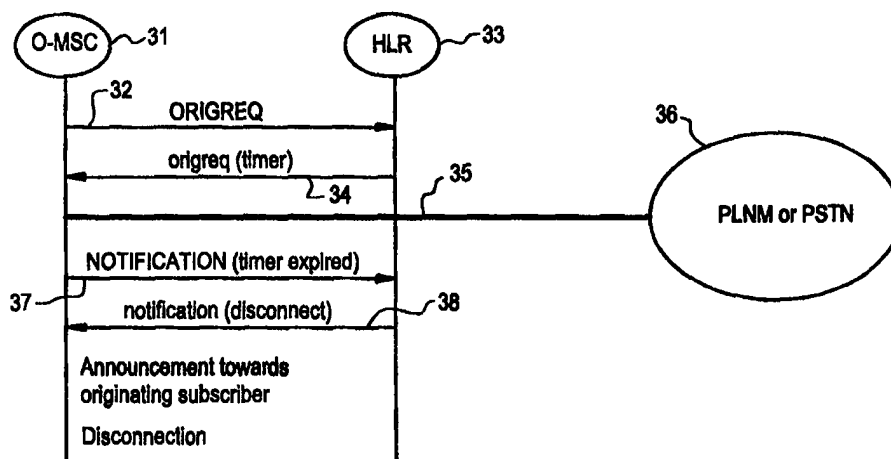




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification <sup>6</sup> :</b> <b>H04M 15/00, H04Q 7/22</b>	<b>A1</b>	<b>(11) International Publication Number:</b> <b>WO 98/44716</b>  <b>(43) International Publication Date:</b> 8 October 1998 (08.10.98)
<b>(21) International Application Number:</b> PCT/SE98/00520 <b>(22) International Filing Date:</b> 20 March 1998 (20.03.98)  <b>(30) Priority Data:</b> 08/829,988      1 April 1997 (01.04.97)      US  <b>(71) Applicant:</b> TELEFONAKTIEBOLAGET LM ERICSSON (publ) [SE/SE]; S-126 25 Stockholm (SE).  <b>(72) Inventor:</b> NGUYEN, Viet Anh; 6440 McLynn, Montreal, Quebec H3X 2R4 (CA).  <b>(74) Agent:</b> ERICSSON RADIO SYSTEMS AB; Common Patent Dept., S-164 80 Stockholm (SE).	<b>(81) Designated States:</b> AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, GW, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, 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>Before the expiration of the time limit for amending the</i> <i>claims and to be republished in the event of the receipt of</i> <i>amendments.</i>	

**(54) Title:** METHOD OF LIMITING CALL CHARGES IN A RADIO TELECOMMUNICATIONS NETWORK

**(57) Abstract**

A method in a radio telecommunication system of limiting charges on a subscriber's account to an available balance. The method begins by storing the available balance in the subscriber's home location register (HLR) (14, 33) and storing, in a subscriber profile in the subscriber's HLR, an instruction to monitor charges incurred by the subscriber's mobile station. The instruction includes the available balance in the subscriber's account. The HLR determines the charge rate for any call to or from the subscriber's mobile station, and converts the available balance to a time limit for the call by dividing the available balance by the charge rate. If the subscriber originates a call, the HLR (33) instructs an Originating Mobile Switching Center (O-MSC) (31) to time the call in an Origination Request Return Result message (34). If a terminating call is received for the subscriber, the HLR (14) instructs a Gateway MSC (G-MSC) (12) to time the call in a Location Request Return Result message (18). The MSC (Gateway or Originating) then times the call. If the call exceeds the time limit, the MSC sends a Notification Invoke message (21) to the HLR with an indication that the time limit expired. The HLR sends a Notification Return Result message (22) to the MSC instructing the MSC to disconnect the call.

**FOR THE PURPOSES OF INFORMATION ONLY**

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav	TM	Turkmenistan
BF	Burkina Faso	GR	Greece		Republic of Macedonia	TR	Turkey
BG	Bulgaria	HU	Hungary	ML	Mali	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MN	Mongolia	UA	Ukraine
BR	Brazil	IL	Israel	MR	Mauritania	UG	Uganda
BY	Belarus	IS	Iceland	MW	Malawi	US	United States of America
CA	Canada	IT	Italy	MX	Mexico	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NE	Niger	VN	Viet Nam
CG	Congo	KE	Kenya	NL	Netherlands	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NO	Norway	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's	NZ	New Zealand		
CM	Cameroon		Republic of Korea	PL	Poland		
CN	China	KR	Republic of Korea	PT	Portugal		
CU	Cuba	KZ	Kazakstan	RO	Romania		
CZ	Czech Republic	LC	Saint Lucia	RU	Russian Federation		
DE	Germany	LI	Liechtenstein	SD	Sudan		
DK	Denmark	LK	Sri Lanka	SE	Sweden		
EE	Estonia	LR	Liberia	SG	Singapore		

**METHOD OF LIMITING CALL CHARGES  
IN A RADIO TELECOMMUNICATIONS NETWORK**

**5 BACKGROUND OF THE INVENTION**

Technical Field of the Invention

This invention relates to radio telecommunication systems and, more particularly, to a method of limiting the amount of charges that can be incurred on a cellular subscriber's account.

**10** Description of Related Art

Many systems have been proposed to control fraud in cellular telecommunication systems. Some have been successful in reducing the number of fraudulent calls under certain circumstances. However, none have been totally successful, and millions of dollars of fraudulent calls still occur each year. It would be advantageous to have a method of limiting the charges which a fraudulent user can make to a legitimate subscriber's account.

An additional problem faced by cellular subscribers is the control of their own charges for cellular calls. Many subscribers do not realize the amount of charges they are incurring until it is too late, and they receive a very large bill at the end of the month. It would be advantageous to have a method of setting a spending limit for a subscriber, and notifying the subscriber when that spending limit has been reached.

Although there are no known prior art teachings of a solution to the aforementioned deficiency and shortcoming such as that disclosed herein, U.S. Patent Number 5,450,477 to Amarant et al. (Amarant) and European Patent Application EP0 629 072 A1 to Telia AB (Telia) discuss subject matter that bears some relation to matters discussed herein. Amarant discloses a method of monitoring the connect time of a call in regards to an assigned limit to an account. When a credit card or debit card is utilized to initiate a call, the card is validated and the available balance in the account is determined. Based upon the available balance in the account, a time limit for the call is established. If the call exceeds the time limit, the system operator terminates the call. When a call terminates, the billing information is sent

- 2 -

to a network database that subtracts the charges from the balance of the account. Amarant primarily teaches an algorithm to calculate the debit.

5 Amarant, however, describes a method that is suitable for a landline telephone system. Amarant does not teach or suggest a method of establishing a debit limit in a cellular telecommunication system, communicating the necessary information between nodes in the cellular system, and disconnecting calls that exceed the established debit limit.

10 Telia discloses an arrangement in a telephone system for controlling debiting of services. Telia briefly describes a system that is suitable for a landline telephone system, but does not provide any details about how such a system would be implemented. In addition, Telia does not teach or suggest a method of establishing a debit limit in a cellular telecommunication system, communicating the necessary information between nodes in the cellular system, and disconnecting calls that exceed the established debit limit.

15 Review of each of the foregoing references reveals no disclosure or suggestion of a system or method such as that described and claimed herein.

In order to overcome the disadvantage of existing solutions, it would be advantageous to have a method of limiting the charges on a cellular subscriber's account to a preset limit. Such a method would limit fraud if a fraudulent user attempts to make calls that are too lengthy or too expensive. In addition, the method would enable cellular subscribers to set their own spending limits and, for example, to end a call when the toll reaches the subscriber's limit. The present invention provides such a method.

## 25 SUMMARY OF THE INVENTION

In one aspect, the present invention is a method of controlling fraud if a fraudulent user attempts to utilize a legitimate subscriber's mobile station to make calls that are too lengthy or too expensive. In addition, the present invention enables cellular subscribers to set their own spending limits and, for example, to end a call when the toll reaches the subscriber's limit.

30

- 3 -

Thus, in one aspect, the present invention is a method in a radio telecommunication system of limiting charges on a subscriber's account to an available balance. The method begins by storing the available balance in the subscriber's home location register (HLR) and storing, in a subscriber profile in the subscriber's HLR, an instruction to monitor charges incurred by the subscriber's mobile station. This is followed by informing the HLR that the subscriber has originated a call. The HLR determines the parameters of the call and converts the available balance to a time limit for the call. This is followed by instructing an Originating Mobile Switching Center (O-MSC) to time the call, and disconnecting the call if the call exceeds the time limit.

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

The invention will be better understood and its numerous objects and advantages will become more apparent to those skilled in the art by reference to the following drawing, in conjunction with the accompanying specification, in which:

FIG. 1 is a message signaling diagram illustrating the flow of messages between affected nodes of a radio telecommunications network when the present invention is implemented for calls terminating at a mobile station operating in the network;

FIG. 2 is a message signaling diagram illustrating the flow of messages between affected nodes of a radio telecommunications network when the present invention is implemented for calls originating at a mobile station operating in the network; and

FIGS. 3A and 3B are a flow chart illustrating the steps of the method of the present invention when the present invention is implemented for calls originating at a mobile station operating in the network.

#### **DETAILED DESCRIPTION OF EMBODIMENTS**

The present invention defines the signaling interface between nodes in a radio telecommunications network required to implement a method of limiting the charges on a subscriber's account to a preset limit. The method of the present invention

- 4 -

limits fraud if a fraudulent user attempts to make calls that are too lengthy or too expensive. In addition, the method enables subscribers to set their own spending limits and, for example, to end a call when the toll reaches the subscriber's limit.

5 In the present invention, the operator or the subscriber may request that call charges or call lengths from the subscriber's mobile station be monitored. This information is stored in the subscriber profile (subscriber category) in the subscriber's home location register (HLR). A subscriber may request the monitoring service to ensure that he does not exceed a predetermined debit limit. The operator may request the monitoring service whenever fraudulent usage is  
10 suspected. Any call originated from a subscriber's mobile station may be a fraudulent call. When the dialed digits reach the HLR, an analysis of the dialed digits indicates whether the call is a local call or a long distance call. If it is a long distance call, it is more likely that the call is a target of fraud. Therefore, the method of the present invention may include a step that activates call monitoring  
15 only if the dialed digits analysis indicates that the call is a long distance call.

A timer in the Gateway Mobile Switching Center (G-MSC) determines whether the call exceeds a predetermined length which is calculated based on the available balance in the subscriber's account. If so, the call is disconnected. The system may optionally play an announcement notifying the subscriber of the reason  
20 that the call was disconnected. The length of the call may be varied, depending on the applicable charge rate. For example, domestic long distance calls may be limited to 30 minutes while international long distance calls may be limited to 10 minutes.

FIG. 1 is a message signaling diagram illustrating the flow of messages  
25 between affected nodes of a radio telecommunications network when the present invention is implemented for calls terminating at a mobile station operating in the network. A call 11 for the mobile station is first received in a Gateway Mobile Switching Center (G-MSC) 12. The G-MSC sends a Location Request (LOCREQ) Invoke message 13 to the subscriber's Home Location Register (HLR) 14. The  
30 HLR sends a Routing Request (ROUTEREQ) Invoke message 15 to the Visited Location Register/Mobile Switching Center (V-MSC) 16 where the mobile station

- 5 -

is operating. In systems which support paging-before-routing, the V-MSC then pages the mobile station and receives a page response.

Whether paged or not, the V-MSC then sends a Routing Request (routereq) Return Result message 17 to the HLR 14. The HLR checks the subscriber profile to determine whether the operator or the subscriber has requested that call charges or call lengths from the subscriber's mobile station be monitored. If call monitoring is activated, the HLR includes a new parameter (timer) in the Location Request (locreq) Return Result message 18 commanding the G-MSC to monitor the length of the call, and informing the G-MSC of the allowable length of the call. The operator or the subscriber may enter a debit limit, and the HLR calculates the allowable length of the call. The method illustrated in U.S. Patent No. 5,450,477 to Amarant et al., which is hereby incorporated by reference, may be utilized as a suitable method of converting a debit limit to time and vice versa. The call is then set up at 19 and monitored by the G-MSC 12.

If the time period expires before the end of the call, the G-MSC 12 sends a Notification Invoke message 21 to the HLR 14 indicating that the timer has expired. The HLR sends a notification Return Result message 22 to the G-MSC ordering the G-MSC to disconnect the call. The Notification Invoke message 21 and the notification Return Result message 22 are new IS-41 messages. Thereafter, an announcement may be played to the mobile subscriber with the reason for the disconnection. This announcement is currently played by the G-MSC 12, and the call is then disconnected.

FIG. 2 is a message signaling diagram illustrating the flow of messages between affected nodes of a radio telecommunications network when the present invention is implemented for calls originating at a mobile station operating in the network. When a subscriber operating a mobile station in an originating MSC (O-MSC) 31 originates a call, an Origination Request (ORIGREQ) Invoke message 32 is sent to the subscriber's HLR 33. The HLR checks the subscriber profile to determine whether the operator or the subscriber has requested that call charges or call lengths from the subscriber's mobile station be monitored. If call monitoring is activated, the HLR includes a new parameter (timer) in the Origination Request

- 6 -

(origreq) Return Result message 34 commanding the O-MSC 31 to monitor the length of the call, and informing the O-MSC of the allowable call length. The operator or the subscriber may enter a debit limit, and the HLR calculates the allowable length of the call. The call is then set up at 35 and monitored by the O-MSC 31. The call may be to another mobile station operating within the Public Land Mobile Network (PLMN) or the Public Switched Telephone Network (PSTN) 36.

If the time period expires before the end of the call, the O-MSC 31 sends a Notification Invoke message 37 to the HLR 33 indicating that the timer has expired. The HLR sends a notification Return Result message 38 to the O-MSC ordering the O-MSC to disconnect the call. The Notification Invoke message 37 and the notification Return Result message 38 are new IS-41 messages. Thereafter, an announcement may be played to the mobile subscriber with the reason for the disconnection. This announcement is currently played by the O-MSC 31, and the call is then disconnected.

FIG. 3 is a flow chart illustrating the steps of the method of the present invention when the present invention is implemented for calls originating at a mobile station operating in the network. The process begins at step 41 where it is determined whether the subscriber desires to set a debit limit for his account. If not, the process ends at 42. If the subscriber desires to set a debit limit, the process moves to step 43 where the subscriber requests that call charges from his mobile station be monitored. The subscriber also enters the allowable debit limit.

The process may also begin at step 44 where it is determined whether fraudulent usage of the subscriber's mobile station is suspected. If not, the process ends at 45. If fraudulent usage is suspected, the process moves to step 43 where the system operator requests that call charges from the subscriber's mobile station be monitored. The operator also enters an allowable debit limit.

At step 46, the subscriber's HLR stores an instruction for call monitoring in the subscriber's profile (category). The instruction includes the allowable debit limit. At step 47, the subscriber originates a call. The operator may desire to implement the present invention only for long distance calls, which are more likely



- 7 -

to be fraudulent. Therefore, at this point, the process may optionally determine whether the call is a long distance call. This may be accomplished in the HLR through an analysis of the dialed digits. If the call is not a long distance call, the process ends at 49.

5           If the call is determined to be a long distance call (or if optional step 48 is not implemented), the process moves to step 51 where the HLR checks the subscriber profile for the call monitoring instruction and allowable debit limit. At step 52, the HLR determines a charge rate for the call and converts the available  
10           balance in the subscriber's account to a time limit for the call. The charge rate may be determined from the time of day, the day of the week, the origin and the destination for the call, and applicable charge rate tables. The time limit for the call may be calculated by dividing the available balance by the charge rate. The process then moves to FIG. 3B.

          The process continues at step 53 where the HLR provides the time limit to  
15           the originating MSC (O-MSC), and instructs the O-MSC to time the call. At step 54, the O-MSC times the call, and at 55, it is determined, while the call is in progress, whether the call is exceeding the time limit. If not, and the call ends before the time limit is exceeded, the process moves to step 56 where the O-MSC informs the HLR of the time utilized for the call. The HLR converts the time  
20           utilized to a debit charge at 57, and updates the available balance in the subscriber profile at 58. The process then returns to step 47 and waits for the subscriber to originate another call.

          If, however, the call exceeds the time limit at step 55, the process moves to step 61 where the O-MSC informs the HLR that the time limit has expired. The  
25           HLR instructs the O-MSC to disconnect the call at 62. At step 63, the O-MSC disconnects the call. An announcement may be played to the subscriber at 64 notifying him of the reason for the disconnection.

          It is thus believed that the operation and construction of the present invention will be apparent from the foregoing description. While the method, apparatus and  
30           system shown and described has been characterized as being preferred, it will be readily apparent that various changes and modifications could be made therein

- 8 -

without departing from the spirit and scope of the invention as defined in the following claims.

- 9 -

**WHAT IS CLAIMED IS:**

1. In a radio telecommunications system, a method of limiting charges on a subscriber's account to an available balance, said method comprising the steps of:

5 storing said available balance in the subscriber's home location register (HLR);

storing, in a subscriber profile in the subscriber's HLR, an instruction to monitor charges incurred by the subscriber's mobile station;

informing said HLR that the subscriber has originated a call;

10 converting said available balance to a time limit for said call;

instructing an Originating Mobile Switching Center (O-MSC) to time said call; and

disconnecting said call if the call exceeds the time limit.

15 2. The method of claim 1 further comprising, before the step of storing the instruction to monitor charges, the step of instructing said radio telecommunications system to monitor charges incurred by the subscriber's mobile station, said instructing step being performed by the system operator when there is an indication of fraudulent usage of the subscriber's mobile station.

20 3. The method of claim 2 wherein the step of instructing said radio telecommunications system to monitor charges includes the steps of:

determining whether said call is a long distance call; and

25 instructing said radio telecommunications system to monitor charges upon determining that said call is a long distance call.

30 4. The method of claim 1 further comprising, before the step of storing the instruction to monitor charges, the step of instructing said radio telecommunications system to monitor charges incurred by the subscriber's mobile station, said instructing step being performed by the subscriber when the subscriber desires to set a debit limit for calls from the subscriber's mobile station.

- 10 -

5. The method of claim 1 wherein the step of converting said available balance to a time limit for said call includes the steps of:

determining the charge rate for said call; and

5 dividing the available balance by the determined charge rate.

6. The method of claim 5 wherein the step of determining the charge rate for said call includes the steps of:

determining the time of day;

10 determining the day of the week;

determining an origin and a destination for the call; and

applying an applicable charge rate.

7. The method of claim 5 wherein the step of instructing the O-MSC to time the call includes sending a message from the HLR to the O-MSC instructing the O-MSC to time the call.

8. The method of claim 7 wherein the step of sending a message from the HLR to the O-MSC instructing the O-MSC to time the call includes sending an instruction to time the call in an Origination Request Return Result message.

9. The method of claim 7 further comprising the step of utilizing a timer in said O-MSC to time the call while the call is in progress.

25 10. The method of claim 9 wherein the step of disconnecting said call if the call exceeds the time limit includes the steps of:

sending a message from the O-MSC to the HLR notifying the HLR that the time limit has expired; and

30 sending a message from the HLR to the O-MSC instructing the O-MSC to disconnect the call.

- 11 -

11. The method of claim 10 wherein the step of sending a message from the O-MSC to the HLR notifying the HLR that the time limit has expired includes notifying the HLR that the time limit has expired in a Notification Invoke message.

5           12. The method of claim 10 wherein the step of sending a message from the HLR to the O-MSC instructing the O-MSC to disconnect the call includes sending an instruction in a Notification Return Result message.

10           13. The method of claim 1 further comprising the step of sending an announcement to the subscriber telling the subscriber why the call was disconnected.

            14. In a radio telecommunications system, a method of limiting charges on a subscriber's account to an available balance, said method comprising the steps of:

15           storing said available balance in the subscriber's home location register (HLR);

            storing, in a subscriber profile in the subscriber's HLR, an instruction to monitor charges incurred by the subscriber's mobile station;

20           informing said HLR that a terminating call has been received for the subscriber;

            converting said available balance to a time limit for said call;

            instructing a Gateway Mobile Switching Center (G-MSC) to time said call;

and

            disconnecting said call if the call exceeds the time limit.

25

            15. The method of claim 14 wherein the step of converting said available balance to a time limit for said call includes the steps of:

            determining the charge rate for said call; and

            dividing the available balance by the determined charge rate.

30

- 12 -

16. The method of claim 15 wherein the step of determining the charge rate for said call includes the steps of:

determining the time of day;

determining the day of the week;

5 determining an origin and a destination for the call;

determining what portion of the charge the subscriber is responsible for; and

applying an applicable charge rate.

17. The method of claim 15 wherein the step of instructing the G-MSC  
10 to time the call includes sending a message from the HLR to the G-MSC instructing the G-MSC to time the call.

18. The method of claim 17 wherein the step of sending a message from the HLR to the G-MSC instructing the G-MSC to time the call includes sending an  
15 instruction to time the call in a Location Request Return Result message.

19. The method of claim 17 further comprising the step of utilizing a timer in said G-MSC to time the call while the call is in progress.

20. The method of claim 19 wherein the step of disconnecting said call  
20 if the call exceeds the time limit includes the steps of:

sending a message from the G-MSC to the HLR notifying the HLR that the time limit has expired; and

25 sending a message from the HLR to the G-MSC instructing the G-MSC to disconnect the call.

21. The method of claim 20 wherein the step of sending a message from the G-MSC to the HLR notifying the HLR that the time limit has expired includes notifying the HLR that the time limit has expired in a Notification Invoke message.

30

- 13 -

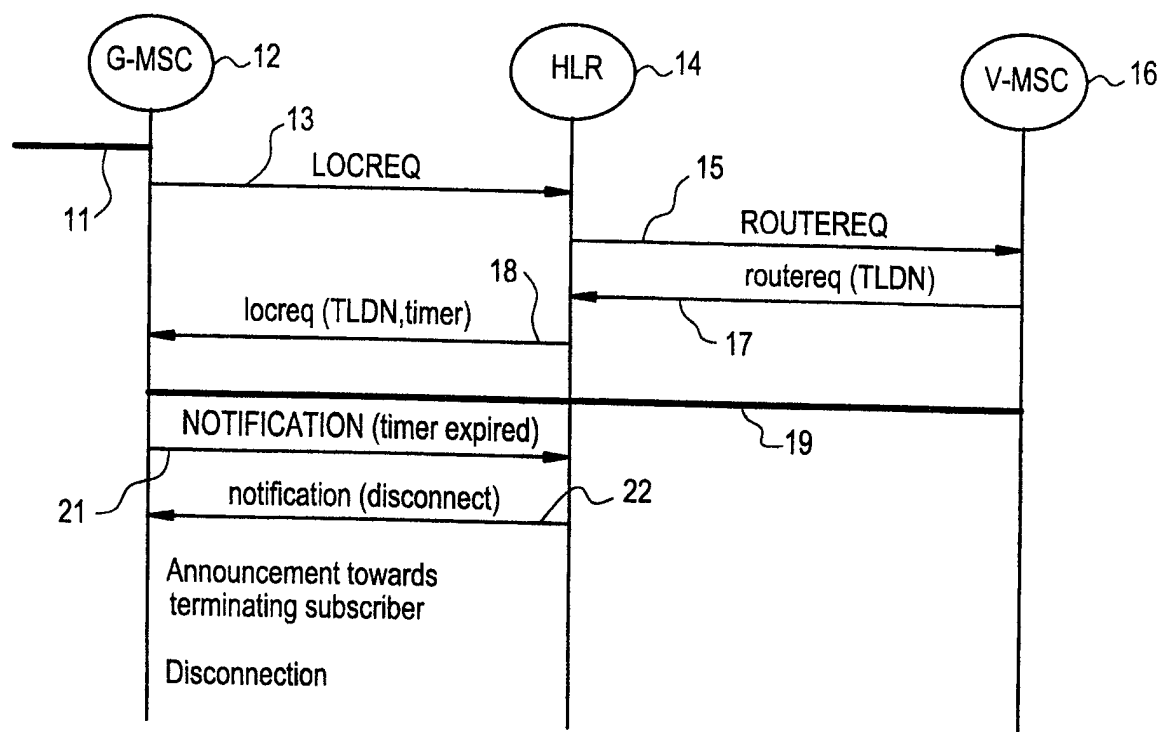
22. The method of claim 20 wherein the step of sending a message from the HLR to the O-MSC instructing the O-MSC to disconnect the call includes sending an instruction in a Notification Return Result message.

5           23. The method of claim 14 further comprising the step of sending an announcement to the subscriber telling the subscriber why the call was disconnected.

10

1 / 4

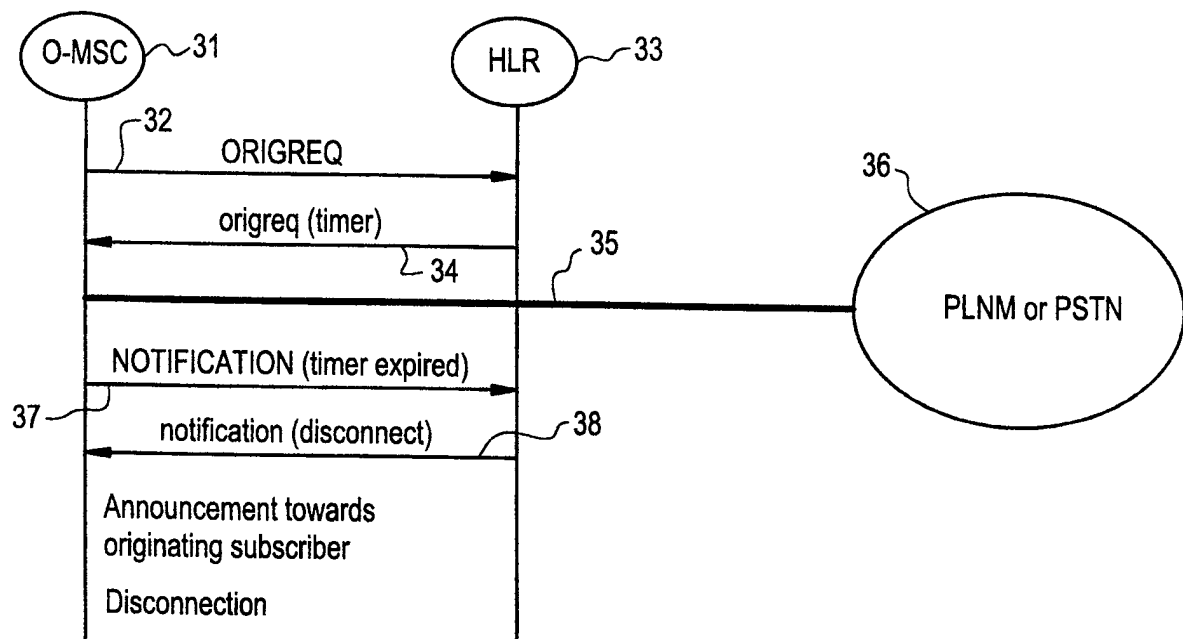
FIG. 1





2 / 4

FIG. 2



3 / 4

FIG. 3A

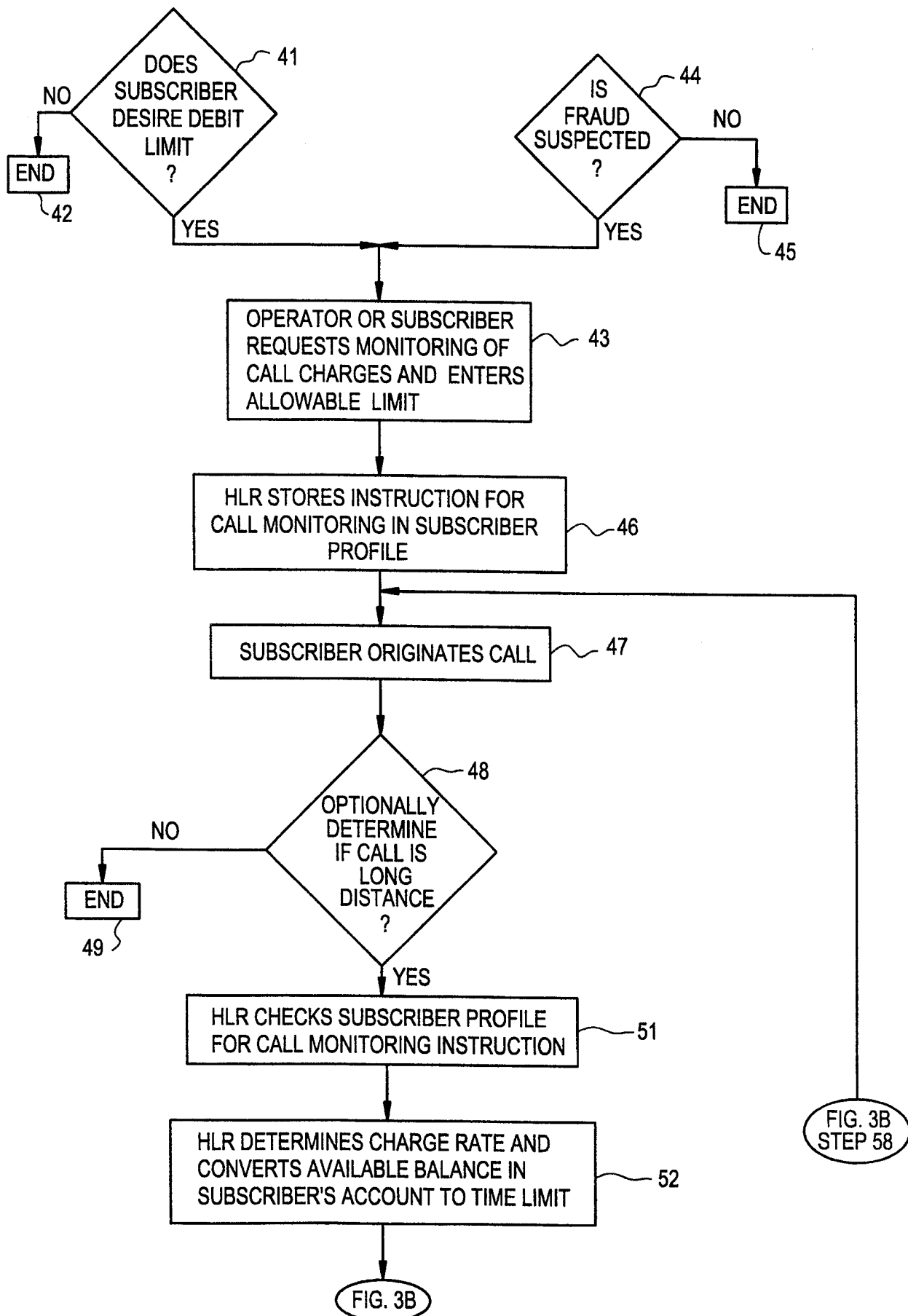
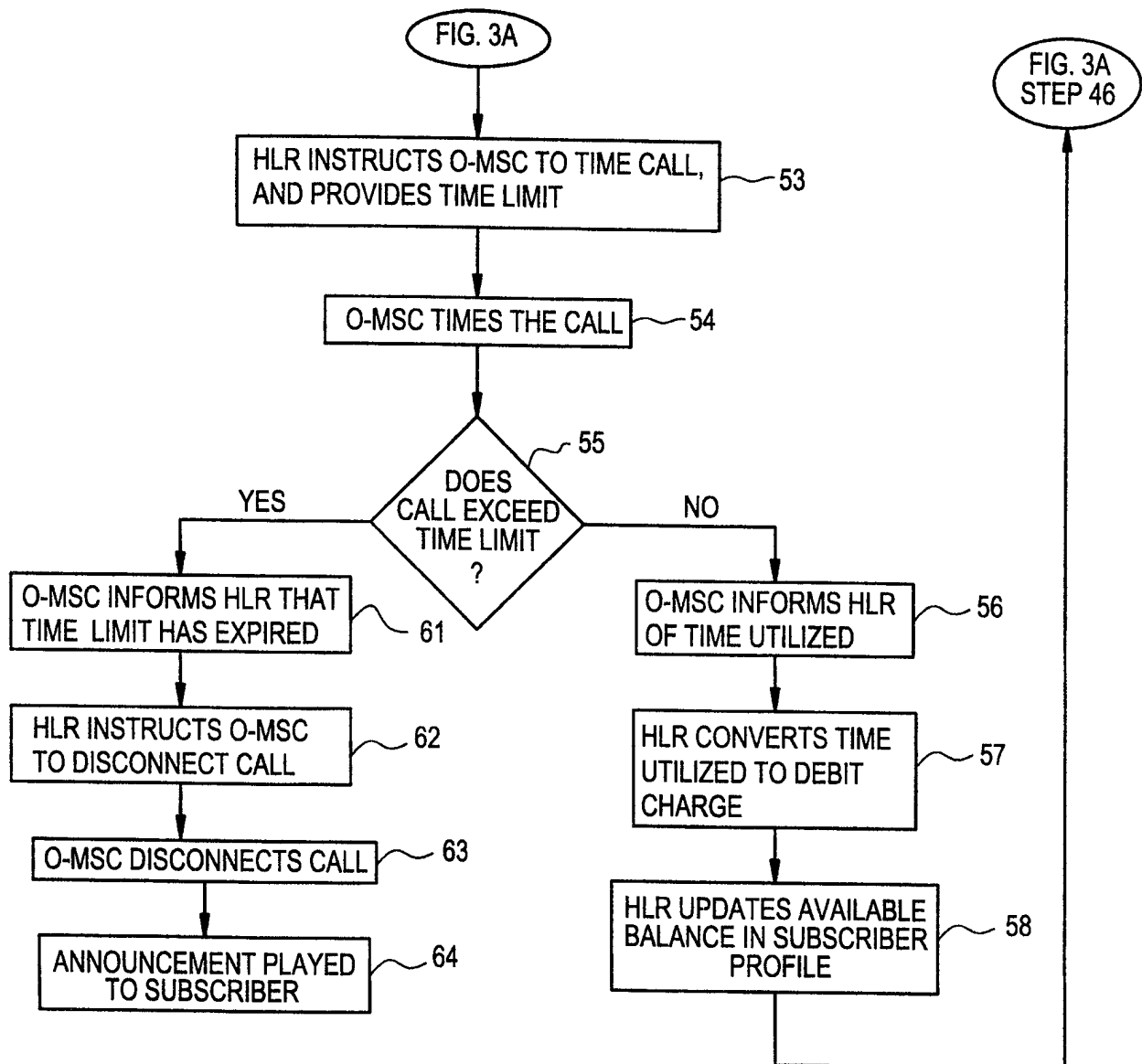


FIG. 3B



# INTERNATIONAL SEARCH REPORT

International Application No

PCT/SE 98/00520

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 6 H04M15/00 H04Q7/22

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)

IPC 6 H04M H04Q

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

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

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 746 135 A (SIEMENS AG) 4 December 1996	1-3, 5-7, 9, 10, 13-17, 19, 20, 23
A	see column 1, line 1 - column 2, line 59 see column 3, line 42 - column 6, line 10 see claims 1, 2	8, 11, 12, 18, 21, 22
A	WO 93 12606 A (CELLULAR TECH SERVICES) 24 June 1993  see page 2, line 15 - page 4, line 14 see page 18, line 5 - page 19, line 22 see claims 1-5, 9-11	1-3, 6, 10, 13, 14, 16, 20, 23
	-/--	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

7 September 1998

Date of mailing of the international search report

15/09/1998

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax: (+31-70) 340-3016

Authorized officer

Neves Appelt, D

# INTERNATIONAL SEARCH REPORT

International Application No

PCT/SE 98/00520

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 592 535 A (KLOTZ BERNHARD) 7 January 1997 see column 1, line 41 - column 4, line 3 ---	1,13
A	DE 44 14 500 A (DEUTSCHE TELEKOM MOBIL) 2 November 1995 see column 1, line 1 - column 2, line 67 ---	1-3
A	EP 0 705 019 A (AT & T CORP) 3 April 1996  see column 1, line 43 - column 2, line 46 see column 14, line 1 - column 15, line 2 ---	3,4,6, 13,16,23
A	US 5 450 477 A (DESMEDT WILLIAM H ET AL) 12 September 1995 cited in the application see abstract -----	5,6,15

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/SE 98/00520

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0746135 A	04-12-1996	DE 19519766 A	05-12-1996
WO 9312606 A	24-06-1993	AU 3238793 A	19-07-1993
		US 5517555 A	14-05-1996
US 5592535 A	07-01-1997	DE 4312362 A	20-10-1994
		EP 0630165 A	21-12-1994
DE 4414500 A	02-11-1995	AT 156641 T	15-08-1997
		AU 2066095 A	16-11-1995
		WO 9529554 A	02-11-1995
		DE 19580370 D	02-10-1997
		DE 59500481 D	11-09-1997
		DK 757871 T	02-03-1998
		EP 0757871 A	12-02-1997
		ES 2108578 T	16-12-1997
		GR 3025300 T	27-02-1998
		ZA 9503344 A	09-01-1996
EP 0705019 A	03-04-1996	US 5559871 A	24-09-1996
		CA 2154602 A	24-03-1996
		JP 8191357 A	23-07-1996
US 5450477 A	12-09-1995	CA 2076433 A	01-05-1993
		DE 69224585 D	09-04-1998
		EP 0540234 A	05-05-1993
		JP 6290195 A	18-10-1994