



## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<b>(21) International Application Number:</b> PCT/FI93/00474 <b>(22) International Filing Date:</b> 11 November 1993 (11.11.93)  <b>(30) Priority data:</b> 925135                      11 November 1992 (11.11.92)    FI 934995                      11 November 1993 (11.11.93)    FI  <b>(71)(72) Applicant and Inventor:</b> VATANEN, Harri, Tapani [FI/ FI]; Lepolantie 25 A 3, FIN-00660 Helsinki (FI).  <b>(74) Agent:</b> KEIJO HEINONEN OY; Fredrikinkatu 61A, P.O. Box 671, FIN-00101 Helsinki (FI).  <b>(81) Designated States:</b> AT, JP, LV, NO, NZ, RU, US, Euro- pean patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).		<b>Published</b> <i>With international search report.</i> <i>In English translation (filed in Finnish).</i>
<b>(54) Title:</b> MOBILE TELEPHONE SYSTEMS AND A METHOD FOR CARRYING OUT FINANCIAL TRANSACTIONS BY MEANS OF A MOBILE TELEPHONE SYSTEM  <div data-bbox="239 1299 1404 1881" data-label="Diagram"> </div> <b>(57) Abstract</b> <p>The object of the invention is a system and a method for utilizing card operated mobile stations, especially utilizing the service card of the GSM-network's SIM-card containing the SIM-unit, favorably in different electronic service systems demanding high data protection.</p>		

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Mobile Telephone Systems and a Method for  
Carrying Out Financial Transactions by means of  
a Mobile Telephone System.

The object of the invention is a system and a method for  
utilizing card operated mobile stations, especially utiliz-  
5 ing the service card of the GSM-network SIM-card containing  
the SIM-unit, favorably in different electronic service  
systems demanding high data protection.

In present card systems the telecommunication networks are  
10 utilized either in on-line or off-line communication of  
transactions. Considerable problems are the development and  
maintenance costs of the card systems and the telecommuni-  
cation fixed costs as well as the variable costs of the  
communication for the service providers, e.g. shops and  
15 banks, etc. In the present card systems the telecommunica-  
tion traffic and subscriber fees are paid by the service  
providers (the shop, restaurant, taxi, hotel, etc.), be-  
cause the division of the telecommunication costs otherwise  
would demand the construction of expensive or for the use  
20 of the customers clumsy solutions.

A vital problem is the prevention of unlawful and criminal  
use of electronic service systems. Such situations occur  
when the card falls into wrong hands or when the card is  
25 used for unauthorized services (the card lacks cover or the  
card limit has been overdrawn). A considerable challenge  
comes from preventing the forgery of service cards and  
electronic service sessions. The problem is e.g. forgery of  
the A-number identity in the public network service appli-  
30 cations, where the A-number is used to check the access  
rights to the service, by which a forged A-number identity  
enables the criminal use of the service in question.

A considerable problem arises also from the management of  
35 the access rights of different services associated to the  
same service card. At present expensive technical arrange-  
ments are provided separately for every service provider in  
order to administrate the different services associated to

the card.

Moreover, the problem of the present card systems is the transfer of the transaction data in connection with the  
5 card transaction to the different parties, e.g. in a trade situation the transfer of the purchase and the card payment to the central system of the shop from a single site, to the payer's bank, the payee's bank, etc. Different banks and credit companies have their own security systems.

10

The existing telephone banks with different numbers provide voice-frequency telephones for the payment of bills and statement of account inquiries. When e.g. a telebank is called, the computer identifying the DTMF-voice frequency  
15 signals available through the telephone network i.e. the central voice applications platform (the CVAP) answers and the caller talks with the CVAP by pushing certain keys suggested by a predetermined program.

20 By linking a card reader system to the phone, the calls can be paid by credit card. The U.S. patent publication 5 144 649 describes the method of using the radio telephone with a credit card. The phone can be used only by first presenting the credit card. The credit card data is read from the  
25 credit card and the local validity of the credit card is established by processing the credit card data. If the validity is approved, the phone can be used. When the client uses the phone to place or receive a call, the time for using the phone is recorded. The validity can be  
30 checked during the call, and if the call charge exceeds the credit limit, the method can cut off the call.

The published EP application 409 417 also describes the charging of calls when using a certain service data termi-  
35 nal having a credit card reader. In the credit card phone method, a local database, a storage and a programming intelligence have been connected to the telephone to enable the processing of the calls, in which method the user

enters the credit card number after having dialled the required number, the data is locally recorded after having checked the authority of the card, and in affirmative case, immediately continues the call set-up. The line is supervised during the call. The card number, the dialled number, the date, time and call time are locally recorded. The host computer is updated with this information. In the methods above only calls are charged by the credit cards.

10 The system and method according to the subject invention provide a preferable solution to the above mentioned problems. The invention is characterized in what is presented in the claims. The solution according to the invention requires the initialization of the service card SIM-unit  
15 always to require the use of the PIN-code, the connection of service number applications demanding high data security from the GSM-network base station onwards through a private network all the way to the service provider (e.g. the bank credit system), searching with the A-number identity in the  
20 service application from the service database the database required by the user, to which the user has a predetermined right according to the database register, the description of the A-number identity related services to the service database, in which e.g. the customer's account number  
25 corresponds to the A- and B-number identities, and, furthermore, for the service management a service center for the control of the access rights of the A- and B-number related services and the re-connection of the services.

30 Vital advantages of the subject invention are the possibilities to utilize the Pan-European GSM-system SIM-card or a card of a corresponding system in and for the different card issuers' applications, the possibilities to reduce and divide the service and equipment related telecommunication  
35 costs, due to i.a. joint usage of different service providers. The invention solves the question of utilizing reliably the GSM-network user's local authentication all the way to the service provider. The invention also provides a

solution to the charging of the card system telecommunication transaction costs direct from the user or from third party, which is a direct benefit for the service supplier of the use of the GSM-network and the SIM-unit in the card system. The invention has resolved the question of substantially obstructing unlawful and criminal use of telecommunication services, and furthermore the safe processing of the A-number identity in service applications.

10 Payment transactions can be secured on-line, by which the use of stolen and forged cards can be prevented immediately when the computer in question has been informed. The transaction data is simultaneously transferred to the payer and the buyer. The same data terminal equipment can be used  
15 also as a mobile phone by installing a mobile communication network service card. Payments can thus take place on the whole network area.

Different services can be associated to the GSM-card customer number defined in the SIM-unit (Subscriber Identity Module). The telecommunication costs related to the use of the services can directly be charged the customer defined by the card. The card related services are described either in the network to the customer's service database i.e. the  
20 AUP (A-user profile), from which the data is searched with the caller's ANI (A-number identity) or to the service card containing the SIM-unit.

Due to the authentication taking place in the local or the  
30 mobile telephone network, the GSM-card is adapted for different transactions demanding high data security, which require authentication of the user. The most important applications are i.a. the banking service cards, such as credit and cash cards, insurance cards, regular customer  
35 cards, hotel cards, passenger traffic cards, etc.

The invention provides a solution to the reliable utilization of the local authentication of the user of the GSM- or

corresponding network in different service applications (e.g. accounts in two different banks). The invention provides a solution to the safe management of different services associated with the same service card and/or A-5 number identity.

By the network is meant a combination of transmission routes and nodes between two or several users of the tele- or data communication connections.

10

The invention is presented below more in detail with reference to the enclosed drawing.

Fig. 1 presents the present system for paying bills;

15 Fig. 2 presents a simple system of the subject invention;

Fig. 3 presents the system between the data terminal equipment and the central computer system.

20

Fig. 1 presents a known system for paying bills or inquiring account information by phone. No A-number identity authentication takes place. The telephone connection goes via the public telephone network 17, which does not enable  
25 a reliable A-number identity authentication in the application. The PIN-code application 18 is required to secure the customer identification in the application. The phone can in principle be used by anyone. The A-number identity cannot reliably be used in applications demanding high data  
30 security to identify the user, e.g. payments, if the connection is permitted without the use of the PIN-code of the service card 2, as in such a case anyone could unlawfully use the service. The application 18 must be installed to ask for the user code and the password.

35

Fig. 2 presents a mobile telephone system according to the invention, in which the audio- and/or data connection is taken from the terminal equipment 1 to the network 13 of

the desired service provider. The service card's SIM-unit has been initialized always to demand e.g. a four-number PIN-code before setting up the connection. In applications demanding high data security the connection from the mobile telephone exchange to the application is coupled via the dedicated network 6 and to the application is communicated the caller's A-number identity used to administrate the user's rights and to connect the user to the service. With the intelligence part of the service card 2 installed in the terminal equipment of the system, the user of the equipment is locally authenticated in point 5, connection is taken via the dedicated network 6 to the service provider, with the help of the identifier the service provider identifies the rights of the service user to use the services.

The system comprises a terminal equipment 1, which is in connection via the telephone network with the service provider's central computer containing the payment system.

20 The object of the invention is a payment system, comprising a mobile telephone network's terminal equipment 1, to which can be connected the subscriber identification unit 2 containing data for subscriber identification and radio traffic secrecy, and which is readable to the terminal equipment for the use of card operated mobile stations, e.g. a SIM-card in a GSM-system. The mobile stations 1 are in connection with the mobile network transmitter-receiver station i.e. base station 3. The base station controller 16 controls the operations of one or several base stations 3.

30 From the controller or the base station there are connections with the mobile telephone exchange, from where there are connections to the telecommunication networks 6. According to the invention, calls to a predetermined number are directed to the dedicated network 6 in the mobile telephone exchange. In the call set-up, the subscriber is identified in the authentication center 5 and the subscriber is given the right to the call. The authentication center contains in i.a. the GSM-system the mobile



subscribers' secret identification keys and this is utilized i.a. in securing the data protection to prevent misuse of the mobile subscriptions and to maintain the radio traffic secrecy. The network can be a public telephone network, as is well known, but according to the invention in applications demanding high data security, a dedicated network 6. Information about e.g. the amount to be paid as well as data required to identify the A- and B-subscribers are transferred in the phone calls.

10

To build up the connections, the system comprises the service connecting point 7, to which has been linked a service control point 8, containing the data about the services available to the subscriber. The control and management devices are essential for the access to the services of the service provider, e.g. in audio-applications a person-aided 9a, e.g. a call-management program intended for operator use in a CallCoordinator 2 operating in local area network PC- or minicomputer environment, or an automatic telephone service system 9b, e.g. a Periphonics VPS or IBM DirectTalk/6000 or some other micro- or minicomputer intended for voice processing, and in data applications a telematic service system 9c, with connections via the service connection point 7 to the services of the service provider.

In the voice-applications the telephone service system comprises a PABX 10, e.g. Meridian, an data adapter 11 linked to the PABX, e.g. Meridian Link for switching of the A- and B-numbers to the talk- and data session, an automatic talk control system 12, e.g. Meridian ACD, a possible PABX network 13, e.g. Meridian, a host computer 14, e.g. host-machine IBM or Tandem, a service application to be run in the host computer 15.

35

The data terminal equipment can be at e.g. the store pay-desk, where the customers puts his own pay (service) card in the terminal, i.e. the GSM-telephone's card reading

device. In the method the charging of the transactions of the card holder is based on the SIM-card and the GSM-network standard, according to which the SIM-card in the GSM-terminal card reader reserves the equipment based on the  
5 SIM-card user data. The GSM-terminal is visible to the network-operator as a personal transaction of the card holder. The payer enters his card identification number into the terminal. After having approved the identification number given by the payer, the GSM-network terminal is  
10 switched to the GSM-network, if permitted by the system. The payer selects the transmitter of the transaction, e.g. a bank, a credit company, based on which a call is placed to the transmitter's payment system. When the connection is set up via the dedicated network 6, the system of the  
15 transmitter's payment system asks for the amount to be paid and requests the payer to confirm the amount. After having approved the transaction, the payment system returns the identification number. The payment terminal utilizing the GSM-network produces a receipt to the customer for the  
20 transaction and records the transaction in the cash register.

In the system the same call gets in connection with the payment system of the payee for a simultaneous securing of  
25 the usability of the card, and with the network operator to charge for the use of the phone.

The system also enables the offering of free services via the network, because the payer of every transaction in the  
30 GSM-connection can be defined so that the payee or another party is charged if utilizing in the GSM-network the payee's free service number, a collect call or alike.

Generally a computer system is built around the GSM-terminal, which system contains the local database, the storage  
35 and the programming intelligence providing the peripheral devices required for the invoicing and cash registering. The identification of the card issuer i.e. the service

provider, e.g. the store, bank, etc. can be made in the SIM-card blank. The SIM-card can, if required, be furnished with a magnetic stripe and card embossing. The SIM-card or a corresponding micro-chip can be programmed and altered so that when putting the card into the data terminal equipment it automatically calls the transaction processing system of the service provider, e.g. the central payment transmission system.

- 10 Due to the high data security demands in banking and payment applications, the banking and payment application connections taken from the GSM-network are connected from the mobile telephone exchange MSC 4 to the dedicated network 6. The dedicated network 6 consists e.g. of N\*2Mbps connections. The use of the dedicated network 6 aims at preventing unlawful use of the services, which at present is possible when using the public telephone network.

In the banking services, the bank customer places the bank service card containing the SIM-unit in the GSM-network terminal. In telephone based banking services the terminal can be a standard GSM-telephone. In databased banking services the terminal can be a microcomputer and a banking service program linked to the GSM-telephone. Thus a sufficient storage and programming intelligence for the data processing and transmission is contained in the data terminal itself or linked to it, as is well known. To the terminal, e.g. Motorola MicroTac-phone serial port can be linked a microcomputer (data processing device) and/or a display, keyboard and means to control these.

The banking services are handled by calling the bank related service numbers, the B-number, based on which is searched from the service database linked to the customer's A-number i.e. the customer's service profile (AUP= A user profile) the customer's account number/(s) and information about available banking services. From the accounts linked to the customer's AUP, means can be transferred to other

accounts, bills can be paid, or bills contained in the bill basket linked to the AUP can be approved or rejected. The bill basket is a system to which the invoicing parties deliver their invoicing material, from which the payers can  
5 approve or reject payments addressed to them.

In the banking service application the customer feeds his card into a device contained in the GSM-network terminal. The customer enters his PIN-code. The GSM-network terminal  
10 makes a local PIN-code checking according to the GSM-standard. If the PIN-code is correct, the customer can get in connection with the bank. In case the PIN-code is incorrect, the customer can try again a limited amount of times according to the GSM-network's SIM-standard. The SIM-unit  
15 has been initialized for banking and payment applications in a state that always demands the PIN-code. When the amount of consecutive faulty entries permitted by the PIN-code is exceeded, the card is locked and its re-opening requires a so called PUG-code which is longer than the PIN-  
20 code. When the entry is correct, the customer selects the banking service number. Based on the customer's A-number the services available to the customer are searched from the customer's database. The customer attends to his banking affairs by phone or by the home computer and thereafter  
25 cuts off the connection.

When paying by pay card, the payer's card is fed into the payment data terminal and the shopkeeper (cashier) enters the code of the payment transmitter selected by the payer  
30 (bank, credit company, etc.) and the amount to be paid. The payer enters his PIN-code. As described above, checking is done, whereafter based on the customer's A-number the account (bank account, credit account, or alike) to be charged is searched from the data base maintained by the  
35 teleoperator or the payment transmitter. After having approved the transaction, the payment system sends to the seller a consecutive approval number for the registration of the transaction and for the producing of the receipt.

The approved transaction is credited to shopkeeper's account with the amount paid. In case there is not a sufficient cover in the account or if the transaction for some other reason cannot be approved, the payment system sends a rejection message.

The payment data terminal contains i.a. a display, a keyboard, a receipt printer, a possible link to the cashier system, a reader etc. as well as the above mentioned SIM-card reader and the GSM-network terminal equipment.

The Mega Service Center operates as the service card system maintenance center, in which different service providers' services related to the service cards and/or A-number identity are administrated, and in which the customers with the help of their A-number identity can change their service profiles (AUP) and easily and safely handle different transactions. The Mega Service Center is a person aided or an automatic telephone or a telematic system (computer supported data service system), from which the customer's telecommunication connection is transmitted to the services available to the customer.

The invention has above been described with reference to one of its favorable forms of application. The invention is not to be considered as so limited, but all modifications within the scope of the inventive idea defined by the claims are naturally applicable.

## CLAIMS

1. A mobile telephone system, in which an audio and/or data connection is taken from the data terminal equipment (1) to  
5 the required service provider (13), characterized in that the user of the system is locally authenticated by means of the service card's (2) intelligence part contained in the system's terminal equipment, connection is taken  
10 (6) to the service provider, an identifier is used to identify the rights of the service user to use the services.

2. A system according to claim 1, characterized in that  
15 the service card contains the SIM-unit of the GSM-network's SIM-card, which has in authentication applications been initialized to demand the entering of the user's identification number (the service card PIN).

20 3. A system according to claims 1 or 2, characterized in that in banking, payment and other applications requiring high data security, the audio or data connections taken in the GSM-network are transmitted from the mobile telephone exchange (4) to a dedicated network (6) to prevent misuse.  
25

4. A system according to any of the above claims, characterized in that with the above mentioned local user authentication and the connections transmitted from the mobile telephone exchange (4) via the dedicated network (6)  
30 to the service (13), the user's A-number identify is utilized to check the user's rights to use the service.

5. A system according to any of the above claims 1 to 4, characterized in that in the mobile telephone exchange a  
35 call to a predetermined number is transmitted to the dedicated network (6) according to the register contained in the mobile telephone exchange.

6. A system according to any of the above claims 1 to 5, characterized in that from the private network there is a connection via the service switching point and the service control point to several of the user services, which are registered e.g. in the service database administrated by the operator to transmit the user to the required services.

7. A method to pay by a terminal equipment of a mobile telephone exchange, said terminal equipment having a telephone/pay card linked to it enabling the user's calls, connections to the mobile telephone network are provided, via which there is access to the service providers' services, characterized in that reserving the equipment based on the user data contained in the SIM-card by putting the SIM-card in the GSM terminal's card reader, entering the card identification number into the terminal equipment, connecting the GSM-network terminal to the GSM-network after having approved the identification number given by the enterer, selecting the transaction transmitter, the service provider, calling the transmitter's payment system, forming a connection with the transmitter's payment system, giving the amount to be paid, confirming the amount, approving the payment, giving the payment an identification number, producing a receipt of the transaction to the customer, recording the transaction in the seller terminal and in the payment system, charging the telephone connection time, and cutting off the connection.

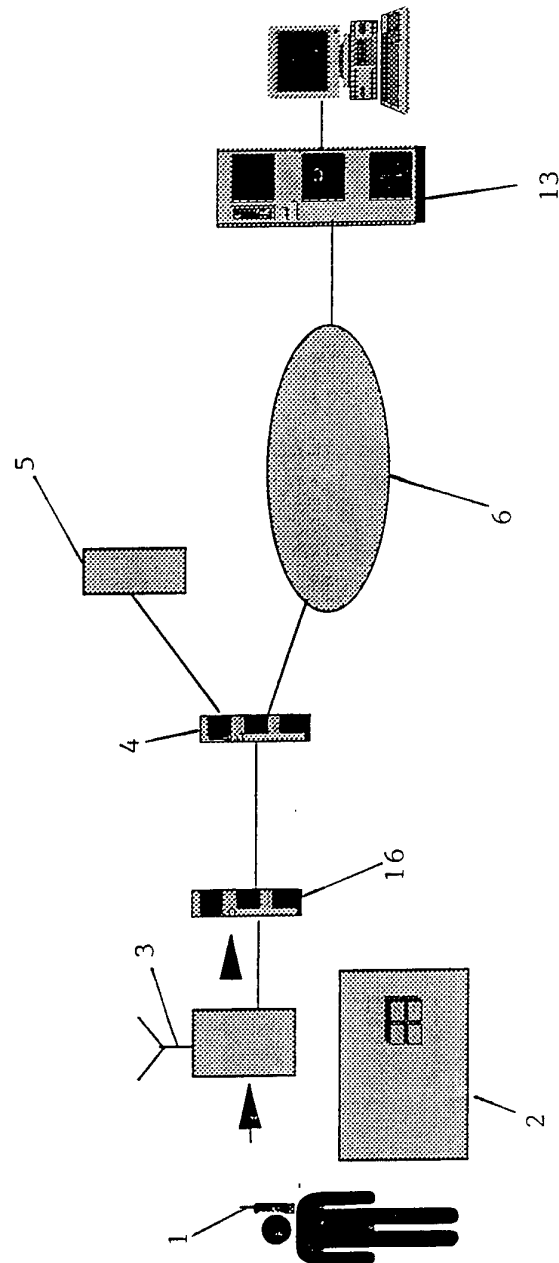
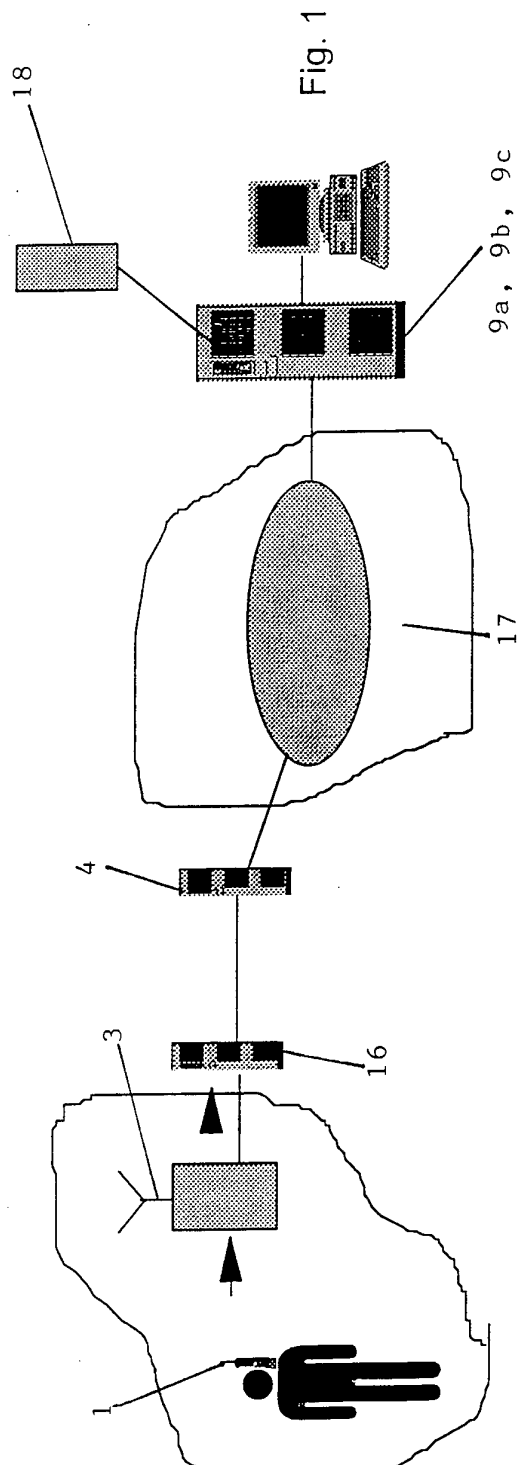
8. A method according to claim 7, characterized in that checking the card owner's right of use in the service provider's computer, and checking in affirmative case the amount to be paid with the card, and if appropriate, acknowledging the receipt of the payment.

9. A method according to claim 7 or 8, characterized in that the A-number identify corresponds to the account number.

10. A payment system comprising a network (6) for the connections via the switching point (7) and the control point (8) of the services regarding the services available to the subscriber, control and administration devices for  
5 the access to the service providers' services, characterized in that the system contains a terminal equipment (1) of a mobile telephone exchange, to which equipment can be connected the subscriber identification unit (2) containing data related to identifying the subscriber and to maintain-  
10 ing the radio secrecy and which is readable to the terminal equipment to use card operated mobile stations, a mobile station network transmitting and receiving station i.e. a base station (3), with which the mobile stations (1) are in connection, a base station controller (16) to control one  
15 or several base stations (3), from which there are connections to the mobile telephone exchange (4) to communicate the connections between the telephone networks (6) and the mobile telephone exchange.



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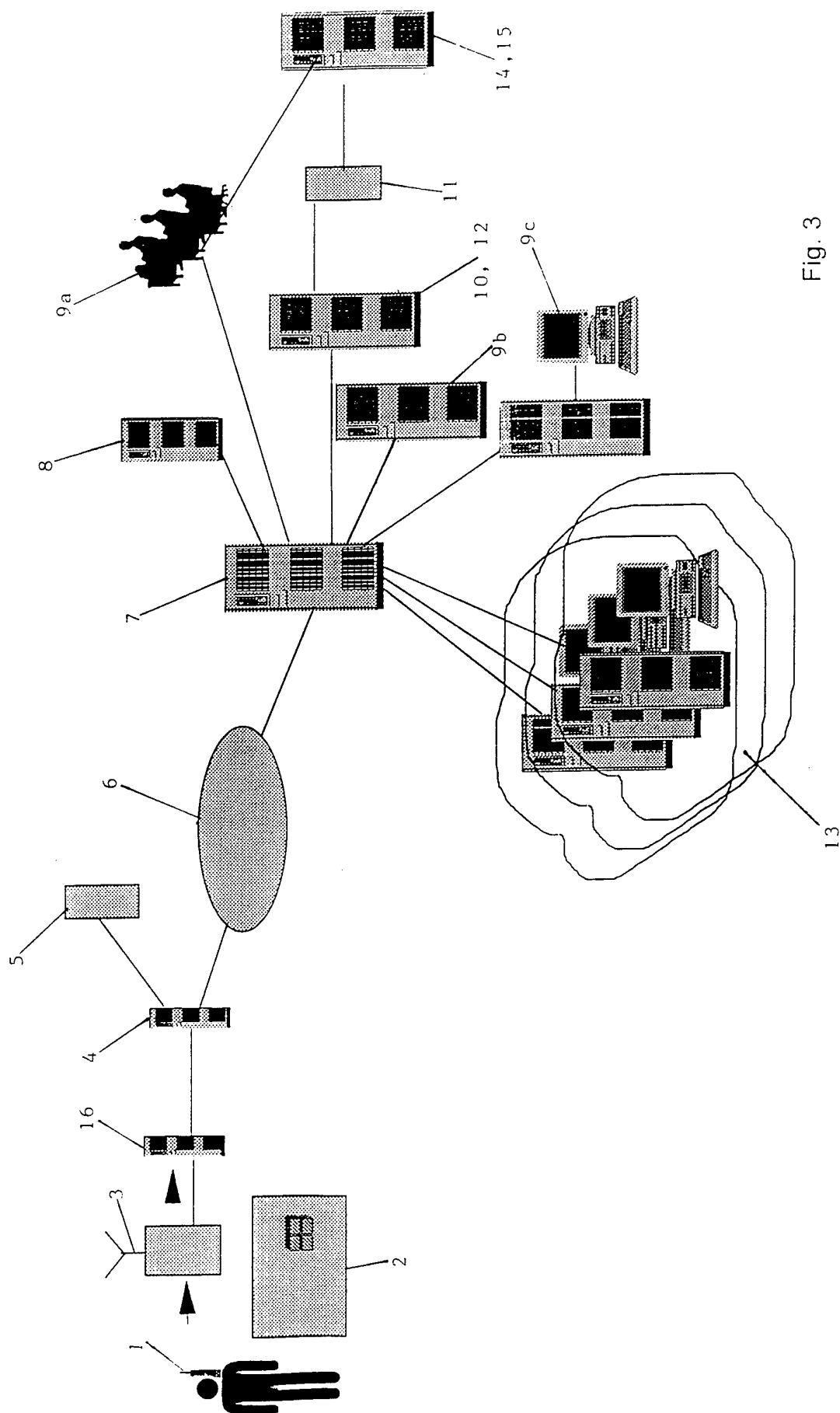


Fig. 3

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 93/00474

## A. CLASSIFICATION OF SUBJECT MATTER

IPC5: G07F 7/08, H04Q 7/04, H04M 3/42

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC5: G07F, H04B, H04M, H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

ORBIT: INSPEC, WPAT

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP, A2, 0481714 (VODAFONE LIMITED), 22 April 1992 (22.04.92), column 3, line 31 - line 43; column 4, line 14 - column 5, line 8, abstract	1-6
Y	--	7-10
X	WO, A1, 9219078 (COMVIK GSM AB ET AL), 29 October 1992 (29.10.92), page 6, line 32 - page 8, line 16, claims 1-4	1-6
Y	--	7-10
Y	EP, A1, 0225010 (BRITISH TELECOMMUNICATIONS PLC), 10 June 1987 (10.06.87), column 1, line 14 - column 2, line 21	7-10
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☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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Name and mailing address of the ISA/  
 Swedish Patent Office  
 Box 5055, S-102 42 STOCKHOLM  
 Facsimile No. +46 8 666 02 86

Authorized officer

Magnus Stiebe  
 Telephone No. +46 8 782 25 00

## INTERNATIONAL SEARCH REPORT

International application No.

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Information on patent family members

28/01/94

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