



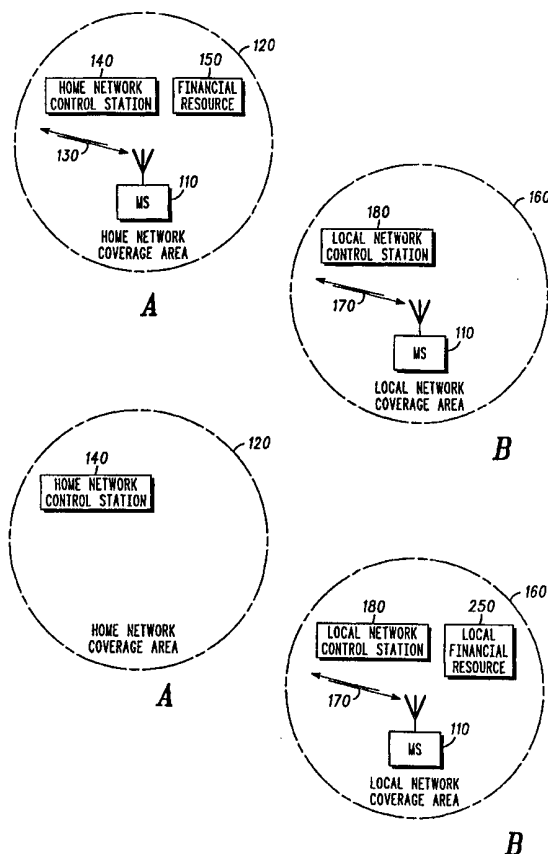
INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁷ : H04M 15/00	A2	(11) International Publication Number: WO 00/52921 (43) International Publication Date: 8 September 2000 (08.09.00)
(21) International Application Number: PCT/EP00/01739 (22) International Filing Date: 28 February 2000 (28.02.00) (30) Priority Data: 9904452.1 1 March 1999 (01.03.99) GB (71) Applicant: MOTOROLA LIMITED [GB/GB]; Jays Close, Viabes Industrial Estate, Basingstoke, Hampshire RG21 7PL (GB). (72) Inventors: O'CONNOR, Erick; Flat 1, 2 Brunswick Place, Bath BA1 2RQ (GB). JOHN, Laurence; 10 Riverholme, Hampton Court Road, East Mosley, Surrey KT8 9BP (GB). (74) Agents: LITCHFIELD, Laura, M. et al.; Motorola European Intellectual Property Operations, Midpoint, Alencon Link, Basingstoke, Hampshire RG21 7PL (GB).		(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>Without international search report and to be republished upon receipt of that report.</i>

(54) Title: CELLULAR COMMUNICATIONS WHEN ROAMING

(57) Abstract

A method and apparatus for a user to pay a cellular communications network for service when roaming. The method comprises the user communicating with a financial resource over a cellular communications radio link to request an electronic currency credit, the requested electronic currency credit being transferred to the user, the user requesting service from a local network, the user and the network determining to pay by the electronic currency credit. A payment profile of the user that can be used in the process is described. The transferred electronic currency credit can represent an exchange of currency into the local currency.



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CELLULAR COMMUNICATIONS WHEN ROAMING

Field of the Invention

5 The present invention relates to a user paying a cellular communications network for service when roaming. The present invention is applicable to, but not limited to, cellular communications systems such as the Global System for Mobile Communications (GSM), and also the Universal Mobile Telecommunication System (UMTS) currently under standardisation.

10

Background of the Invention

One type of communications system is a cellular communications system. In a cellular communications system, the area over which service is provided is divided into a
15 number of smaller areas called cells. Typically each cell is served from a base transceiver station (BTS) which has a corresponding antenna or antennas for transmission to and reception from a user station, normally a mobile station. An established harmonised cellular radio communications system is GSM (Global System for Mobile Communications). A further harmonised standard currently being defined is
20 the Universal Mobile Telecommunication System (UMTS), which is intended to provide a harmonised standard under which cellular radio communications networks and systems will provide enhanced levels of interfacing and compatibility with other types of communications systems, which in addition to speech and data services, will further include extensive provision for multi-media communications. It is also expected that
25 within the framework of developments such as UMTS or the like, cellular radio communication systems will play an increasing role in information highways such as the Internet.

It is customary that a user subscribes to a particular network, which is called that user's
30 home network. When in range of his home network, the user will be provided with service by his home network, which can bill him accordingly. One advantage of harmonised systems such as GSM or UMTS is that user equipment, such as mobile telephones, are compatible with numerous different cellular operators' networks. Thus, when out of the region served by his home network, the user can instead receive service
35 from a different network, customarily referred to as the local network. Such a situation is known as roaming. Conventionally, for service to be provided to a user when roaming, it is necessary for the local network to have a so-called roaming agreement with the user's network. Under this agreement, the local network recovers the cost of the service from

the home network, which then recovers the cost from the user as part of the home network subscription arrangement.

5 It is disadvantageous that in the above roaming procedure, a user can only use a network that has a roaming agreement with his home network. This disadvantage will become more significant as the number of different networks, and service providers, increases globally. Also, the present roaming procedure is disadvantageous in that costs can be increased due to the administrative procedures involved in calculating and passing along costs from the local network to the home network, especially when they are in different
10 countries with different currencies.

Summary of the Invention

15 According to one aspect of the present invention, there is provided a method for a user to pay a cellular communications network for service when roaming, as claimed in claim 1.

According to another aspect of the present invention, there is provided an apparatus for implementing payment from a user to a cellular communications network for service
20 when roaming, as claimed in claim 7.

According to another aspect of the present invention, there is provided an apparatus for paying a cellular communications network for service when roaming, as claimed in claim 12.

25 According to another aspect of the present invention, there is provided an apparatus for receiving payment from a user for cellular communications service when the user is roaming, as claimed in claim 17.

30 Further aspects of the invention are as claimed in the dependent claims.

The present invention advantageously allows local networks to provide service to mobile users without requiring a reciprocal roaming agreement with the home networks of the users, whilst nevertheless being ensured of payment and reducing potential for fraud.

35 Additional specific advantages are apparent from the following description and figures.

Brief Description of the Drawings

Fig. 1 is a schematic illustration showing aspects of a first embodiment of the present invention.

Fig. 2 is a schematic illustration showing aspects of a second embodiment of the present invention.

Fig. 3 is a schematic illustration of a payment profile.

Fig. 4 is a schematic illustration of a further payment profile.

Description of Preferred Embodiments of the Invention

The embodiments are hereinafter described by way of example only, and relate to cellular communications system which are GSM systems, although it will be appreciated that the invention is not limited to such a system and can equally be used in other cellular communications systems, including other time division multiple access (TDMA) systems, code division multiple access (CDMA) systems, or combined TDMA-CDMA systems, and also the Universal Mobile Telecommunication System (UMTS) currently under standardisation.

In a first embodiment, a user is a subscriber of a GSM cellular communications network. That cellular communications network is therefore termed the home network of that subscriber. The user communicates by means of a mobile station (MS), in the present example a mobile telephone. Communications service is provided by the home network by providing a cellular communications radio link between the MS and base transceiver stations (BTS's) of the home network. In conventional fashion, each base transceiver station of the home network forms a coverage area known as a cell, and the total area covered by such cells forms the home network coverage area. A radio link is established between a BTS of the network and the MS. This radio link is used to transmit and receive signalling between the network and the MS. Such signalling will at least in part be initiated by a control station of the home network, such as a mobile services switching centre (MSC), which is coupled to the BTS. Similarly, the radio link between the MS and the BTS forms the first part of a chain of communications links for the

information content, or traffic, that flows when the user communicates with a third party. Connection on from the BTS to the third party will be made via links provided by connections from the BTS, for example to an MSC and then on to a public switched telephone network (PSTN).

5

The first embodiment will now be described with reference to Fig. 1, which is a schematic illustration. Fig. 1a of Fig. 1 schematically shows an MS 110, as described above, located within the home network coverage area 120 of the home network of MS 110. Radio link 130 is shown merely schematically, being in implementation a radio communication link established between MS 110 and a BTS, not shown, of the home network. Home network control station 140 is shown, and merely schematically represents that communication service from MS 110 by radio link 130 is provided by the home network and under its control, in conventional fashion. In the first embodiment the user makes use of his home network service to communicate, over radio link 130, with a financial resource shown schematically as item 150 in Fig. 1a. The financial resource in the present example is physically located within home network coverage area 120, but this need not be the case, since the communications coupling between the home network control station 140 and financial resource 150 can be over long-distance landline connection or via a PSTN, or via any other suitable communications chain. In the present example the financial resource is a bank at which the user has a personal account, but this need not necessarily be the case. In the case of the bank, the credit represents a transfer of funds already held by the user, but could alternatively be a loan.

According to the present embodiment, the user requests an electronic currency credit. This can for example be implemented in the form of a menu driven procedure, or by means a pre-programmed one-touch procedure. In response the financial resource transfers the requested electronic currency credit to the user, again involving the cellular communications radio link 130. The electronic currency credit is received and stored at MS 110. In the present example, this is done by means of a suitably programmed smart card located in the mobile telephone constituting MS 110, this being one of a plurality of smart cards in the telephone. For example, the telephone can have one smart card for such electronic currency credit purposes, and a second smart card for subscriber identity purposes, for example a conventional subscriber identity module (SIM) card. Preferably, a conventional, high level protocol for electronic financial transactions between smart cards and financial institutions is employed, thus safeguarding against theft or fraud. An example of such a protocol is the EMV (European Mastercard Visa) (trademark)

protocol. Similarly, an appropriate application programming interface is preferably employed.

5 The electronic currency credit is in the form of electronic cash, in other words it is not merely a pre-paid token or credit of a particular communications company, network, or grouping, rather it is universally accepted and universally worthwhile currency. One means of implementing such electronic cash is in the form of the VisaCash (trademark) scheme, which functions as follows.

10 The VisaCash customer contacts their card-issuing bank to request the transfer of a certain amount of cash from their personal account onto his or her card. The bank relays this request to Visa, who electronically transfers the cash onto the card in the form of "tokens". These tokens can then be spent in the same way as real cash. To purchase goods, the customer inserts their card into the merchant's terminal, which deducts the
15 appropriate amount. The merchant can then "cash" the collected tokens with Visa (trademark), who transfer the appropriate amount into the merchant's bank account.

According to the present embodiment, the user is later at a new location which is geographically outside the home network coverage area 120, but he nevertheless wishes
20 to use his mobile telephone to make a call. On turning his telephone on, it scans for suitable networks. On ascertaining, in conventional fashion, that the home network is not available, the phone identifies a particular local network, as having the strongest signal. Other criteria can be used. The coverage area of this local network is shown schematically as item 160 in Fig. 1b of Fig. 1. Radio link 170 is shown merely
25 schematically, being in implementation a radio communication link established between MS 110 and a BTS, not shown, of the local network. Local network control station 180 is shown, and merely schematically represents that communication service from MS 110 by radio link 170 is provided by the local network and under its control, in conventional fashion. The user communicates to the network that he wishes to acquire service, by
30 sending a service request. This function can be selected manually by the user from a menu driven option basis, or can be carried out automatically under pre-programmed control of the telephone and/or one or more smart cards or other control features. By two-way signalling, the local network ascertains from the mobile unit the identity of the home network. Let us assume that the local network further ascertains that there is no
35 roaming agreement between the home network and the local network. In this case the local network sends a message, in any suitable form, e.g. text or voice, to the user's telephone, indicating no roaming agreement service can be provided, but that direct cash

service can be offered. The user responds in suitable fashion. For example, the message may indicate that the user must respond with a certain key function or sequence. Included in such response can be relevant details of the user's available currency credit. Consequently, on verifying the details, the local network provides a call service to the user. Payment is made for the service by automatic debiting of the electronic currency credit. In the case of the present VisaCash (trademark) example, this is implemented by securely transferring cash "tokens" to the merchant, in this case the local network.

An alternative embodiment of the present invention, hereinafter referred to as the second embodiment, is now described with reference to Fig.2, in which like parts are numbered the same as above.

In the second embodiment the user finds himself away from his home network coverage area without having arranged an electronic currency credit. Thus in the second embodiment, as shown schematically by the absence of a financial resource in Fig. 2a of Fig. 2, there is no requirement for the user to communicate with a financial resource prior to seeking service whilst roaming.

In the second embodiment the user communicates with the network to request service in the same fashion as in the first embodiment described above. Also, in the same fashion as above, it is consequently determined that payment will be made by debiting of electronic currency credit. However, in contrast to the first embodiment, in the present second embodiment it is now necessary for the user to acquire an electronic currency credit. A number of possibilities exist. Merely by way of example, certain possibilities are now described. A first possibility is that the local network indicates by a suitable messaging or prompting procedure that a limited service is available to the user on the local network for the purpose of acquiring a currency credit. The nature of the limited service could be limited time, limited number calling options, and so on, including combinations thereof. Another possibility is that the local network provides connection only to certain predetermined financial resources, such as local banks. Alternatively, such a call could be connected automatically. Whichever possibility is pursued, the effect is that MS 110 is provided with a communications route, involving radio link 170, to a financial resource. In the present second embodiment, the financial resource is in effect a local one, based in local network coverage area 160, and is therefore shown as local financial resource 250 in Fig. 2b of Fig. 2. The advantage of this is that the local network does not have to allow expensive calls to be made before being able to charge. Nevertheless, depending on the wishes and particular requirements of the local network,

connection to financial resources located elsewhere are technically feasible, and are included by means of overall communications links established thereto involving radio link 170 as part of the chain of links thereof. Consequently, and in the same fashion as in the first embodiment described above, the user communicates with financial resource 250 over cellular communications radio link 170 to request an electronic currency credit; financial resource 250 transfers the requested electronic currency credit to the user over the cellular communications radio link 170; and the local network thereafter provides service to the user and debits the user's electronic currency credit in payment for the service.

In either of the above embodiments, an optional preferred version is that the determination that payment will be made by debiting the user's electronic currency credit is made by means of analysis of a payment profile of the user. In this version, the telephone of the user, or alternatively one or more smart cards therein, or other suitable arrangement connected to the telephone, is pre-programmed with a payment profile that specifies the order of preferences the user has with respect to how his calls should be arranged and paid for when roaming. The form of the pre-programming can be such that the user keeps the same payment profile over a relatively long time, encompassing perhaps a number of trips, or alternatively it can be pre-programmed merely in the sense that the user can specify it prior to making a particular trip or prior to seeking service in a particular location. The preferences in the payment profile will be chosen according to the particular user's wishes, and will also vary according to the arrangements made by his home network. For explanatory cases a simple case is described with reference to Fig. 3. Fig. 3 shows schematically an example of the contents of a payment profile 300. Preference 1 is shown as "roaming agreement". In this example, when a local network has a roaming agreement with the user's home network, payment will be made conventionally under the roaming agreement. Preference 2 is shown as "pay electronic currency credit". Thus when the local network interrogates or analyses this payment profile of the user, it is able to automatically determine that the user wishes to pay by currency credit in the absence of a roaming agreement between the local network and the home network. An alternative payment profile could be that the preference is to pay via a roaming agreement unless the price will be at least 25% cheaper by paying by electronic currency, in which case debiting the user's electronic currency should be the payment means.

Another aspect is the question of when the user's home currency is different to the currency used in the locality of the local network. Thus, in a preferred version of each of

the above embodiments, the electronic currency credit transferred from the financial resource to the user is in the local currency of the network. In the case of the first embodiment, if we assume the user knows which country he will be visiting, then this option is implemented simply by, when communicating with financial resource 150
5 before setting off on his trip, requesting the electronic credit to be in the local currency of the local network in the local network coverage area 160 where he is travelling to.

In the case of the second of the above described embodiments, where the user is already in the local network coverage area 160 before communicating with financial resource
10 250, one possibility is that the electronic currency credit is transferred from the financial resource to the user in the local currency of the network in exchange for an existing electronic currency credit which is already held by the user and is in his home currency, having already obtained that home currency credit in an earlier transaction. In such a case the local financial resource 250 might merely be a currency exchange office rather
15 than a bank as such. The exchange could even be for a further currency which is already held electronically by the user, i.e. a currency which is neither the home location currency nor the local location currency, being perhaps currency left over from paying for calls as per the present invention when on an earlier trip. The above described versions of currency exchange merely provide a small number of examples of the overall
20 combinations and permutations for currency exchanging possible under the present invention.

Referring back to the payment profile, a further simple example of a payment profile 400, in the context of currency exchange, is shown schematically in Fig. 4. Preference 1
25 is again shown as "roaming agreement", so again, when a local network has a roaming agreement with the user's home network, payment will be made conventionally under the roaming agreement. Preference 2 is now shown as "pay electronic currency credit in home currency". Thus when the local network interrogates or analyses this payment profile of the user, it is able to automatically determine that the user wishes to pay by
30 currency credit in the absence of a roaming agreement between the local network and the home network. Moreover, the user is specifying that he would ideally like to pay in his home currency. If this is acceptable to the local network, it will carry out debiting of payment in the user's home currency. However, if this is not acceptable to the local network, it will automatically glean from preference 3, namely "pay electronic currency
35 credit in local currency", that the user is willing to do that, and so service will be provided on that basis. Further communication, either automatic or involving the user manually, will be used to determine whether the user already holds such a credit or

whether he needs to communicate with a financial resource. Clearly, many other factors related to currency exchange can be included in a payment profile. Merely by way of example, one possibility is that the choice between paying in home currency or local currency could include questions as to how much surcharge a local network will charge

5 for debiting in the user's home currency.

Claims

1. A method for a user to pay a cellular communications network for service when roaming;
5 wherein the method comprises the following steps carried out in the following order:
(a) the user communicates with a financial resource over a cellular communications radio link to request an electronic currency credit;
(b) the financial resource transfers the requested electronic currency credit to the user over the cellular communications radio link;
10 (c) the user communicates with the network to request service;
(d) the user and the network further communicate, responsive to which the user and/or the network determine that payment will be made by debiting the user's electronic currency credit; and
(e) the network provides service to the user and debits the user's electronic currency
15 credit in payment for the service.
2. A method for a user to pay a cellular communications network for service when roaming;
wherein the method comprises the following steps carried out in the following order:
20 (a) the user communicates with the network to request service;
(b) the user and the network further communicate, responsive to which the user and/or the network determine that payment will be made by debiting the user's electronic currency credit;
(c) the user communicates with a financial resource over a cellular communications
25 radio link to request an electronic currency credit;
(d) the financial resource transfers the requested electronic currency credit to the user over the cellular communications radio link; and
(e) the network provides service to the user and debits the user's electronic currency
30 credit in payment for the service.
3. A method according to claim 1 or 2, wherein the cellular communications radio link is provided by the network.
4. A method according to any preceding claim, wherein the determination that
35 payment will be made by debiting the user's electronic currency credit is made by means of analysis of a payment profile of the user.

5. A method according to any preceding claim, wherein the electronic currency credit transferred from the financial resource to the user is in the local currency of the network.
- 5 6. A method according to claim 5, wherein the electronic currency credit transferred from the financial resource to the user in the local currency of the network is in exchange for an existing electronic currency credit which is already held by the user and is in a currency other than the local currency of the network.
- 10 7. An apparatus for implementing payment from a user to a cellular communications network for service when roaming;
the apparatus comprising:
(a) means for the user to communicate with a financial resource over a cellular communications radio link to request an electronic currency credit;
15 (b) means for the financial resource to transfer the requested electronic currency credit to the user over the cellular communications radio link;
(c) means for the user to communicate with the network to request service;
(d) means for the user and the network to further communicate, and means for the user and/or the network responsively thereto to determine that payment will be made by
20 debiting the user's electronic currency credit; and
(e) means for the network to provide service to the user and means to debit the user's electronic currency credit in payment for the service.
8. An apparatus according to claim 7, wherein the cellular communications radio
25 link is provided by the network.
9. An apparatus according to claim 7 or 8, wherein the determination that payment will be made by debiting the user's electronic currency credit is made by means of analysis of a payment profile of the user.
- 30 10. An apparatus according to any of claims 7 to 9, wherein the electronic currency credit transferred from the financial resource to the user is in the local currency of the network.
- 35 11. An apparatus according to claim 10, wherein the electronic currency credit transferred from the financial resource to the user in the local currency of the network is

in exchange for an existing electronic currency credit which is already held by the user and is in a currency other than the local currency of the network.

12. An apparatus for paying a cellular communications network for service when
5 roaming;
the apparatus comprising:
(a) means for communicating with a financial resource over a cellular communications
radio link to request an electronic currency credit;
(b) means for receiving the requested electronic currency credit from the financial
10 resource over the cellular communications radio link;
(c) means for communicating with the network to request service;
(d) means for further communicating with the network such that responsively thereto it
can be determined that payment will be made by debiting the electronic currency credit;
(e) means for receiving service from the network; and
15 (f) means for allowing the electronic currency credit to be debited by the network in
payment for the service.

13. An apparatus according to claim 12, wherein the cellular communications radio
link is provided by the network.

- 20 14. An apparatus according to claim 12 or 13, wherein the determination that payment
will be made by debiting the user's electronic currency credit is made by means of
analysis of a payment profile of the user.

- 25 15. An apparatus according to any of claims 12-14, wherein the electronic currency
credit transferred from the financial resource to the user is in the local currency of the
network.

- 30 16. An apparatus according to claim 15, wherein the electronic currency credit
transferred from the financial resource to the user in the local currency of the network is
in exchange for an existing electronic currency credit which is already held by the user
and is in a currency other than the local currency of the network.

- 35 17. An apparatus for receiving payment from a user for cellular communications
service when the user is roaming;
the apparatus comprising:
(a) means for receiving a service request from the user;

(b) means for communicating with the user such that responsively thereto it can be determined that payment will be made by debiting an electronic currency credit of the user;

(c) means for providing service to the user; and

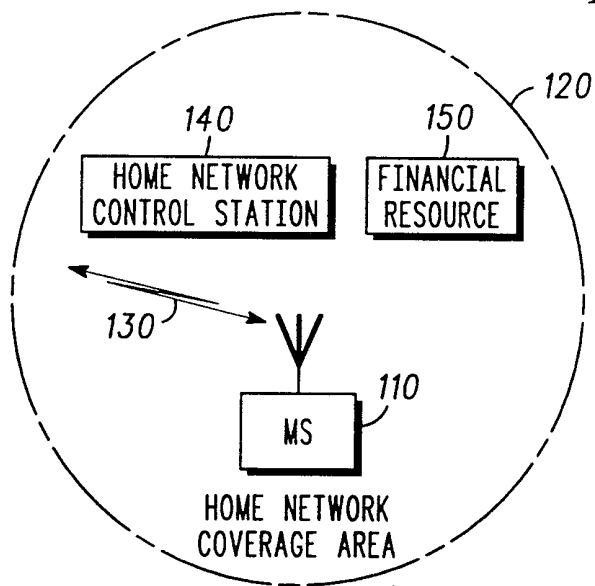
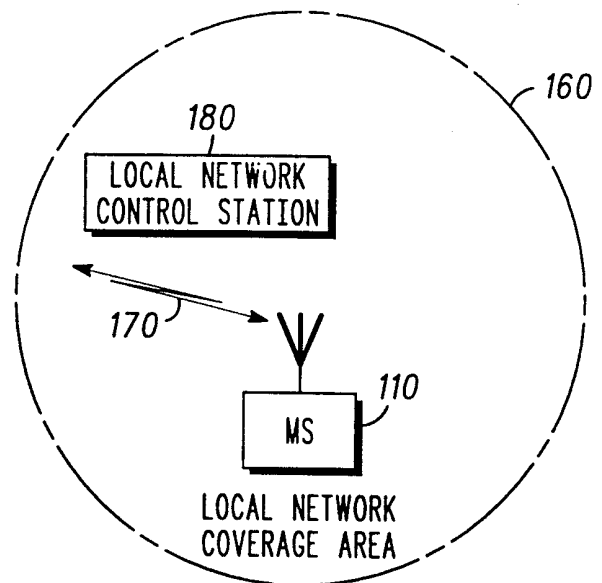
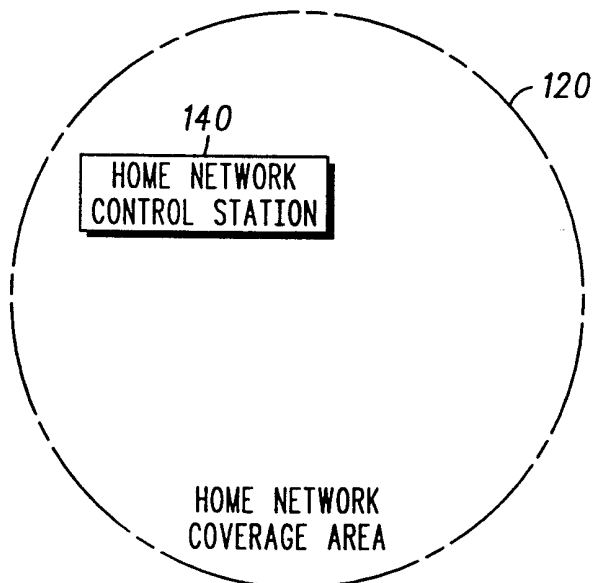
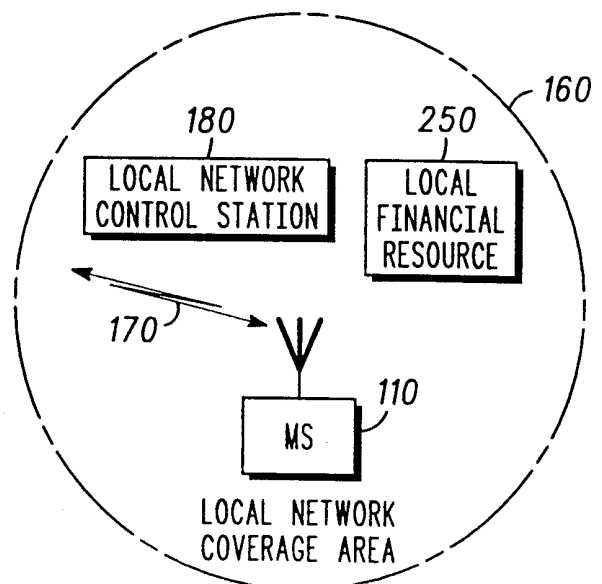
5 (d) means for debiting the user's electronic currency credit in payment for the service.

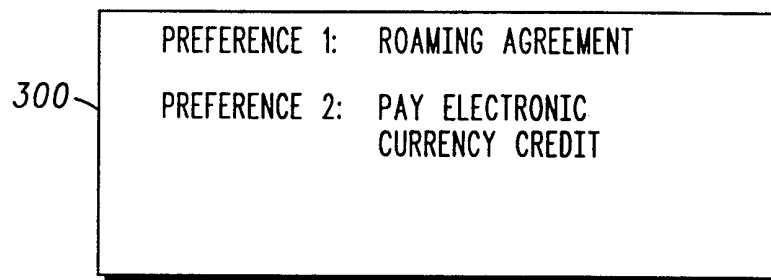
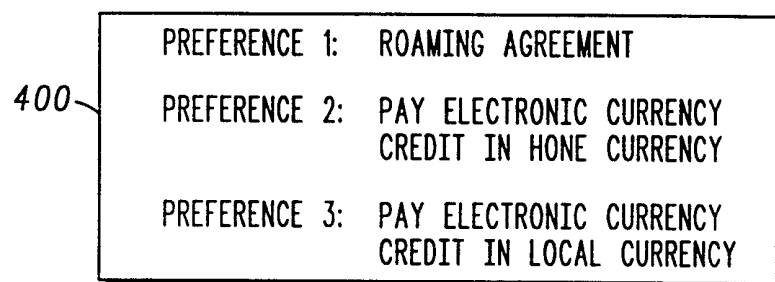
18. An apparatus according to claim 17, wherein the determination that payment will be made by debiting the user's electronic currency credit is made by means of analysis of a payment profile of the user.

10

19. An apparatus according to claim 17 or 18, wherein the electronic currency credit is in the local currency of the network.

1/2

**FIG. 1A****FIG. 1B****FIG. 2A****FIG. 2B**

*FIG. 3**FIG. 4*