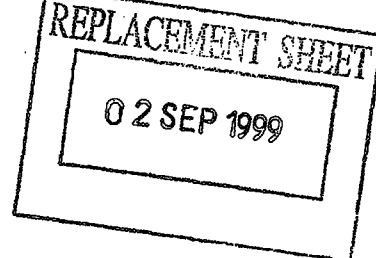
Figure 2 shows a process in which a subscriber unit transmits a message and requested information;

Figure 3 is a block diagram showing elements of a module shown in figures 1 and 2;

Figure 4 shows details of one of the blocks shown in figure 3; and

Figure 5 is a flowchart showing the operation of the module shown in figures 1 to 4.

Figure 1 illustrates an SMS distribution path according to the invention. In the prior art, the short messages have usually been directed to a single subscriber or a specified group of subscribers such as a sales team.



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However, GSM also supports a feature known as Cell Broadcast in which messages can be sent to all the subscribers in a particular area. In the embodiment of the invention illustrated, a message consists of the telephone number of an advertiser and an alphanumeric tag to identify the advertiser.

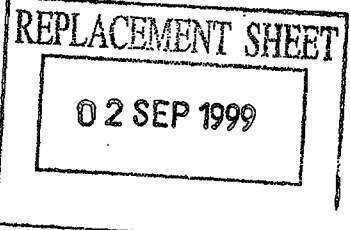
An operator enters the message into a terminal 1. The message is then coded into a secure format known as an Embedded Command Stream (ECS) and sent via a modem 2 and a fixed line 3 to a local GSM switch 4. According to its delivery address, the message is delivered to any or all of the other switches within that network, or even across networks.

The switch 4, which in this example is in the geographical area to which the message is to be transmitted, delivers the message to a number of cellsites 5. The cellsites 5 are the base transceiver stations of the GSM network.

Each cellsite 5 then broadcasts the message to a group of transceivers or mobile telephones, hereinafter referred to as "mobiles". If Cell Broadcast is used, the group consists of all mobiles within the geographical area at the time of the broadcast.

A selected mobile 6 receiving the message transmits a confirmation of receipt back to its respective cellsite 5. From now on, until an update situation, the system will not contact this mobile 6 again.

The mobile 6 recognises the message as SMS data and passes it to a SIM card 7, which is a small self-contained microprocessor, held in a slot in the mobile 6. The SIM card 7 in turn recognises the ECS using special hardware and software and stores the message in memory in such a way that it may not be overwritten by the subscriber. Known SIM cards contain a large number of fixed memory locations



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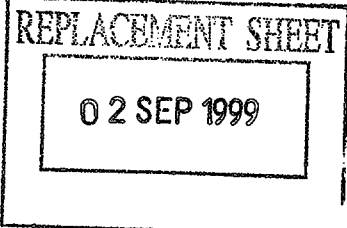
in which the subscriber can store frequently dialled numbers and corresponding alphanumeric tags. The SIM card 7 of the invention stores the message in one of these locations, and then carries out a write protect operation. The locations dedicated to storing write protected messages may be designated by code numbers relating to a particular category of advertiser. Thus, for example, car hire company telephone numbers can be stored in location 01, hotel reservations in location 02 and so on.

Figure 2 shows a call placing process in which a subscriber communicates with an advertiser. The subscriber, remembering that the car hire company's number is in location 01 as shown at 8, keys in a short code corresponding to the location, such as 01#. The mobile 6 then interrogates the SIM card 7 to retrieve the telephone number from the location. The SIM card 7 provides both the number and the alphanumeric tag giving the company's name and displays it to the subscriber. The user confirms that he wishes to proceed by pressing SEND.

Next, the mobile obtains a voice channel through which the call proceeds to the dialled number. The GSM system automatically handles intra-network and inter-network hops. At this point the subscriber can hold a voice conversation with the company.

Providing the correct equipment has been installed at the company, as soon as the call is answered, subscriber identity information read from the SIM card 7 gives the company immediate customer billing details such as a name and address.

The SIM card 7 also contains information detailing the subscriber's credit account. This information is held in a separate, secure memory location, accessible only when the subscriber enters a mandatory PIN number, known only to himself, thus confirming that the mobile has not been



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stolen or lost. When the subscriber has confirmed his car hire deal, he enters the PIN number into the mobile 6, requesting the credit information from the SIM card 7. The SIM card 7 supplies the information and the mobile uses existing voice/data techniques to transmit the information to the company, in a format secure against detection by fraudsters. The sale is confirmed by the company or its equipment and the call is terminated.

In this example, it is also possible to obtain a telephone or fax number from the operator-assisted directory enquiries system without the subscriber having to manually enter the number into the communications terminal which he desires to use.

To use this feature, the subscriber calls network directory enquiries and gives the name of the person, company or service of which he wishes to ascertain the telephone number, as well as any additional information requested by the operator answering the call. The operator then locates the number, confirms it and enquires as to whether the number is to be transmitted verbally, transferred over SMS into a given memory location of the subscriber's SIM card or both.

If the subscriber chooses a SIM update, the voice call is terminated and the operator initiates the SMS process by entering a sequence into a computer or pressing a dedicated button. The telephone number is then encoded into an ECS message at the despatch centre and is posted across the network to the subscriber's communications terminal, which transmits a confirmation to the despatch centre. Thus the retry mechanism, which operates until such a confirmation is received, is suspended.

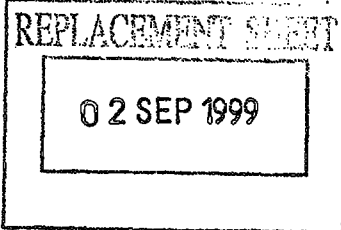
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The communications terminal recognises the message as SMS data, passes it to the SIM card, and if capable, displays a "message received" banner. The SIM card in turn recognises the ECS using special hardware and software, and decodes it accordingly. The number, and any associated alphanumeric tag, which would normally consist of the name of the person or company, are recovered together with the memory location in which they are intended to be stored. The number and name-tag are then written to that location and are write-protected if requested by the subscriber, the overwrite protection being encoded into the message at source.

Subsequently, the subscriber attempts to place a call to the number in the known memory location by keying in the memory location number. The SIM card passes the telephone or fax number to the communications terminal on demand, and upon receipt of the subscriber's confirmation, the communications terminal sets up the call to the desired number.

Figure 3 shows the electronic structure of the SIM card 7. The card communicates with the mobile to which it is connected via an input/output (I/O) manager 15, preferably using the protocol ISO 7816 T=0. The I/O manager is typically a program which resides in part of the operating system (O/S) ROM and its function is to buffer and forward data to and from the subscriber unit. A filter 16 of the card receives incoming short message data from the I/O manager and examines it for the presence of enhanced short message data in the form of an embedded command stream (ECS). When detected, the ECS is sent directly to an electrically erasable read only memory (E²ROM) 17, which is preferably a "flash" E²ROM. Once the message has been stored in the E²ROM, it is decoded and the associated command data as extracted, as described

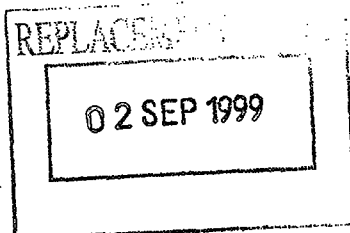


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hereafter with reference to the flow chart of figure 5. The remaining blocks shown in figure 3 are standard components of a SIM card. During the decoding process, the Scratchpad memory may, where necessary, be used as a temporary data store and the processing power of the CPU may also be utilised. Data can also be output from the E²ROM directly to the I/O manager.

As mentioned above, the SIM card may include a directory structure within which files may be stored. With this arrangement, directories are allocated blocks of memory locations for storage of their data files and each file typically occupies a plurality of these locations. Figure 4 shows how such directories and files are organised within the E²ROM of the SIM card. A root directory 18 is the starting point, at the top of the E²ROM's filing system tree, and represents the point from which any of its sub-directories may be accessed. Within the root directory are the following sub-directories, as will be familiar to a person skilled in the art. That is, a SIM administration and identifier directory 19 which contains files identifying the SIM card as being for use with a GSM cellular telephone and not some other type of card receiving device; GSM directory and network data 20 which contains files relevant to administering the minimal requirements of a GSM compliant system, such as LAI, TMSI, BCCH and Adjacent BCCH's; and telecom directory 21 which contains files relevant to administering the subscriber requirements of a GSM compliant system, such as "abbreviated dial numbers" 22, "capability configuration" 23, "short messages" 24, "fixed dial numbers" 25 and "charging counter" 26. Within this directory, frequently dialled numbers and their corresponding alphanumeric tags are stored in the "abbreviated dial number" memory locations 22.

Associated with the "abbreviated dial numbers" and "short messages" memory locations 22,24, are respective locking control files 27,28 which contain details of the

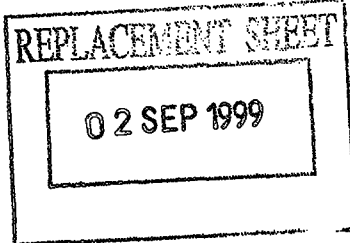


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lock/unlock attributes of the memory locations in which each short message and abbreviated dial number are stored. These control files constitute means for read/write protecting and read/write enabling their associated memory locations. This provides the facility to prevent specified memory locations from being overwritten or accessed or, alternatively, to allow such actions. The locking control files 27,28 will typically be stored in the telecom directory 21, as shown. However, they can be located elsewhere, such as, in an administration directory.

Figure 5 is a flowchart illustrating the operation of the SIM card 7, which uses the specially fabricated hardware and software described above, in response to an incoming SMS, to implement the operations illustrated. At decision box 9, messages, requests and instructions having ECS are distinguished from those without. Each of these ECS types consists of a data stream headed by a command which is one of at least four types: write commands for the messages, read commands for the requests for information, attribute commands for lock or unlock instructions and run commands for instructions to run a program. If the message is found to be devoid of ECS, then it is assumed to be a standard SMS message and is dealt with in a manner known to those skilled in the art. Typically, at box 100, the standard SMS message is displayed to the user who is then, at box 101, given the option of storing it on the SIM. However, if the message is found to contain an ECS, then the command and data types contained therein are decoded and validated at box 10 to ensure that the data is correct and free from invalid coding. If the validation test fails then the message is discarded at box 102 and the process ends. However, if it is successful, the decoded message is parsed via decision boxes 110,120,130 and 140 for one of the aforementioned commands and is acted upon in one of the four paths 11-14.

Hence, path 11 handles each write command and starts at box 111 which derives from the decoded data details of



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the first memory location into which the data is to be written, the number of bytes of data included with the message and the actual bytes of data. Starting at the first memory location, successive bytes are written to successive memory locations by boxes 112 and 113 until the required number of bytes have been written, as determined by decision box 114.

Path 12 handles each read command and starts at box 121 which derives from the decoded data details of the first memory location from which data is to be read and the number of bytes to be read. At boxes 122 and 123, starting from the first memory location, bytes are read from successive memory locations and the data is stored in a buffer. This process repeats until the required number of bytes have been read, as determined by decision box 124. The buffered data is then encoded into ECS format at box 125 and, at box 126, despatched from the mobile, using SMS, to the calling party.

In path 13, once the parser has determined that an attribute command is present, box 131 is responsible for deriving from the decoded data the location and desired status of the location. At decision box 132, if the desired status is 'write protect' then processing proceeds to block 133 where the specified location is write protected, otherwise, at block 134, it is write enabled. In this way, specified memory locations may be rendered accessible or inaccessible, either to calling parties or to the subscriber.

Processing of the run command is via path 14. The command is used to execute a stored program and, at block 141, the location of the executable program and an associated check handle are derived from the decoded data. At box 142, the check handle is used as a form of checksum so that the program stored at the derived location may be validated. At decision box 143, if the routine is found to be invalid then the process ends, otherwise the program is executed at block 144 and if block 145 finds the program to

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comprise command updating information, box 146 ensures that the range of commands stored on the SIM card are updated to include the new command.

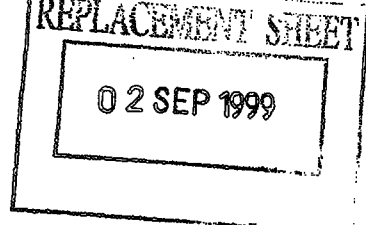
The basic ECS system is expandable to up to 255 internal shell commands of which write, read, lock/unlock and run are four examples. The specific protocol used for the transfer of information is not fixed and could be ISO7816 T=0 or any other suitable protocol.

The internal shell commands are a supplement to the ability of the system to create external file objects within the SIM card 7. The file objects are of two types: Application Data File Programs (ADFP's) containing functional data which can be executed by the SIM card processor and can self modify if required and Application Data Files (ADF's) containing non-functional data which does not have these capabilities. Existing ADF(P)'s can be modified over-the-air enabling advanced facilities such as personalisation, re-personalisation or downloadable phone book.

The SIM card 7 has a directory structure, similar to that of a computer disk, and new ADF(P)'s can be downloaded into any directory over the air. Also over the air, directories can be created, deleted and modified, multiple tree directory operations can be carried out and ADF(P)'s that are no longer required can be deleted. The amount of ADF(P) data which can be downloaded is limited only by the size of the E²ROM memory of the card.

The invention, as described, greatly extends the applications of SIM cards. For example, using the Value Added Services Directory, subscribers can book hotels and airline seats over their mobiles quickly and easily.

An additional advantage of this feature of invention is that the geographical distribution of messages to cards in a specific area such as the south of France is facilitated. Thus advertisers can direct their messages to



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all mobile subscribers in the specific area. This is particularly useful when subscribers "roam" from one area to another and have no knowledge of local services.

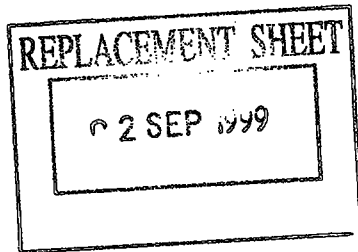
The directory enquiries download enables contact telephone or fax numbers to be delivered to a subscriber's communications terminal without any intervention by the subscriber. The process of manually entering a number whilst engaged in a call to the operator is often dangerous, especially when the subscriber is driving.

The ability of the system to download ADF(P)'s means that additional services can be added to the SIM card over the air while maintaining total compatibility with the existing cellular system. Thus the SIM card could acquire the functions of a credit card, passport, driving licence, car park pass, membership card and so on, becoming a multi-service card. Also, dynamically updatable services can be added which require a different process to be run each time a service is accessed.

Once the card has extra services on it, it can be used outside of the mobile phone environment if desired as a standalone item. This can be read from or written to by a dedicated piece of hardware, such as a point of sale machine. If desired, the new services can be deleted, however the card will never lose its mobile phone SIM capability. In addition, if the card has extra services, they will continue to function even if the subscriber has been disconnected from the mobile phone network, unless otherwise desired.

Modifications are possible without departing from the scope of the invention.

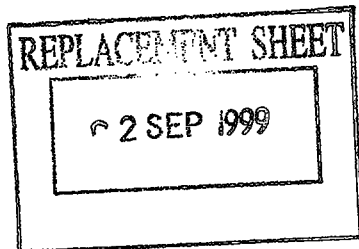
For example, the SIM card can be trained only to receive messages detailing services relevant to the subscriber's needs.



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CLAIMS

1. A telecommunications system comprising at least one host station and a plurality of subscriber units, each subscriber unit having a multiplicity of memory locations adapted to be selectively accessible from said at least one host station and the subscriber unit, means at said host station operable to transmit to at least one of the subscriber units first messages coded in a predetermined first format, means at said host station operable to transmit to said at least one subscriber unit preselected second messages coded in a second format which is distinguished from said first format; said second format comprising a data-stream having an embedded command, and each subscriber unit having means for receiving said transmitted first and second messages, means for distinguishing said formats, means connected to said distinguishing means for decoding said second messages transmitted in said second format, means for detecting when a decoded second message comprises an embedded command which is an attribute command selectively identifying at least one of said memory locations which is to be locked or unlocked so as to render said at least one memory location accessible or inaccessible to at least one of said host station and said subscriber unit, and means for processing the attribute command to lock or unlock said at least one memory location, whereby to control access to said at least one memory location from at least one of said host station and said subscriber unit.



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2. A system as claimed in claim 1, including means for detecting when a decoded second message comprises an embedded command which is a write command, and means for writing data comprised in said second message into at least one of said memory locations.

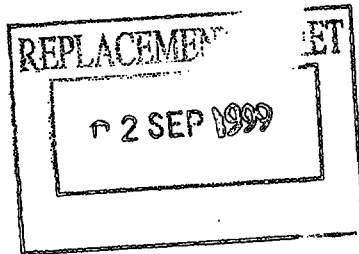
3. A system as claimed in claim 1 or 2, wherein said attribute command locks said at least one memory location to prevent overwriting from at least one of the host station and subscriber unit.

4. A system as claimed in claim 1 or 2, wherein said attribute command locks said at least one memory location to prevent reading of data stored therein from at least one of the host station and subscriber unit.

5. A system as claimed in claim 1, 2, 3 or 4, wherein each subscriber unit includes access means enabling said memory locations of the subscriber unit to be selectively accessed, when required, to fetch from a selected memory location data stored therein.

6. A system as claimed in claim 5, wherein each subscriber unit includes means to present information corresponding to data fetched from a selected memory location to a user of the subscriber unit, and means for transmitting data fetched from a selected memory location to said at least one host station.

7. A system as claimed in any preceding claim, including means for detecting when said decoded second message comprises an embedded command which is a read command, and means for reading data stored in at least one of the memory locations as identified by said read command, buffer for storing the data read from said at



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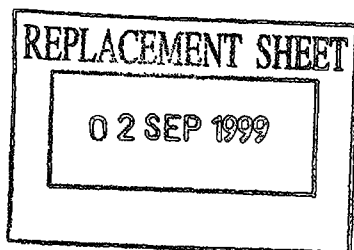
least one memory location, means for encoding said stored data into a third message coded in said second format, and means for transmitting said third message.

8. A system as claimed in claim 7, wherein said at least one memory location is a secure memory location and said data is only fetched and transmitted from a secure memory location in response to entry of a personal identification signal into the subscriber unit.

9. A system as claimed in any preceding claim, including means for detecting when a decoded second message comprises an embedded command which is an execute command, and means for executing data stored in at least one of the memory locations.

10. A system as claimed in any preceding claim, including means for detecting when a decoded second message comprises an executable application data file program for providing additional services, and means for executing said program.

11. A module for controlling a subscriber unit in a telecommunications system including at least one host station, said module being adapted to be removably connected to the subscriber unit, and said module comprising a multiplicity of memory locations adapted to be selectively accessible from said at least one host station and the subscriber unit, means for detecting first and second messages transmitted thereto from said at least one host station, said first message being coded in a predetermined first format and said second message being coded in a second format which is distinguished from said first format, said second format comprising a



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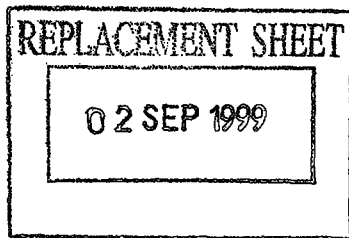
data stream having an embedded command, said module further comprising means for detecting received first and second messages, means for distinguishing said formats, means connected to said distinguishing means for decoding said second messages coded in said second format, means for detecting when a decoded second message comprises an attribute command selectively identifying at least one of said memory locations which is to be locked or unlocked so as to render said at least one memory location accessible or inaccessible to at least one of the host station and subscriber unit and means for processing the attribute command to lock or unlock said at least one memory location, whereby to control access to said at least one memory location from at least one of the host station and subscriber unit.

12. A module as claimed in claim 11, including means for detecting when a decoded second message comprises an embedded command which is a write command, and means for writing data comprised in said second message into at least one of said memory locations.

13. A module as claimed in claim 11 or 12, wherein said attribute command locks said at least one memory location to prevent overwriting from at least one of the host station and subscriber unit.

14. A module as claimed in claim 11 or 12, wherein said attribute command locks said at least one memory location to prevent reading of data stored therein from at least one of the host station and subscriber unit.

15. A module as claimed in claim 11, 12, 13 or 14, wherein the subscriber unit includes access means



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enabling its memory locations to be selectively accessed, when required, to fetch from a selected said memory location data stored therein.

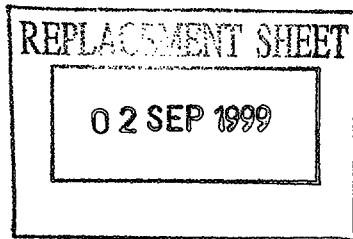
16. A module as claimed in claim 15, wherein the subscriber unit includes means to present information corresponding to data fetched from a selected memory location to a user of the subscriber unit, and means for transmitting data fetched from a selected memory location to said at least one host station.

17. A module as claimed in any preceding claim, including means for detecting when the decoded second message comprises an embedded command which is a read command, and means for reading data stored in at least one of the memory locations as identified by said read command, a buffer for storing the data read from said at least one memory location, means for encoding said stored data into a third message coded in said second format, and means for transmitting said third message.

18. A module as claimed in claim 17, wherein said at least one memory location is a secure memory location and said data is only fetched and transmitted from a secure memory location in response to entry of a personal identification signal into the subscriber unit.

19. A module as claimed in any preceding claim 11 to 18, including means for detecting when a decoded second message comprises an embedded command which is an execute command, and means for executing data stored in at least one of the memory locations.

20. A module as claimed in any preceding claim 11 to 19, including means for detecting when a decoded second

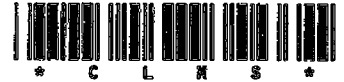
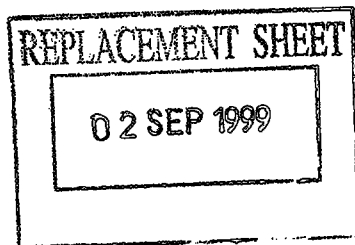


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message comprises an executable application data file program for providing additional services, and means for executing said program.

21. A method of operating a telecommunications system in which a host station is operable to transmit, to at least one of a plurality of subscriber units of the system, a first message coded in a predetermined first format which is adapted to be received and displayed by said at least one subscriber unit, comprising the steps of coding a preselected second message in a second format distinguished from said first format, said second format comprising a data stream having an embedded command, transmitting said coded second message from said host station to said at least one subscriber unit, receiving said coded second message at said at least one subscriber unit, causing said at least one subscriber unit to distinguish said coded second message from said first message coded in said predetermined first format, routing said second message coded in said second format to decoding means, decoding said second message, and processing said decoded second message as dictated by said embedded command.

22. A method as claimed in claim 21, wherein the processing step comprises detecting when the decoded second message comprises an attribute command identifying at least one of the memory locations which is to be locked or unlocked so as to render said at least one memory location accessible or inaccessible to at least one of the host station and subscriber unit, and locking or unlocking said identified memory location(s), thereby



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to control access thereto from at least one of the host station and subscriber unit.

23. A method as claimed in claim 21 or 22, wherein the processing step comprises detecting when the decoded second message comprises an embedded command which is a write command and writing data comprised in said second message into at least one of said memory locations as identified in said second message.

24. A method as claimed in claim 21, 22 or 23, wherein the processing step comprises detecting when the decoded second message comprises an embedded command which is a read command and reading data stored in at least one of said memory locations as identified by said second message.

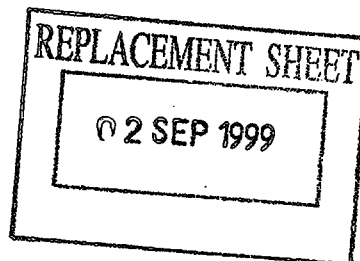
25. A method as claimed in claim 21, wherein the processing step comprises detecting when the decoded second message comprises an embedded command which is a write command, writing data comprised in said second message into at least one of the memory locations, as identified by said second message, to store said data, protecting said stored data from overwriting from said subscriber unit whilst permitting reading thereof from the subscriber unit, accessing said at least one memory location so as to fetch therefrom data stored at said at least one memory location, storing the data fetched from said at least one memory location in a buffer, encoding data stored in the buffer in said second format so as to produce a third message, and transmitting said third message.

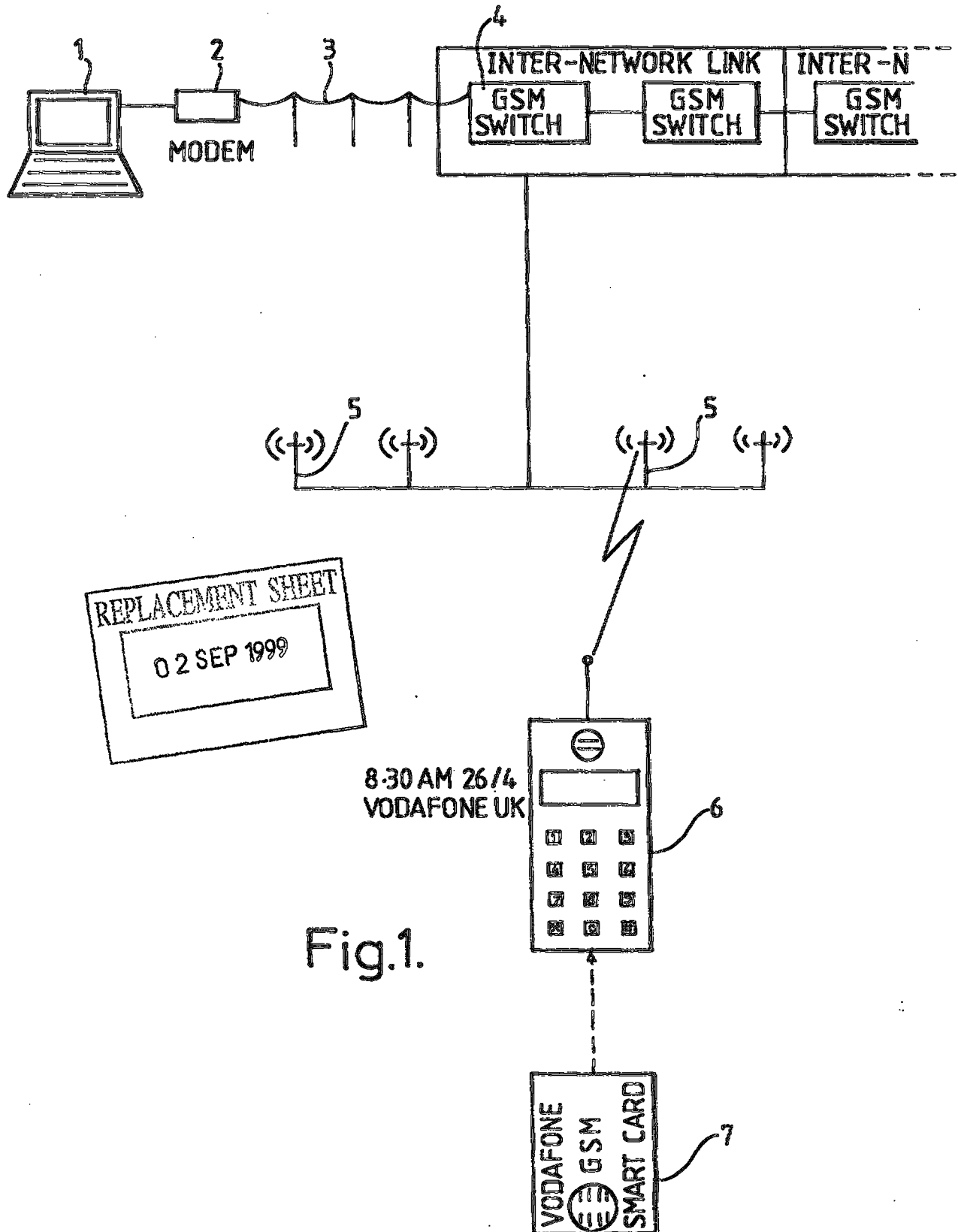
ABSTRACT

TELECOMMUNICATIONS SYSTEM

5 In a telecommunications system such as a global mobile
telephone network in which each subscriber unit includes a
Subscriber Identity Module (SIM card), each SIM card has
fixed memory locations 22, to which data can be addressed
over the air. Some of the locations 22 can not be
10 overwritten from the subscriber unit but can be accessed
therefrom on the entry of short simple codes, each
associated with one of the locations. Further fixed memory
locations 24 can be read over the air only when the
subscriber enters a personal identification number.
15 Locking control files 27, 28 are used to control read/write
access to the locations 22, 24 respectively.

(Fig. 4)





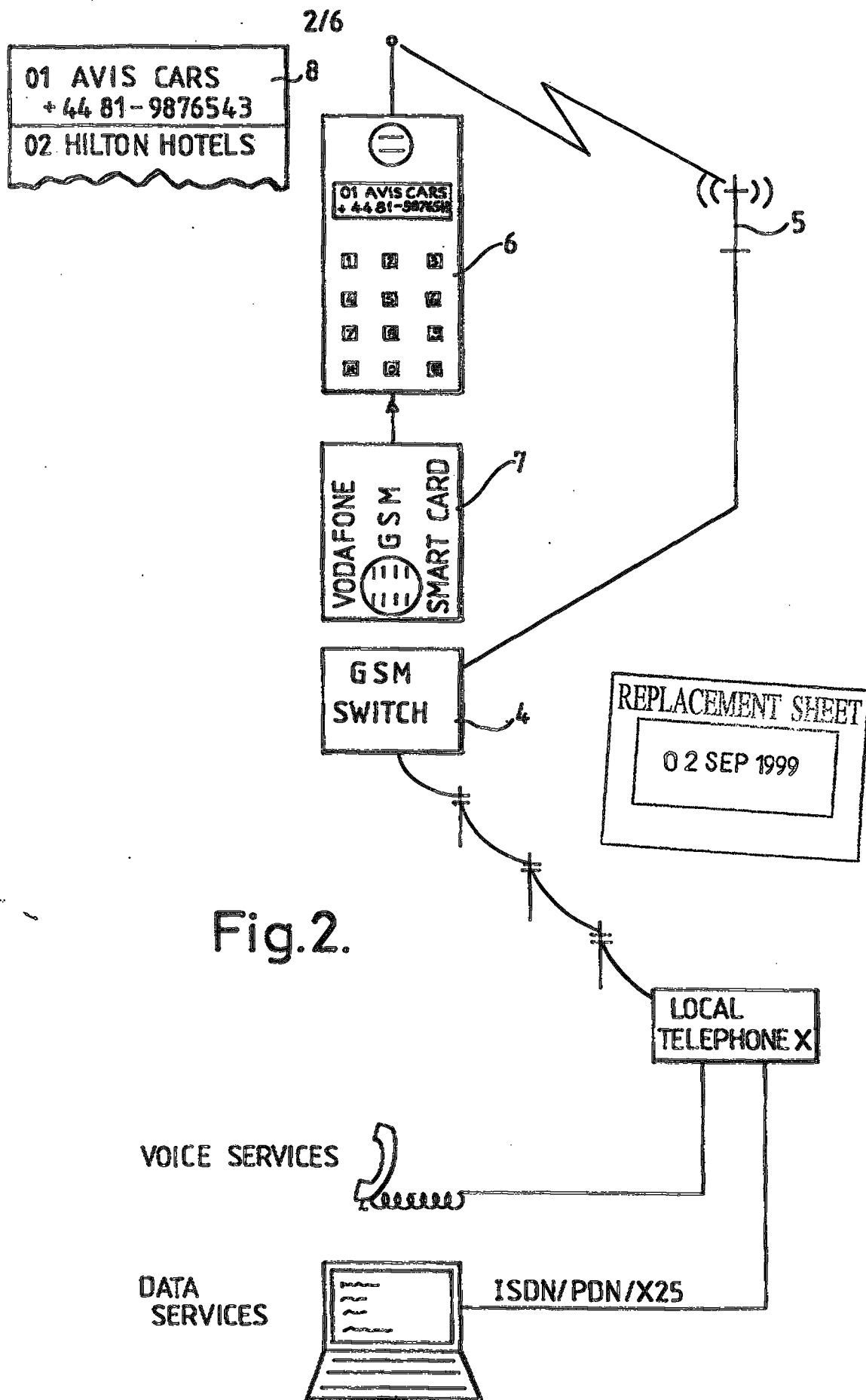
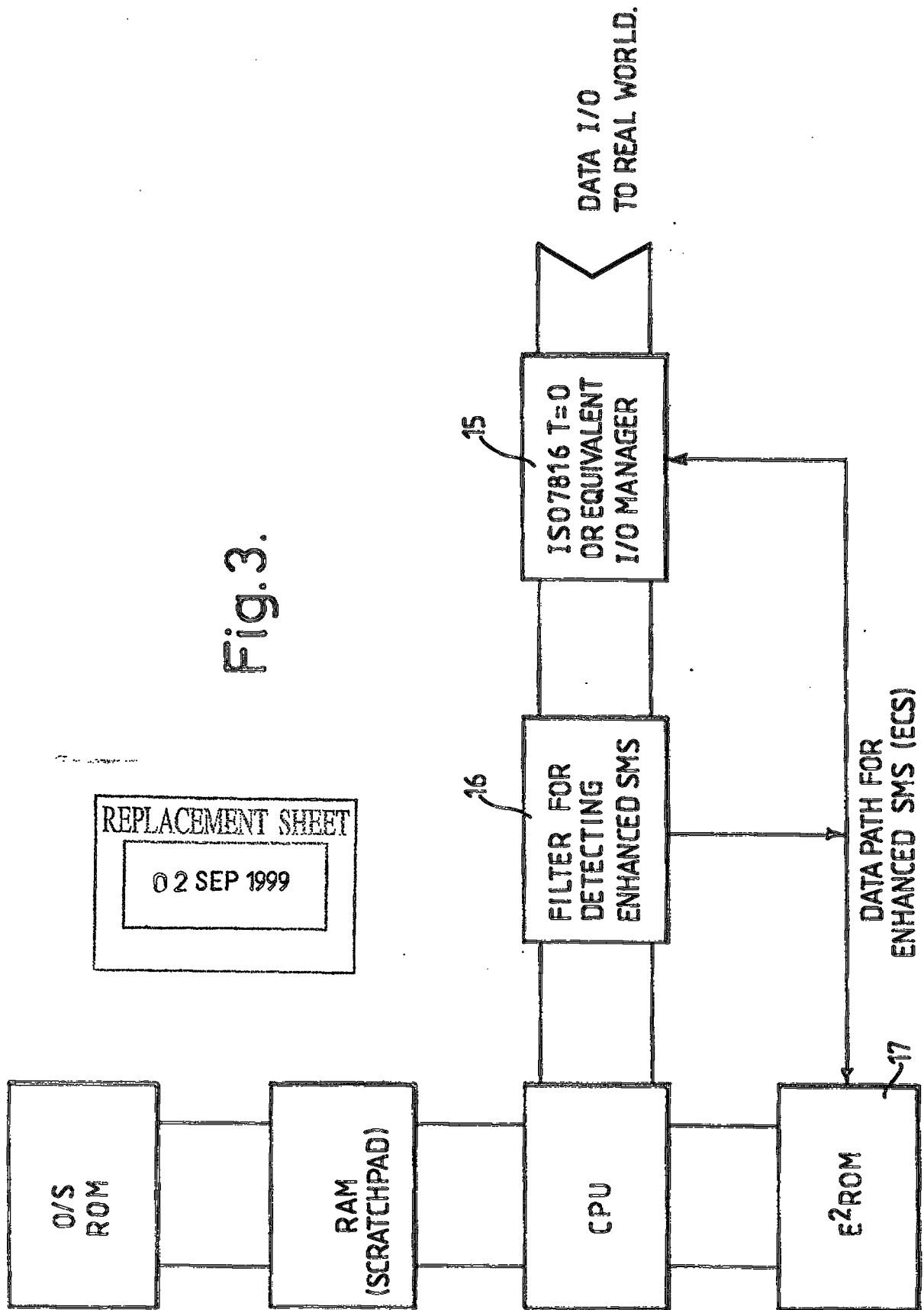


Fig.2.



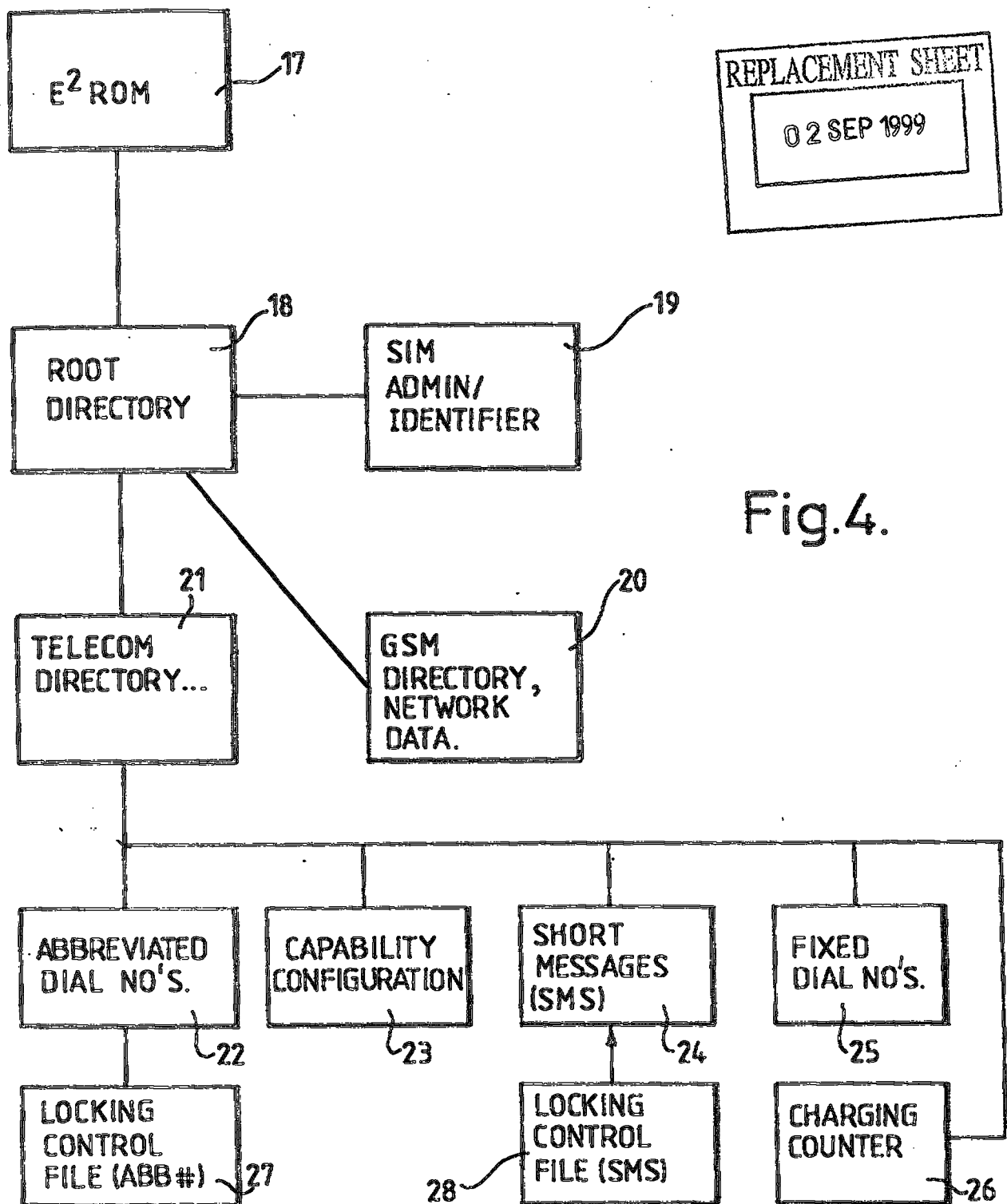


Fig.4.

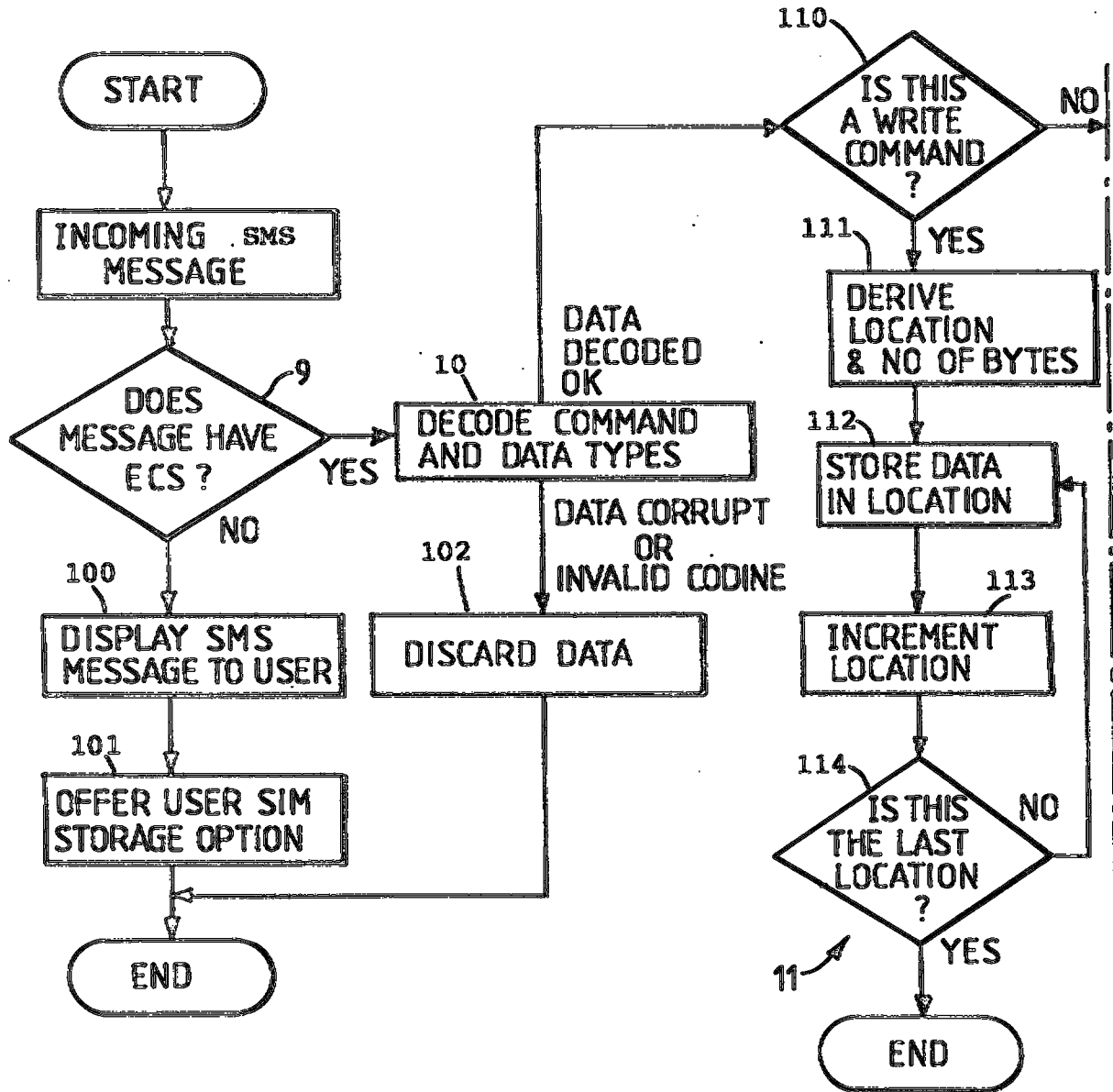
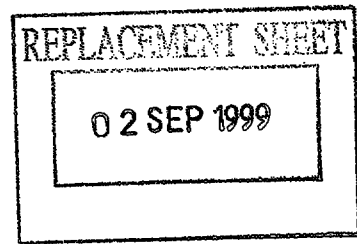


Fig.5.

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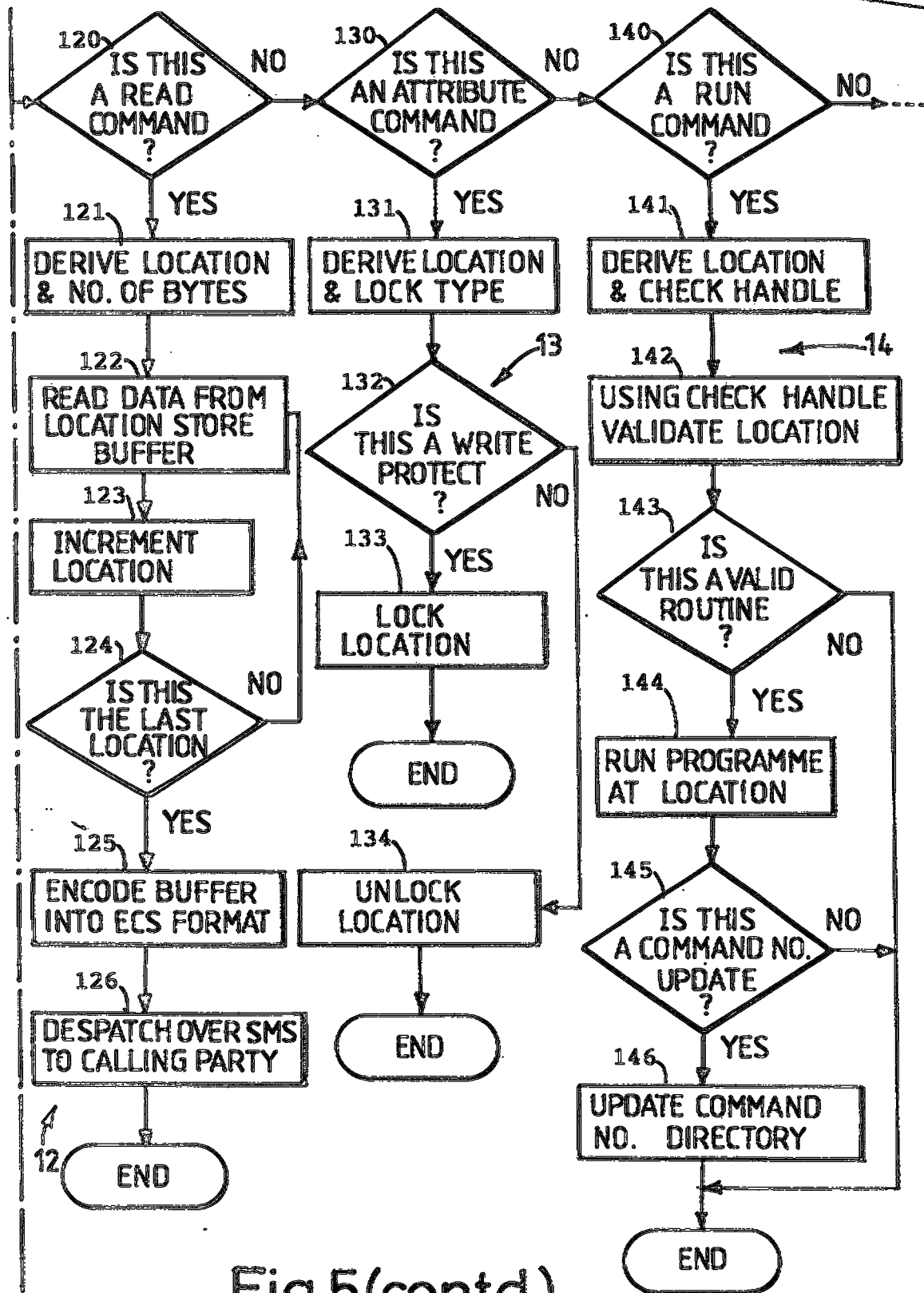


Fig.5(contd.)