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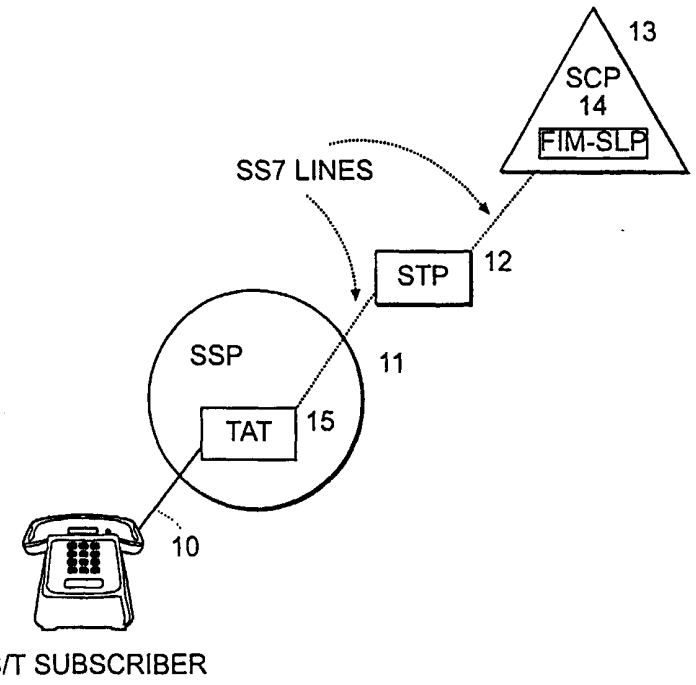
(54) Title: MULTIPLE SERVICES PER TRIGGER

(57) Abstract

The present invention allows a single trigger, such as a Termination Attempt Trigger, to invoke multiple feature service logic programs (feature SLPs) through the use of a Feature Interaction Manager service logic program (FIM–SLP) installed at a service control point (SCP). A database, accessible by the service control point, contains subscriber information such as the type of services subscribed and the order in which the services are to be invoked. The Feature Interaction Manager service logic program invokes individual feature SLPs based on the information contained in the database that specify how the feature SLPs will interact. In one embodiment, the present invention allows multiple services to be deployed within a common service control point. In a different embodiment, the Feature Interaction Manager service logic program located in a first service control point can also invoke features SLPs that are located in other service control points. The Feature Interaction Manager SLP and the feature SLPs can reside on the same SCP. Alternatively, the Feature Interaction Manager SLP and feature SLPs can reside on multiple SCPs. In the case of multiple SCPs, the Feature Interaction Manager SLP can reside by itself or can be co–located with one or more feature SLPs.



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MULTIPLE SERVICES PER TRIGGER

This application claims priority from U.S. Provisional Patent Application Serial No. 60/129,116 filed April 14, 1999.

BACKGROUND

Field of the Invention

The present invention relates generally to telecommunication systems and more particularly relates to a method and system for providing multiple services per trigger to a subscriber.

Background of the Invention

In the telecommunication industry today, many advanced services are available to telephone line subscribers in which a customer can set up her telephone line in such a way that a number of tasks could be performed by the telephone system before ringing the subscriber's telephone. For example, in an advanced intelligent network (AIN) structure, the Flexible Call Forwarding service allows a Flexible Call Forwarding subscriber to receive all calls made to her home telephone number at any location she so designates. AIN structures are described in U.S. Patent No. 5,701,301, which is hereby incorporated by reference. The Flexible Call Forwarding service can be provided through the use of a Termination Attempt Trigger (TAT) and the Flexible Call Forwarding Service Logic Program (SLP). The Flexible Call Forwarding service is one example of several services that are implemented using feature SLPs. Feature SLPs are software subsystems

implemented in, *e.g.*, a Service Control Point, that are used to provide specific services to subscribers. The TAT is located at the service switching point (SSP) to which the Flexible Call Forwarding subscriber's telephone line is physically connected. The Flexible Call Forwarding SLP helps the SCP process queries originating from the TATs of Flexible Call Forwarding subscribers. For example, when a Flexible Call Forwarding subscriber's telephone number is dialed by a caller, prior to ringing the Flexible Call Forwarding subscriber's telephone, the TAT sends an AIN query to the SCP. The AIN query contains a specific Translation Type that is unique for all TATs serving Flexible Call Forwarding subscribers. In a preferred embodiment, this AIN query goes through a signal transfer point (STP) where the Translation Type prompts the STP to add a subsystem number specific to the Flexible Call Forwarding SLP to the query. Thus each subsystem number is unique to a specific subsystem of the SCP. The Flexible Call Forwarding SLP then goes through appropriate steps to process that call. If the Flexible Call Forwarding service has been activated by the Flexible Call Forwarding subscriber, the call is routed to the predetermined destination as designated by the Flexible Call Forwarding subscriber. Otherwise, the Flexible Call Forwarding SLP prompts the SCP to send an instruction authorizing the SSP to put the call through to the default location.

Similarly, when an Internet Call Waiting subscriber's telephone number is dialed, the Internet Call Waiting subscriber's SSP sends a query

to the SCP asking for instructions before allowing the call to go through. The SCP, through the Translation Type and the subsystem number that are specific to the Internet Call Waiting subscriber's TAT and the Internet Call Waiting SLP, respectively, consults the Internet Call Waiting SLP to determine whether the Internet Call Waiting subscriber had activated the Internet Call Waiting service. If the Internet Call Waiting service has been activated by the Internet Call Waiting subscriber, the SCP sends an authorization to the SSP to put the call through, and the subscriber is alerted that there is an incoming call waiting while she is connected to the Internet. Otherwise, the Internet Call Waiting SLP would cause the SCP to send a different instruction directing the SSP to inform the caller that the Internet Call Waiting subscriber's telephone line is busy or is otherwise unavailable.

One major limitation of the current AIN structure is that each TAT can only invoke one feature SLP. In other words, a Flexible Call Forwarding subscriber may not simultaneously subscribe to other services such as Internet Call Waiting, Privacy Director, and Messaging. This gives telephone line subscribers limited choices, despite the variety of services available to them. For example, under the current AIN structure, an Internet Call Waiting subscriber who wants to subscribe to one of the other services offered at the same AIN trigger must give up the Internet Call Waiting service.

SUMMARY OF THE INVENTION

The present invention makes it possible for a customer to subscribe to multiple services simultaneously using a single trigger, such as a Termination Attempt Trigger (TAT), that is connected to her telephone line. In a preferred embodiment, the present invention makes it possible for a single TAT to invoke multiple feature Service Logic Programs (feature SLPs) in an order determined by the Multiple Services per Trigger subscriber. The present invention provides telephone line subscribers with greater flexibility for handling incoming calls through various services, including without limitation, Flexible Call Forwarding, Internet Call Waiting, and Privacy Director and Messaging.

The setup procedures for the present invention are straightforward. In a preferred embodiment, a Multiple Services per Trigger subscriber calls the business office of the telephone company to designate the type of services she wishes to have, and the order in which the services are to be invoked. Then, a TAT is installed at the service switching point (SSP) that is physically connected to the subscriber's telephone line. A unique Translation Type specific to Multiple Services per Trigger subscribers, *e.g.*, "220," is then assigned to the subscriber's TAT. The business office then updates a database that is accessible by a service control point (SCP) with the Multiple Services per Trigger subscription information. Following this setup, the subscriber can subsequently update the database to activate or deactivate the various services as often as she wants to.

In a preferred embodiment, various feature SLPs are present at the SCP to which all queries from SSPs are directed. The feature SLPs process incoming queries and prompt the SCP to send appropriate instructions to the SSPs from which the queries had originated. Each feature SLP performs a specific task. For example, a Flexible Call Forwarding SLP processes the incoming calls of Flexible Call Forwarding subscribers, an Internet Call Waiting SLP processes Internet Call Waiting subscribers' incoming calls, and a Privacy Director SLP processes Privacy Director subscribers' incoming calls.

The present invention is implemented by installing a Feature Interaction Manager SLP on an SCP in the network. The Feature Interaction Manager SLP manages all feature SLPs, whether the feature SLPs are located within the same SCP on which the Feature Interaction Manager SLP resides, or on other SCPs. The Feature Interaction Manager SLP has access to a database that contains subscriber information that lists which customers subscribe to which AIN service or services. The database also defines how multiple services subscribed by a single subscriber are to be invoked and the location of the SLP in the network.

For example, when a query comes from the TAT of a Multiple Services per Trigger subscriber, the unique "220" Translation Type assigned to that TAT would cause the signal transfer point (STP) to supply the corresponding subsystem number (SSN) of the Feature Interaction Manager SLP to the query. Each subsystem number is unique to a specific SLP. For example,

the Flexible Call Forwarding SLP, Internet Call Waiting SLP, and Privacy Director SLP might have subsystem numbers of "1," "2," and "3," respectively. The Feature Interaction Manager SLP also has its own subsystem number. In this example, the Feature Interaction Manager's subsystem number could be "4." When the STP receives the query from the SSP with Translation Type of "220," the STP supplies subsystem number of "4" to the query and forwards the query to the SCP. When the SCP receives the query with the subsystem number "4," it routes the query to the Feature Interaction Manager SLP. The Feature Interaction Manager SLP then consults the database to find out which services the Multiple Services per Trigger subscriber had contracted for, and the service interaction rules that prescribe the order in which the subscribed services are to be invoked.

For example, if Subscriber A has ordered both Internet Call Waiting and Flexible Call Forwarding services (in that order), and Subscriber A had also activated both services, a query from her TAT would cause the Feature Interaction Manager SLP to invoke the Internet Call Waiting SLP first. The Internet Call Waiting SLP would then prompt the SCP to alert Subscriber A that a call is waiting if she is connected to the Internet. If Subscriber A is not on line or is otherwise unavailable at her telephone, the Feature Interaction Manager SLP would then invoke the next feature SLP, namely, the Flexible Call Forwarding SLP. Then, the Flexible Call Forwarding SLP would process the query by instructing the SSP to route the call to the forwarding telephone number designated by Subscriber A.

In a different example in which Subscriber B has a subscription to Flexible Call Forwarding and Internet Call Waiting services (in that order), the procedures would be reversed. In other words, all incoming calls of Subscriber B would be forwarded to the predetermined forwarding telephone number. The Internet Call Waiting SLP would be invoked only if Subscriber B had deactivated the Flexible Call Forwarding service and updated the database accordingly.

Accordingly, it is an object of the present invention to allow telephone line subscribers greater flexibility in managing incoming calls.

It is another object of the present invention to allow a single trigger to support multiple services.

It is a further object of the present invention to provide a telephone network in which additional services can be readily provided to a telephone network's subscribers.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1a is a schematic diagram illustrating an advanced intelligent network embodying a preferred embodiment of the Feature Interaction Manager ("FIM") of the present invention.

Figure 1b is a flowchart illustrating the steps by which a query is forwarded to the Feature Interaction Manager according to a preferred embodiment of the present invention.

Figure 2a is a schematic diagram illustrating a service control point (SCP) embodying a preferred embodiment of the Feature Interaction Manager of the present invention.

Figure 2b is a flowchart illustrating the steps by which the Feature Interaction Manager processes a query according to a preferred embodiment of the present invention.

Figure 3a is a schematic diagram illustrating a specific example of the manner in which the Feature Interaction Manager processes a query according to a preferred embodiment of the present invention.

Figure 3b is a flowchart illustrating a specific example of the steps by which the Feature Interaction Manager processes a query according to a preferred embodiment of the present invention.

Figure 4 is a schematic diagram illustrating a Feature Interaction Manager which manages feature service logic programs (SLPs) located in different service control points.

Figure 5 is a flowchart illustrating the logic of a Feature Interaction Manager service logic program of the present invention.

Figure 6 is a schematic diagram illustrating another preferred embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

The present invention includes a Feature Interaction Manager Service logic program that manages individual feature service logic

programs (feature SLPs) such as the Flexible Call Forwarding SLP, the Internet Call Waiting SLP, the Privacy Director SLP, the Advanced Intelligent Messaging SLP, and the Simultaneous Ringing SLP. The Feature Interaction Manager SLP determines the order in which multiple feature SLPs are to be invoked based on service interaction rules. The Feature Interaction Manager SLP invokes the first feature SLP and waits for a response. The Feature Interaction Manager SLP then evaluates the response from the feature SLP, and, based on the rules for how the feature SLPs interact, determines if the next feature SLP should be invoked or if the response should be sent to the SSP. This process continues as long as additional feature SLPs can be invoked.

When the Feature Interaction Manager SLP receives the appropriate response from an activated feature SLP, or when no feature SLP has been activated, the Feature Interaction Manager SLP prompts the service control point (SCP) to instruct the service switching point (SSP) from which the query had originated to process the call accordingly.

Figure 1a is a schematic diagram illustrating an advanced intelligent network embodying a preferred embodiment of the Feature Interaction Manager ("FIM") of the present invention. As shown in Figure 1a, a subscriber of the present invention has a telephone line 10 that is connected to an SSP 11. Subscribers who use the present invention shall be referred to herein as Multiple Services per Trigger subscribers ("MS/T Subscriber"). In a preferred embodiment, the subscriber's telephone line 10 is provisioned

with a trigger, such as Termination Attempt Trigger (TAT) 15. The trigger is provisioned with a unique Translation Type that is specific for Multiple Services per Trigger subscribers. SSP 11, in turn, is connected to a signal transfer point (STP) 12 via the SS7 signaling system of the advanced intelligent network (AIN). Any query originating from the Multiple Services per Trigger subscriber's TAT 15 and sent through SSP 11 to STP 12 carries the specific Translation Type as well as the originating point code of SSP 11. When STP 12 receives the query, STP 12 supplies a corresponding subsystem number that is specific to the Feature Interaction Manager SLP (FIM-SLP) 14. In other words, a query from a non-MS/T subscriber carrying a different Translation Type does not receive the subsystem number of the Feature Interaction Manager SLP, but may receive the subsystem number that invokes a specific feature SLP. Thus, when the query from SSP 11 reaches SCP 13, the query is immediately routed to Feature Interaction Manager SLP 14.

Figure 1b is a flowchart illustrating the steps by which a query is forwarded to the Feature Interaction Manager according to a preferred embodiment of the present invention. In this specific example, a caller dials the telephone number of the Multiple Services per Trigger (MS/T) subscriber in step 101. Then in step 102, TAT 15 is triggered by the call. Instead of routing the call through immediately, the call is suspended. TAT 15 then prompts SSP 11, in step 103, to send a query to SCP 13 via STP 12. The query contains a Translation Type of "220" that has been assigned to TAT

15. In step 104, STP 12 recognizes the Translation Type of "220" as one that has been originated by a TAT that is assigned to a Multiple Services per Trigger subscriber. Therefore, STP 12 supplies the subsystem number "4" to the query. When SCP 13 receives the query in step 105, it recognizes the subsystem number "4" to be the subsystem number of Feature Interaction Manager SLP 14. As a result, in step 106, SCP 13 routes the query to Feature Interaction Manager SLP (FIM-SLP) 14 for processing. Finally, in step 107, Feature Interaction Manager SLP 14 processes the call according to the Multiple Services per Trigger subscriber's instructions, *i.e.*, Feature Interaction Manager SLP 14 invokes feature SLPs in the specific order designated by the Multiple Services per Trigger subscriber.

Figure 2a is a schematic diagram illustrating a service control point (SCP) embodying a preferred embodiment of the Feature Interaction Manager of the present invention. In this embodiment, SCP 13 contains a Feature Interaction Manager SLP 14, a first feature SLP 15, a second feature SLP 16, and a third feature SLP 17. In this preferred embodiment, when SCP 13 receives a query from a Multiple Services per Trigger subscriber, the query is forwarded to Feature Interaction Manager SLP 14 because of the subsystem number contained in the query. Feature Interaction Manager SLP 14 then consults Database 18 that contains, among other information, a table showing different sets of valid service combinations. For example, a telephone company that offers three services such as Flexible Call Forwarding (FCF), Internet Call Waiting (ICW), and

Privacy Director (PD), could have up to 15 service groups as shown in Table A below.

Table A: Possible Service Combinations of FCF, ICW, and PD

Service Group Number	Order of Service Execution
001	FCF
002	ICW
003	PD
004	FCF, ICW
005	ICW, FCF
006	FCF, PD
007	PD, FCF
008	ICW, PD
009	PD, ICW
010	FCF, ICW, PD
011	FCF, PD, ICW
012	ICW, FCF, PD
013	ICW, PD, FCF
014	PD, FCF, ICW
015	PD, ICW, FCF

As a practical matter, however, one skilled in the art would recognize that not all the service groups shown in Table A are necessarily commercially practicable.

In addition to Table A, Database 18 might also contain a second table associating specific subscribers to their subscribed sets of valid service combinations, such as the examples of relationships shown in Table B below.

Table B: Customer Group Subscription Table

Customer Telephone Number	Service Group
404-332-2166	004
404-332-2189	006
404-332-7239	001
404-332-1234	007
404-332-2310	013
404-332-2361	005
404-332-3222	010

Database 18 might also contain a third table identifying the location of each feature SLP by point code and subsystem number, such as shown in Table C below.

Table C: Location of Feature SLP Table

Feature SLP	Point Code	Subsystem Number
FCF	252001230	1
ICW	252001230	2
PD	252002260	3

Figure 2b is a flowchart illustrating the steps by which the Feature Interaction Manager processes a query according to a preferred embodiment of the present invention. In step 201, SCP 13 receives a query containing a subsystem number. In step 202, the SCP determines whether the subsystem number contained in the query matches that of Feature Interaction Manager SLP 14. If it does not, SCP 13, in step 203, routes the query to an appropriate feature SLP with the same subsystem number that is in the query, and the appropriate feature SLP would process the call in step 204.

If the subsystem number contained in the query is the subsystem number of Feature Interaction Manager SLP 14, SCP 13 channels the query to Feature Interaction Manager SLP 14. In step 205, Feature Interaction Manager SLP 14 consults Database 18. From a table such as Table B above, Feature Interaction Manager SLP 14 determines the specific feature SLPs to which the Multiple Services per Trigger subscriber has subscribed. Furthermore, from a table such as that shown in Table A, Feature Interaction Manager SLP 14 determines the order in which the feature SLPs are to be invoked. As a result, in step 206, Feature Interaction Manager SLP 14 routes the query to the appropriate feature SLP based on the information in Table C in Database 18.

In step 207, if that feature SLP has not been activated, the process returns to Feature Interaction Manager SLP 14 in step 208 to consult Database 18 for the next feature SLP. The process in the loop of steps 205,

206, 207, 208, and 209 continues until an activated feature SLP is found or all feature SLPs in the service group have been consulted and no activated service is found. Once the end of the list is encountered in step 209, the process stops in step 210 where Feature Interaction Manager SLP 14 authorizes SSP 11 to terminate the call.

If in step 207 the feature SLP has been activated, it processes the query in step 211 and sends a response to the Feature Interaction Manager SLP 14. In step 212, Feature Interaction Manager SLP 14 consults Database 18 for the rules defining how the feature SLPs interact (*i.e.*, the service interaction rules) to determine what response should be sent to SSP 11. In step 213, SSP 11 executes the instruction received from SCP 13

For each combination or permutation shown in Table A, service interaction rules on how the services would interact must be defined and be available to the Feature Interaction SLP. For example, the service interaction rules for Service Group 004 might be as follows:

Execute Flexible Call Forwarding SLP

State After Execution	Next Action
(1) Forward-call	Forward_Call
(2) Allow-call	Execute Internet Call Waiting SLP

State After Execution	Next Action
(a) Accept-call	Authorize_Termination
(b) Reject-call	Disconnect
(c) Timeout, Default	Authorize_Termination

(3) Block-call	Send_to_Resource
(4) Timeout, Default	Authorize_Termination

Based the specific example above, a subscription to Service Group 004 might result in four mutually exclusive alternative call processing routes. First, if the subscriber had activated the Flexible Call Forwarding service, the call will be forwarded as shown in Alternative (1). Second, if the call forwarding service had not been activated, but the Internet Call Waiting service had been activated such as shown in Alternative (2), then the subscriber can exercise one of three options: (a) accept the call; (b) reject the call; and (c) ignore the call. Third, the Flexible Call Forwarding service may provide that all incoming calls be blocked if the subscriber has selected such an option. Finally, the service interaction rules might also include a default

feature where after a certain time has elapsed, the call is automatically terminated.

The example shown above is only illustrative and is not an exhaustive list of the rules required for either the Flexible Call Forwarding service or the Internet Call Waiting service. For each feature SLP, the state after the feature SLP is executed must be identified with a corresponding next action. In some cases, the state after a feature SLP is executed will have a next action that responds to the SSP. In some cases, the next action will be to invoke the next feature SLP in the sequence.

Figure 3a is a schematic diagram illustrating a specific example of the manner in which the Feature Interaction Manager processes a query according to a preferred embodiment of the present invention. Figure 3b is a flowchart illustrating a specific example of the steps by which the Feature Interaction Manager processes a query according to a preferred embodiment of the present invention.

In this example, a caller has dialed "404-332-2166," the telephone number of a Multiple Services per Trigger subscriber. As described above, a query from the Multiple Services per Trigger subscriber's TAT 15 and SSP 11 prompts STP 12 to supply the subsystem number of "4" to SCP 13, such as that shown in step 301 (see Figure 3b). In step 302, when Feature Interaction Manager SLP 14 (FIM-SLP 14) receives the query, it consults Database 18 that contains, among other information, Tables A, B, and C described above, and service interaction rules for each Service Group listed

in Table A. From Table B, telephone number "404-332-2166" is associated with Service Group 004. From Table A, Service Group 004 provides that the Multiple Services per Trigger subscriber wants to have the Flexible Call Forwarding service invoked before the Internet Call Waiting service. As a result, in step 303, Database 18 tells Feature Interaction Manager SLP 14 to invoke Flexible Call Forwarding SLP 15 (FCF-SLP 15) first. The location of Flexible Call Forwarding SLP 15 can be obtained from Table C. In step 304, Feature Interaction Manager SLP 14 forwards the query to Flexible Call Forwarding SLP 15. In step 304a, if the Multiple Services per Trigger subscriber has activated the Flexible Call Forwarding service, Flexible Call Forwarding SLP 15 forwards a response to Feature Interaction Manager SLP 14 in step 305a. SCP 13 then instructs SSP 11, in step 305b, to forward the call per the response from Feature Interaction Manager SLP 14 to a forwarding telephone number that the Multiple Services per Trigger subscriber supplied when the subscriber activated the Flexible Call Forwarding service. Otherwise, the response is routed to Feature Interaction Manager SLP 14 for further processing in step 305c.

In step 306, Feature Interaction Manager SLP 14 consults Database 18 for the second time. Based on Table A, Database 18 tells Feature Interaction Manager SLP 14, in step 307, that Internet Call Waiting SLP 16 (ICW-SLP 16) is to be invoked next. In step 308, Feature Interaction Manager SLP 14 forwards the query to Internet Call Waiting SLP 16 and the Internet Call Waiting service is executed. In step 308a, if the Internet

Call Waiting service has been activated, Internet Call Waiting SLP 16 sends a response to Feature Interaction Manager SLP 14 in step 309a to authorize SSP 11 to terminate the call. As a result, SCP 13 instructs SSP 11 in step 309b to alert the Multiple Services per Trigger subscriber that a call is waiting if the subscriber is engaged in a communication session with her Internet service provider. However, if the Internet Call Waiting service has not been activated, the response is returned to Feature Interaction Manager SLP 14 in step 309c. Feature Interaction Manager SLP 14 then consults Database 18 for the third time in step 310. Since Service Group 004 contains only two feature SLPs both of which have been invoked, Database 18 informs Feature Interaction Manager SLP 14 in step 311 that the end of the list has been reached. Based on the service interaction rules, Feature Interaction Manager SLP 14 responds to SSP 11 to authorize call termination and forwards that instruction to SSP 11 in step 312.

The interactions between Feature Interaction Manager SLP 14 and all feature SLPs are made possible through an SCP platform. In a preferred embodiment, an SCP platform capability that supports AIN inter-SLP communications may be used. In such an embodiment, the AIN messages defined in Bellcore generic requirements (*e.g.*, GR-1299-CORE) for communicating between the SSP and SCP will also be used for inter-SLP communication between the Feature Interaction Manager SLP and feature SLPs.

In a further embodiment illustrated in Figure 4, a Feature Interaction Manager SLP can also manage feature SLPs located in different SCPs. As shown in the example of Figure 4, Feature Interaction Manager SLP (FIM-SLP) 44, Flexible Call Forwarding (FCF) SLP 45, Internet Call Waiting (ICW) SLP 46, and Database 48 are located with SCP 43. Privacy Director SLP 47, however, is located within SCP 23. In this example, a query from the SSP of a customer subscribing to Service Group 003 (Privacy Director service only) is processed as follows.

Feature Interaction Manager SLP 44 consults Database 48 after it is invoked. Database 48 then informs Feature Interaction Manager SLP 44 that the feature SLP to be invoked, Privacy Director-SLP 17, is located in SCP 23. As a result, Feature Interaction Manager SLP 14 channels the query out of SCP 43, and routes the query via SS7 network to SCP 23 on which Privacy Director SLP 47 is located. After processing the call, Privacy Director SLP 47 returns the results to Feature Interaction Manager SLP 44. Finally, an instruction is given to the SSP from which the query had originated.

As illustrated in this example shown in Figure 4, the present invention is capable of managing multiple feature SLPs located in different SCPs. In addition, the present invention is also capable of managing a single feature SLP. This capability allows the telephone company to add new services to a subscriber's line as they are ordered by the subscriber. To add new services to a subscriber's line, the telephone company just has to

change the Translation Type of the TAT at the SSP if the Translation Type does not already specify the Translation Type corresponding to a Multiple Services per Trigger subscriber, and update Database 48 accordingly.

Figure 5 is a flowchart illustrating the logic of a preferred embodiment of a Feature Interaction Manager SLP of the present invention. As described above, the Feature Interaction Manager SLP is located within an SCP of an AIN structure. In step 501, the Feature Interaction Manager SLP receives a query from an SSP. In step 502, the Feature Interaction Manager SLP consults a database containing, among other information, a table similar to Table B discussed above, to find out which service group the subscriber belongs to. In step 503, if such inquiry is unsuccessful, *e.g.*, the database is down, the Feature Interaction Manager SLP, in step 504, sends a default response to the SSP from which the query had originated. The default response could be, for example, an instruction containing an authorization for the SSP to terminate the call.

On the other hand, if the Feature Interaction Manager SLP is able to determine the service group to which the subscriber belongs, the Feature Interaction Manager SLP proceeds to step 506 to retrieve service interaction rules that are unique to the service group. In step 507, if the retrieval of service interaction rules is unsuccessful, the Feature Interaction Manager SLP, in step 508, sends the default response to the SSP. If the retrieval of service interaction rules is successful, the Feature Interaction Manager SLP, in step 510, invokes the first feature SLP specified in the service

interaction rules. In step 511, the Feature Interaction Manager SLP sets a timer for the feature SLP to respond. One of ordinary skill in the art would understand that the time limit specified in step 511 must be shorter than the time limit set by the SSP for a response from the SCP. In step 512, if the timer expires before the invoked feature SLP responds, the Feature Interaction Manager SLP proceeds to step 513 to execute an appropriate timeout action or to generate an error message in step 514.

Otherwise, in step 515, the Feature Interaction Manager SLP receives a response from the first feature SLP, and it evaluates the response in step 516. If the response from the feature SLP is invalid or is otherwise not executable, the Feature Interaction Manager SLP sends the default response to the SSP in step 517. If the response from the feature SLP is valid (*i.e.*, a response of the type that the Feature Interaction Manager SLP is expecting based on service interaction rules, such as forward the call or authorize termination), the Feature Interaction Manager SLP makes a further determination in step 519 whether to respond to the SSP. In step 519, the Feature Interaction Manager SLP evaluates the response based on the service interaction rules to determine if another SLP should be executed before a final response is sent to the service switching point. For example, if the Flexible Call Forwarding SLP responds with Allow_Call, Service Group 004 rules require that the Internet Call Waiting SLP be invoked before a response is sent to the service switching point. In that case, the process returns to step 510 to invoke the Internet Call Waiting SLP. On the other

hand, if the response in step 519, in the case of Service Group 004, is "Forward-call" or "Block-call," the Feature Interaction Manager SLP proceeds to step 520 to send an appropriate instruction to the SSP.

Figure 6 is a schematic diagram showing another preferred embodiment of the present invention having multiple SCPs. As shown on Figure 6, Feature Interaction Manager SLP (FIM-SLP) 71 resides on SCP 61 while feature SLP 72, feature SLP 73, feature SLP 74, and feature SLP 75 reside on other SCPs. As demonstrated, the present invention allows the Feature Interaction Manager SLP to reside on an SCP by itself, or on an SCP with one or more feature SLPs as shown in Figures 2a and 3a.

The specific types of AIN services identified above, namely Flexible Call Forwarding, Internet Call Waiting, Privacy Director, Advanced Intelligent Messaging, and Simultaneous Ringing, are provided as specific examples of services that the present invention can manage and is not intended to be an exhaustive list of types of such features. When used in this patent specification these terms are not intended to refer to any particular feature or service but rather to any feature or service generally of the type described below:

Flexible Call Forwarding service: upon receiving an incoming call directed to a first telephone number, forwarding the call to a second telephone number predetermined by the subscriber;

Internet Call Waiting: upon receiving an incoming call while the telephone line is connected to an Internet service provider, alerting the subscriber (called party) that an incoming call is waiting;

Privacy Director: screening all incoming calls and blocking calls originated by callers who do not supply their identities;

Advanced Intelligent Messaging: providing the calling party with a variety of options to leave messages for the subscriber; and

Simultaneous Ringing: upon receiving an incoming call intended for a first telephone number; generating multiple calls to a list of predetermined telephone numbers.

The foregoing disclosure of embodiments of the present invention and specific examples illustrating the present invention have been presented for purposes of illustration and description. It is not intended to be exhaustive or to limit the invention to the precise forms disclosed. Many variations and modifications of the embodiments described herein will be obvious to one of ordinary skill in the art in light of the above disclosure. The scope of the invention is to be defined only by the claims appended hereto, and by their equivalents.

WHAT WE CLAIM IS:

1. An advanced intelligent network telecommunication system comprising:

(a) at least one service switching point;

(b) a service control point comprising a database containing service interaction rules for providing multiple services per trigger to a subscriber, the subscriber having a telephone line connecting the subscriber's telephone to at least one service switching point;

(c) a trigger with a translation type provisioned on the subscriber's telephone line at the service switching point;

(d) a first feature service logic program on the service control point;

(e) a second feature service logic program on the service control point; and

(f) a feature interaction manager service logic program, located on the service control point,

wherein when said trigger prompts said at least one service switching point to send a query containing said translation type to the service control point, said feature interaction manager service logic program is invoked and in turn subsequently invokes at least one of said first feature service logic program and said second feature service logic program, according to said service interaction rules in the database.

2. The advanced intelligent network telecommunication system of claim 1, further comprising a signal transfer point located between the service switching point and the service control point, wherein the signal transfer point has the capability of supplementing a query from the service switching point with a subsystem number identifying said feature interaction manager service logic program.

3. The advanced intelligent network telecommunication system of claim 1, wherein said trigger is a termination attempt trigger.

4. The advanced intelligent network telecommunication system of claim 1, further comprising a second service control point, wherein at least one additional feature service logic program is installed on said second service control point.

5. The advanced intelligent network telecommunication system of claim 1, wherein the first and the second feature service logic programs are two services selected from the group consisting of flexible call forwarding, Internet call waiting, privacy director, advanced intelligent messaging, and simultaneous ringing.

6. The advanced intelligent network telecommunication system of claim 4, wherein said feature interaction manager service logic program invokes said at least one additional feature service logic program via SS7 network according to said rules in the database.

7. The advanced intelligent network telecommunication system of claim 6, wherein the first, the second, and said at least one additional feature

service logic programs are selected from the group consisting of flexible call forwarding, Internet call waiting, privacy director, advanced intelligent messaging, and simultaneous ringing.

8. A method for providing multiple services per trigger to a telephone line subscriber of an advanced intelligent network telecommunication system having a telephone line, a service switching point, a service control point, and a database, comprising the steps of:

(a) provisioning a trigger with a translation type on the subscriber's telephone line at the service switching point;

(b) providing a first feature service logic program on the service control point;

(c) providing a second feature service logic program on the service control point;

(d) specifying in the database the service interaction rules of priority for invoking at least one of the first feature service logic program and the second feature service logic program; and

(e) providing a feature interaction manager service logic program on the service control point,

wherein when said trigger prompts said service switching point to send a query to the service control point,

the feature interaction manager service logic program is invoked such that it subsequently invokes at least one of the first feature service logic

program and the second feature service logic program as specified in the service interaction rules.

9. The method of claim 8, further comprising a signal transfer point located between the service switching point and the service control point, wherein the signal transfer point supplements the query from the service switching point with a subsystem number identifying said feature interaction manager service logic program.

10. The method of claim 8, wherein said trigger is a termination attempt trigger.

11. The method of claim 8, wherein said advanced intelligent network has a second service control point, the method further comprising the step of providing at least one additional feature service logic program on said second service control point.

12. The method of claim 8, wherein the first and the second feature service logic programs are two services selected from the group consisting of flexible call forwarding, Internet call waiting, privacy director, advanced intelligent messaging, and simultaneous ringing.

13. The method of claim 11, wherein said feature interaction manager service logic program invokes said at least one additional feature service logic program via SS7 network according to said rules in the database.

14. The method of claim 13, wherein the first, the second, and said at least one additional feature service logic programs are selected from the

group consisting of flexible call forwarding, Internet call waiting, privacy director, advanced intelligent messaging, and simultaneous ringing.

15. The method of claim 13, wherein the feature interaction manager service logic program is invoked such that it subsequently invokes at least one of the first and the second feature service logic programs on the first service control point and said at least one additional feature service logic program on said second service control point as specified in the service interaction rules.

16. A service control point for providing multiple services per trigger to a telephone line subscriber of an advanced intelligent network telecommunication system having a telephone line, a service switching point, and a trigger with a specific translation type on the subscriber's telephone line at the service switching point, said service control point comprising:

(a) a plurality of feature service logic programs each of which has a unique subsystem number;

(b) a feature interaction manager service logic program having its own unique subsystem number;

(c) a database comprising service interaction rules for invoking one or more of said plurality of feature service logic programs;

wherein when the service control point receives a query with said feature interaction manager service logic program's unique subsystem number, said feature interaction manager service logic program routes said

query to one or more of said plurality of feature service logic programs according to said service interaction rules.

17. The service control point of claim 16, further comprising a signal transfer point located between the service switching point and the service control point, wherein the signal transfer point supplements an initial query received from the service switching point with said feature interaction manager service logic program's own unique subsystem number.

18. The service control point of claim 16, wherein said trigger is a termination attempt trigger.

19. A method for managing a plurality of feature service logic programs through a feature interaction manager located on a service control point, comprising the steps of:

(a) provisioning a trigger on a subscriber's line at a service switching point;

(b) receiving a query from the service switching point at the service control point;

(c) in response to the query, consulting a database containing service interaction rules regarding how the services are to be invoked; and

(d) using the feature interaction service manager to manage the plurality of feature service logic programs according to said rules.

20. The method of claim 19, further comprising the step of providing a signal transfer point located between the service switching point and the service control point, wherein the signal transfer point supplements an

initial query received from the service switching point with a subsystem number identifying said feature interaction manager service logic program.

21. The method of claim 19, wherein at least one of said plurality of feature service logic programs is installed on a first service control point and at least a second one of said plurality of feature service logic programs is installed on a second service control point.

22. The method of claim 21, wherein said feature interaction manager is invoked such that said feature interaction manager subsequently invokes at least one of said plurality of feature service logic programs located on said first service control point and said at least one of said plurality of feature service logic programs installed on said second service control point, according to said service interaction rules in the database.

23. The method of claim 19, wherein said trigger is a termination attempt trigger having a translation type to invoke said feature interaction manager service logic program.

24. A method for managing multiple services of an advanced intelligent network telecommunication system having a telephone line, a service switching point, a signal transfer point, and a service control point comprising the steps of:

(a) installing a feature interaction manager service logic program on the service control point;

(b) installing a first feature service logic program and a second feature service logic program on the service control point;

(c) installing on the service control point service interaction rules for invoking said first feature service logic program and said second feature service logic program;

(d) assigning a first subsystem number to the feature interaction manager service logic program;

(e) assigning a second subsystem number to the first feature service logic program package and a third subsystem number to the second feature service logic program package;

(f) provisioning a trigger on the subscriber's line at the service switching point;

(g) assigning a unique translation type to the trigger on the subscriber's line;

(h) upon receiving a query at the signal transfer point from the service switching point containing the unique translation type, supplementing said query with the first subsystem number and sending said supplemented query to the service control point;

(i) upon receiving said supplemented query at the service control point containing the first subsystem number, invoking the feature interaction manager service logic program; and

(j) managing, in the feature interaction manager, said first and second feature service logic programs according to said service interaction rules.

25. The method of claim 24, wherein said trigger is a termination attempt trigger.

26. The method of claim 24, wherein the first and the second feature service logic programs are two services selected from the group consisting of flexible call forwarding, Internet call waiting, privacy director, advanced intelligent messaging, and simultaneous ringing.

27. The method of claim 24, further comprising the step of installing a second service control point, wherein at least one additional feature service logic program is installed on said second service control point.

28. The method of claim 27, wherein said feature interaction manager service logic program is invoked such that it subsequently invokes at least one of the first feature service logic program, the second feature service logic program, and said at least one additional feature service logic program, according to said service interaction rules in the database.

29. The method of claim 24, further comprising the step of installing a second service control point having at least one additional feature service logic program, wherein said feature interaction manager service logic program invokes said at least one additional feature service logic program via SS7 network according to said service interaction rules in the database.

30. The method of claim 29, wherein the first, the second, and said at least one additional feature service logic programs are selected from the group consisting of flexible call forwarding, Internet call waiting, privacy director, advanced intelligent messaging, and simultaneous ringing.

31. The method of claim 29, wherein the feature interaction manager service logic program is invoked such that it subsequently invokes at least one of the first and the second feature service packaging applications on the first service control point and said at least one additional feature service logic program on said second service control point as specified in the service interaction rules.

32. The method of claim 24, wherein said feature interaction manager service logic program returns a default response to the service switching point as specified in the service interaction rules when none of said first and second feature service logic programs has been activated.

33. The method of claim 32, wherein said default response is an instruction authorizing call termination.

34. An advanced intelligent network telecommunication system comprising:

(a) a telephone line;

(b) a service switching point that is connected to the telephone line;

(c) a trigger having a unique translation type provisioned on the subscriber's line at the service switching point;

(d) a service control point in communication with the service switching point;

(e) a feature interaction manager service logic program installed on the service control point having a first subsystem number;

(f) a first feature service logic program having a second subsystem number and a second feature service logic program having a third subsystem number; and

(g) means for managing said first feature service logic program and said first feature service logic program according to a set of service interaction rules.

35. The advanced intelligent network telecommunication system of claim 34, further comprising a signal transfer point located between the service switching point and the service control point, wherein the signal transfer point supplements an initial query received from the service switching point with said first subsystem number.

36. The advanced intelligent network telecommunication system of claim 34, wherein said trigger is a termination attempt trigger.

37. The advanced intelligent network telecommunication system of claim 34, wherein the first and the second feature service logic programs are two services selected from the group consisting of flexible call forwarding, Internet call waiting, privacy director, advanced intelligent messaging, and simultaneous ringing.

38. The advanced intelligent network telecommunication system of claim 34, further comprising a second service control point, wherein at least one additional feature service logic program is installed on said second service control point.

39. The advanced intelligent network telecommunication system of claim 38, wherein said feature interaction manager service logic program is invoked such that it subsequently invokes at least one of the first feature service logic program, the second feature service logic program, and said at least one additional feature service logic program according to said service interaction rules in the database.

40. The advanced intelligent network telecommunication system of claim 39, wherein the first, the second, and said at least one additional feature service logic programs are services selected from the group consisting of flexible call forwarding, Internet call waiting, privacy director, advanced intelligent messaging, and simultaneous ringing.

41. The advanced intelligent network telecommunication system of claim 34, further comprising a second service control point having at least one additional feature service logic program, wherein said feature interaction manager service logic program invokes said at least one additional feature service logic program via SS7 network according to said service interaction rules in the database.

42. The advanced intelligent network telecommunication system of claim 41, wherein the first, the second, and said at least one additional feature service logic programs are selected from the group consisting of flexible call forwarding, Internet call waiting, privacy director, advanced intelligent messaging, and simultaneous ringing.

43. A method for managing multiple services of an advanced intelligent network telecommunication system having a telephone line, a service switching point, and a signal transfer point, comprising the steps of:

(a) installing a feature interaction manager service logic program on a first service control point;

(b) installing a first feature service logic program on said first service control point;

(c) installing a second feature service logic program on a second service control point;

(d) installing on said first service control point service interaction rules for invoking said first feature service logic program and said second feature service logic program;

(e) assigning a first subsystem number to the feature interaction manager service logic program;

(f) assigning a first unique subsystem number to the first feature service logic program package and a second unique subsystem number to the second feature service logic program package;

(g) provisioning a trigger on the subscriber's line at the service switching point;

(h) assigning a unique translation type to the trigger on the subscriber's line;

(i) upon receiving a query at the signal transfer point from the service switching point containing the unique translation type,

supplementing said query with the first subsystem number and sending said supplemented query to said first service control point;

(j) upon receiving said supplemented query at said first service control point containing the first subsystem number, invoking the feature interaction manager service logic program; and

(k) managing, in the feature interaction manager, said first and second feature service logic programs according to said service interaction rules.

44. The method of claim 43, wherein said trigger is a termination attempt trigger.

45. The method of claim 43, wherein the first and the second feature service logic programs are selected from the group consisting of flexible call forwarding, Internet call waiting, privacy director, advanced intelligent messaging, and simultaneous ringing.

46. The method of claim 43, wherein said feature interaction manager service logic program returns a default response to the service switching point as specified in the service interaction rules when none of said first and second feature service logic programs has been activated.

47. The method of claim 46, wherein said default response is an instruction authorizing call termination.

48. An advanced intelligent network telecommunication system comprising:

(a) at least one service switching point;

(b) a first service control point comprising a database containing service interaction rules for providing multiple services per trigger to a subscriber, the subscriber having a telephone line connecting the subscriber's telephone to at least one service switching point;

(c) a trigger with a translation type provisioned on the subscriber's telephone line at the service switching point;

(d) a feature interaction manager service logic program, located on the first service control point;

(e) a first feature service logic program on a second service control point; and

(f) a second feature service logic program on one of a third service control point and the second service control point,

wherein when said trigger prompts said at least one service switching point to send a query containing said translation type to the first service control point, said feature interaction manager service logic program is invoked and in turn subsequently invokes at least one of said first feature service logic program and said second feature service logic program, according to said service interaction rules in the database.

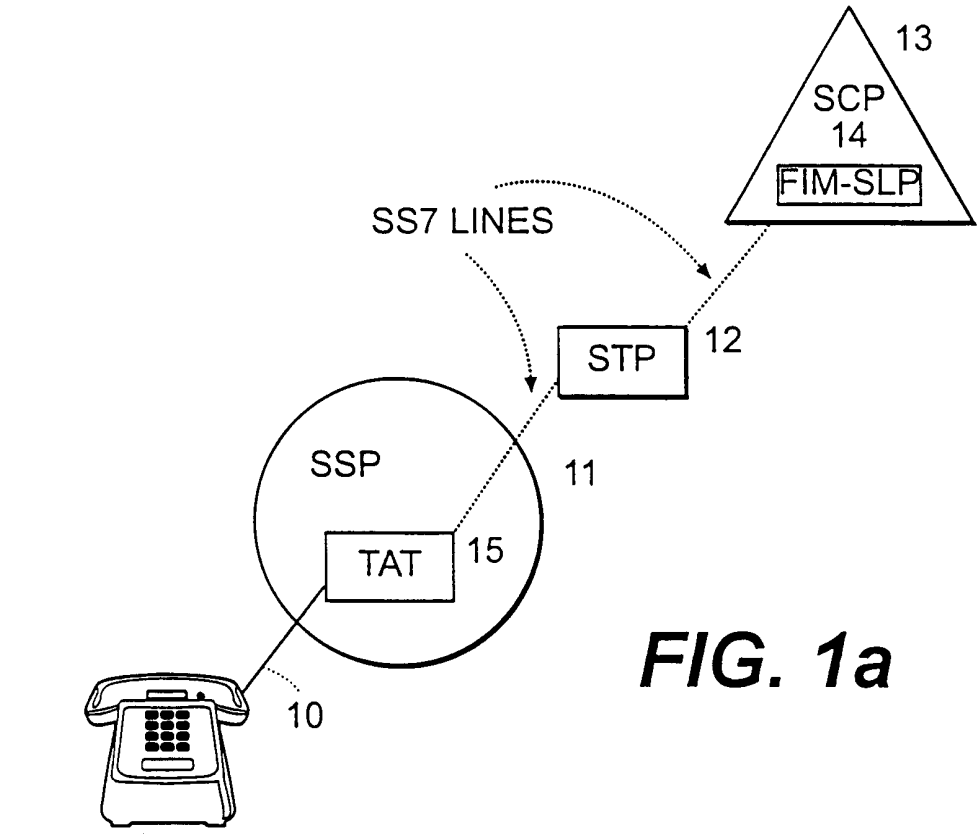
13
SCP
14
FIM-SLP
SS7 LINES
STP
12
SSP
11
TAT
15
10
MS/T SUBSCRIBER

FIG. 1a

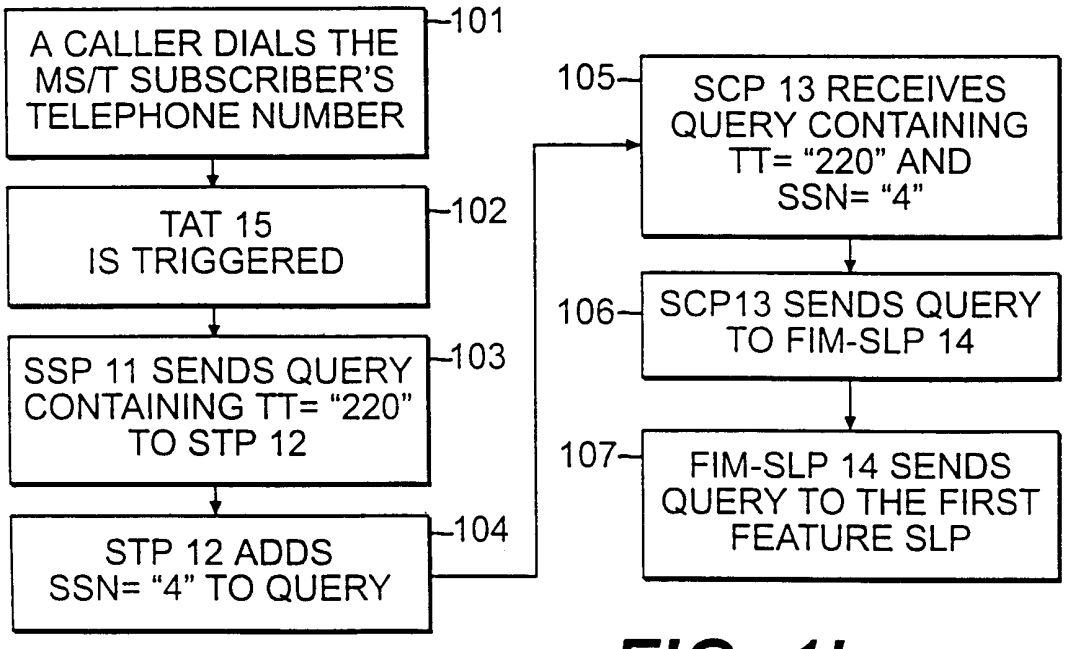
A CALLER DIALS THE MS/T SUBSCRIBER'S TELEPHONE NUMBER
101
TAT 15 IS TRIGGERED
102
SSP 11 SENDS QUERY CONTAINING TT= "220" TO STP 12
103
STP 12 ADDS SSN= "4" TO QUERY
104
105
SCP 13 RECEIVES QUERY CONTAINING TT= "220" AND SSN= "4"
106
SCP13 SENDS QUERY TO FIM-SLP 14
107
FIM-SLP 14 SENDS QUERY TO THE FIRST FEATURE SLP

FIG. 1b

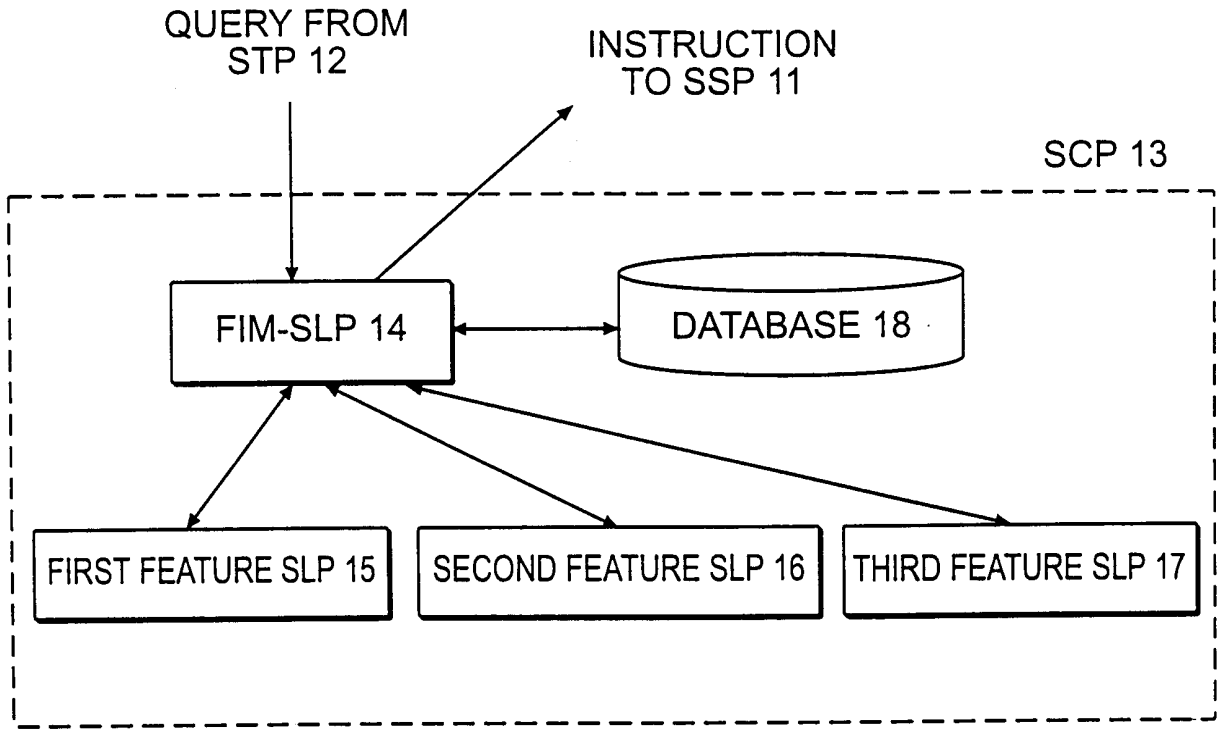
QUERY FROM
STP 12
INSTRUCTION
TO SSP 11
SCP 13
FIM-SLP 14
DATABASE 18
FIRST FEATURE SLP 15
SECOND FEATURE SLP 16
THIRD FEATURE SLP 17

FIG. 2a

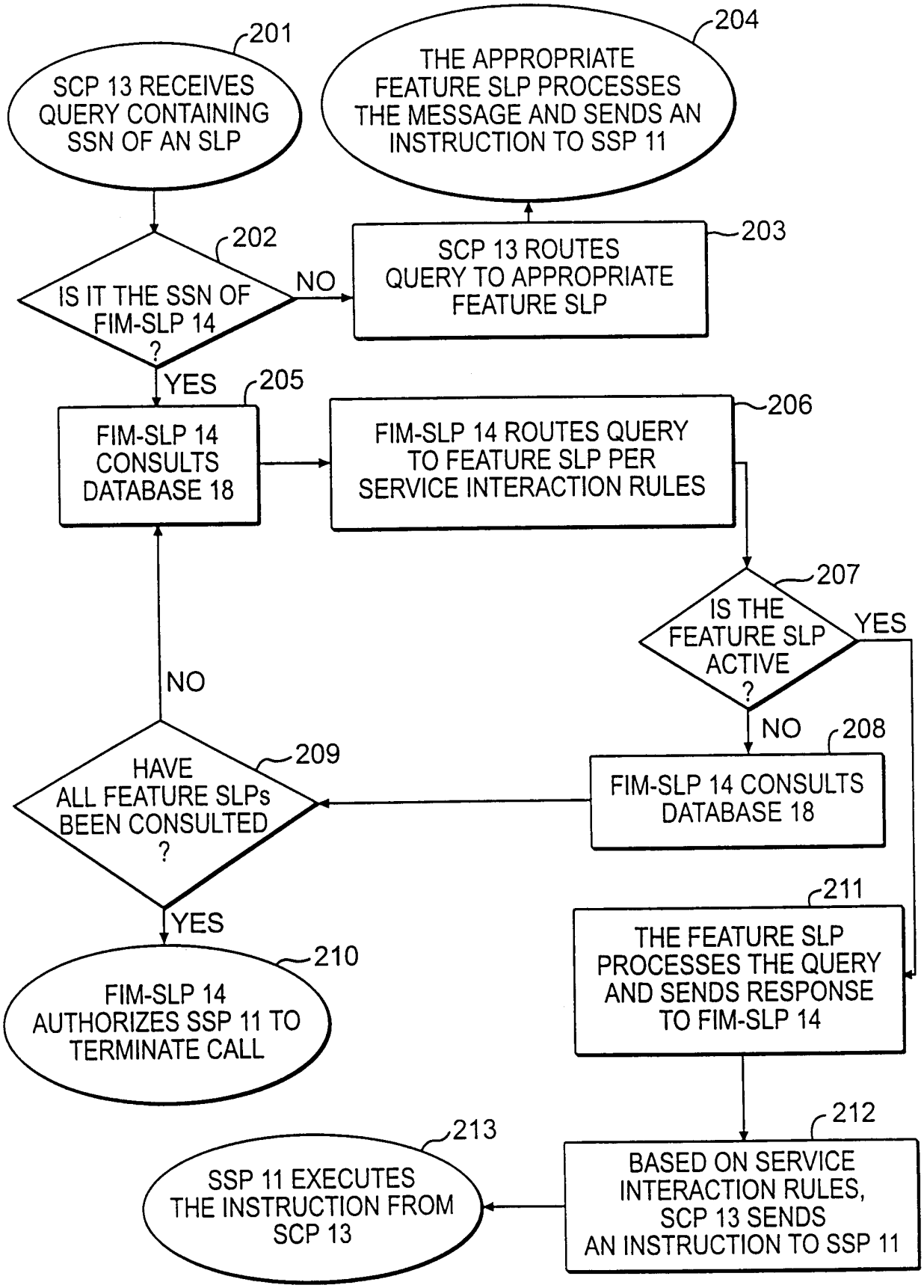
201
SCP 13 RECEIVES QUERY CONTAINING SSN OF AN SLP
202
IS IT THE SSN OF FIM-SLP 14 ?
NO
203
SCP 13 ROUTES QUERY TO APPROPRIATE FEATURE SLP
204
THE APPROPRIATE FEATURE SLP PROCESSES THE MESSAGE AND SENDS AN INSTRUCTION TO SSP 11
YES
205
FIM-SLP 14 CONSULTS DATABASE 18
206
FIM-SLP 14 ROUTES QUERY TO FEATURE SLP PER SERVICE INTERACTION RULES
207
IS THE FEATURE SLP ACTIVE ?
YES
NO
208
FIM-SLP 14 CONSULTS DATABASE 18
209
HAVE ALL FEATURE SLPs BEEN CONSULTED ?
NO
YES
210
FIM-SLP 14 AUTHORIZES SSP 11 TO TERMINATE CALL
211
THE FEATURE SLP PROCESSES THE QUERY AND SENDS RESPONSE TO FIM-SLP 14
212
BASED ON SERVICE INTERACTION RULES, SCP 13 SENDS AN INSTRUCTION TO SSP 11
213
SSP 11 EXECUTES THE INSTRUCTION FROM SCP 13

FIG. 2b

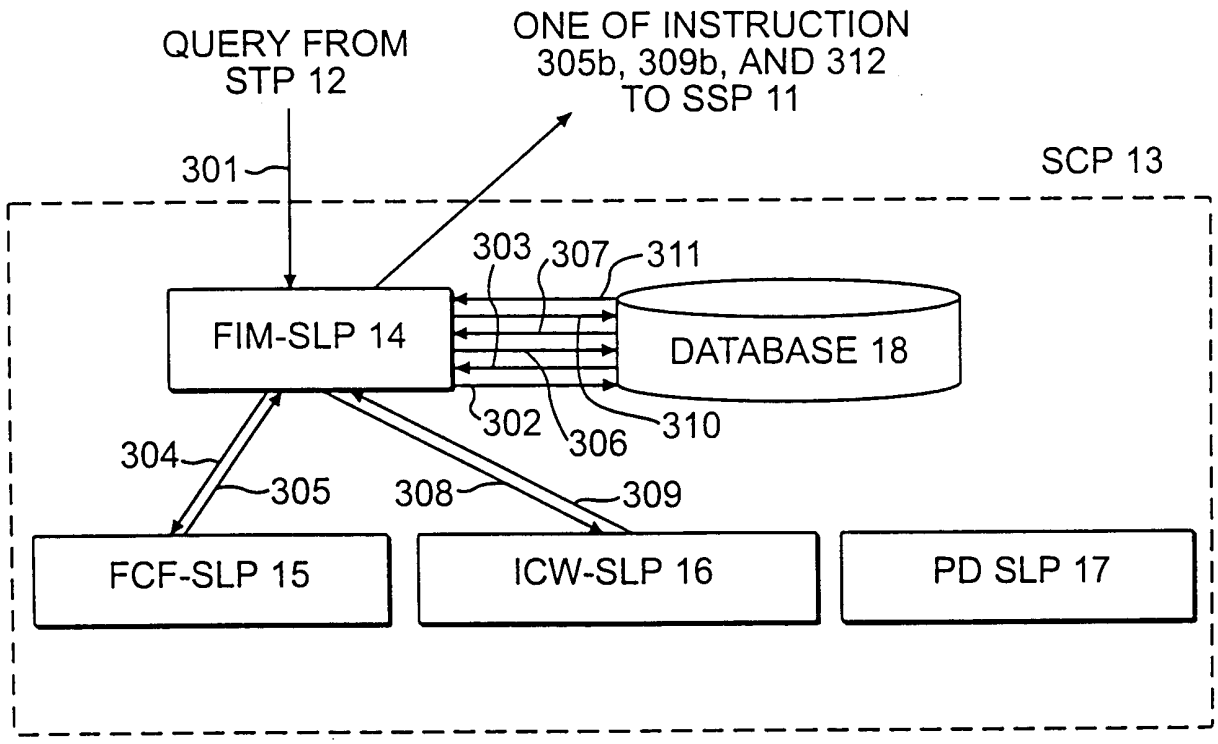
QUERY FROM
STP 12
ONE OF INSTRUCTION
305b, 309b, AND 312
TO SSP 11
301
SCP 13
303
307
311
FIM-SLP 14
DATABASE 18
302
306
310
304
305
308
309
FCF-SLP 15
ICW-SLP 16
PD SLP 17

FIG. 3a

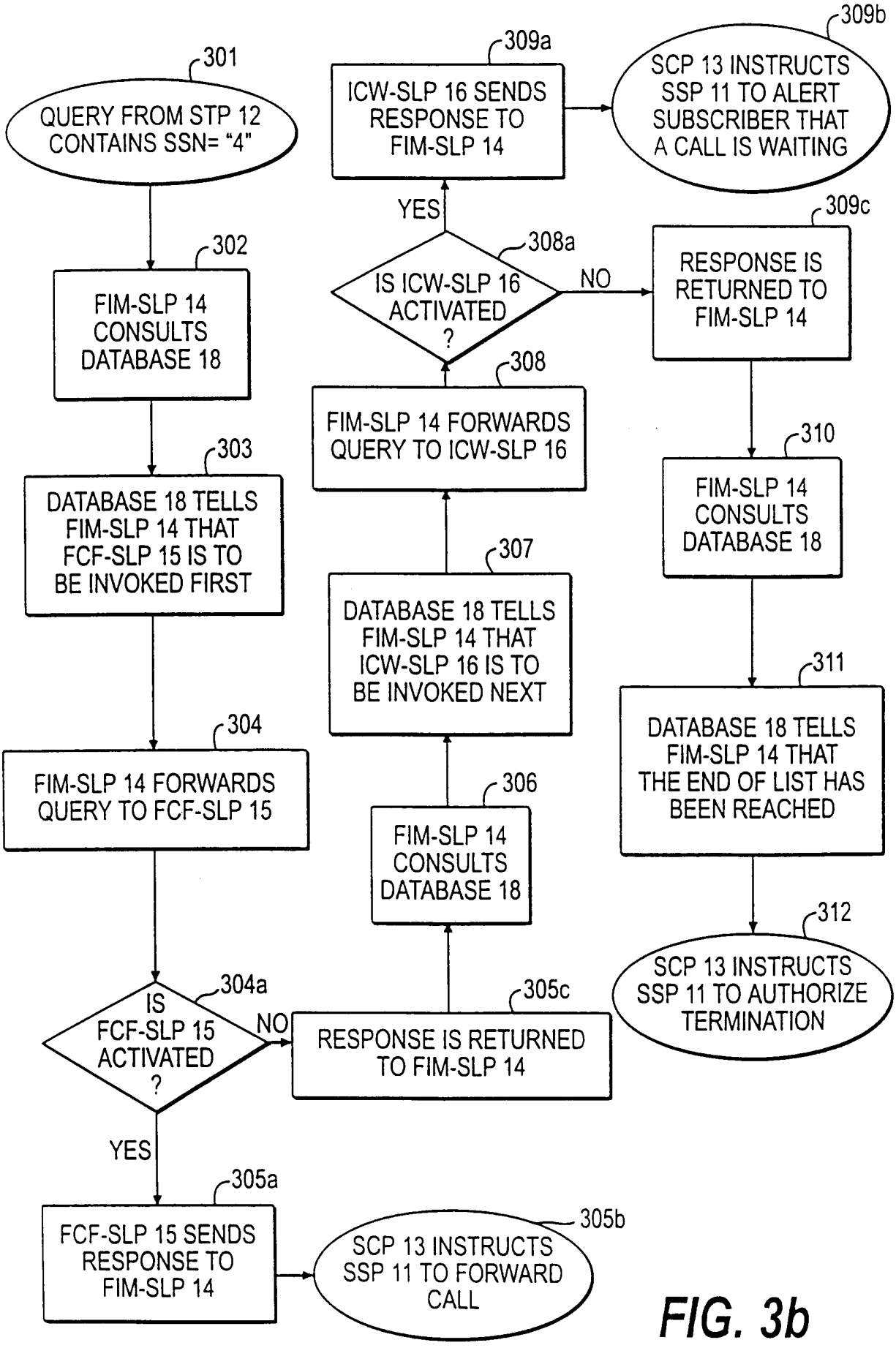
301
QUERY FROM STP 12 CONTAINS SSN= "4"
302
FIM-SLP 14 CONSULTS DATABASE 18
303
DATABASE 18 TELLS FIM-SLP 14 THAT FCF-SLP 15 IS TO BE INVOKED FIRST
304
FIM-SLP 14 FORWARDS QUERY TO FCF-SLP 15
304a
IS FCF-SLP 15 ACTIVATED ?
NO
YES
305a
FCF-SLP 15 SENDS RESPONSE TO FIM-SLP 14
305b
SCP 13 INSTRUCTS SSP 11 TO FORWARD CALL
305c
RESPONSE IS RETURNED TO FIM-SLP 14
306
FIM-SLP 14 CONSULTS DATABASE 18
307
DATABASE 18 TELLS FIM-SLP 14 THAT ICW-SLP 16 IS TO BE INVOKED NEXT
308
FIM-SLP 14 FORWARDS QUERY TO ICW-SLP 16
308a
IS ICW-SLP 16 ACTIVATED ?
NO
YES
309a
ICW-SLP 16 SENDS RESPONSE TO FIM-SLP 14
309b
SCP 13 INSTRUCTS SSP 11 TO ALERT SUBSCRIBER THAT A CALL IS WAITING
309c
RESPONSE IS RETURNED TO FIM-SLP 14
310
FIM-SLP 14 CONSULTS DATABASE 18
311
DATABASE 18 TELLS FIM-SLP 14 THAT THE END OF LIST HAS BEEN REACHED
312
SCP 13 INSTRUCTS SSP 11 TO AUTHORIZE TERMINATION

FIG. 3b

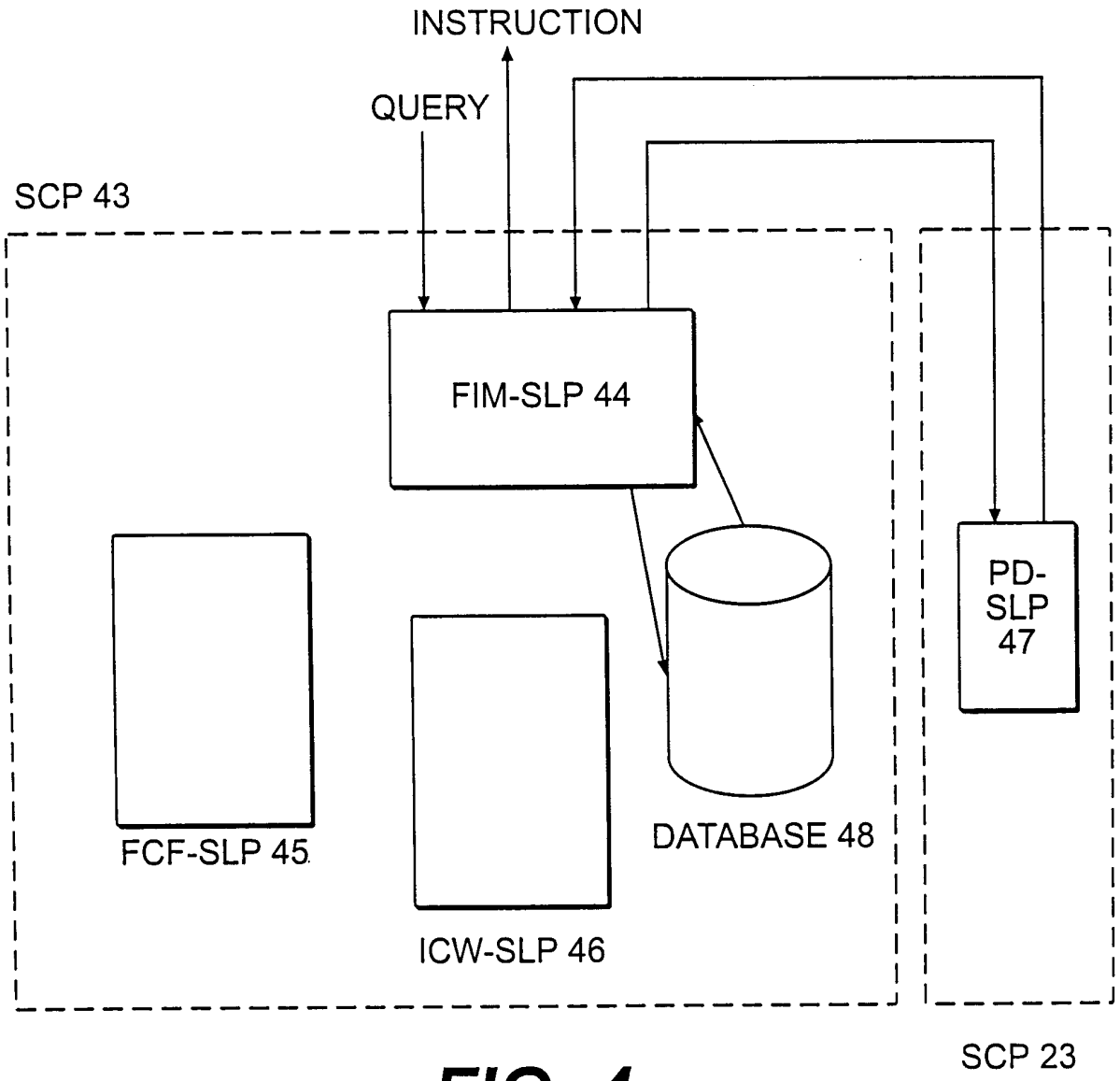
INSTRUCTION
QUERY
SCP 43
FIM-SLP 44
PD-
SLP
47
FCF-SLP 45
DATABASE 48
ICW-SLP 46
SCP 23

FIG. 4

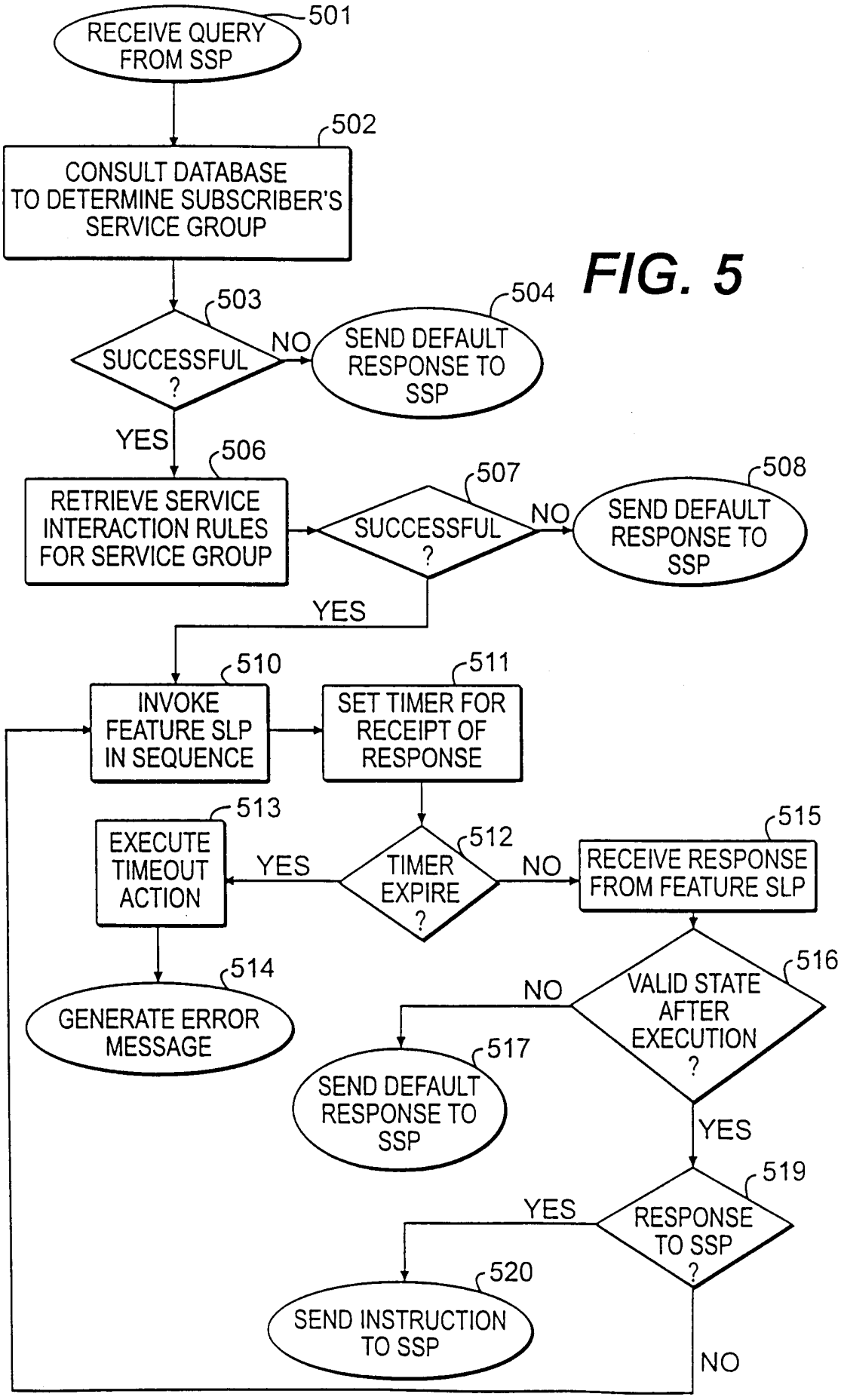
RECEIVE QUERY FROM SSP
501
CONSULT DATABASE TO DETERMINE SUBSCRIBER'S SERVICE GROUP
502
SUCCESSFUL ?
503
NO
SEND DEFAULT RESPONSE TO SSP
504
YES
RETRIEVE SERVICE INTERACTION RULES FOR SERVICE GROUP
506
SUCCESSFUL ?
507
NO
SEND DEFAULT RESPONSE TO SSP
508
YES
INVOKE FEATURE SLP IN SEQUENCE
510
SET TIMER FOR RECEIPT OF RESPONSE
511
TIMER EXPIRE ?
512
YES
EXECUTE TIMEOUT ACTION
513
NO
RECEIVE RESPONSE FROM FEATURE SLP
515
GENERATE ERROR MESSAGE
514
VALID STATE AFTER EXECUTION ?
516
NO
SEND DEFAULT RESPONSE TO SSP
517
YES
RESPONSE TO SSP ?
519
YES
SEND INSTRUCTION TO SSP
520
NO

FIG. 5

INTERNATIONAL SEARCH REPORT

Inter nal Application No
PCT/US 99/28353

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04Q3/00

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 7 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 Y	EP 0 578 964 A (SIEMENS STROMBERG CARLSON) 19 January 1994 (1994-01-19) column 2, line 38 -column 4, line 6 column 10, line 20 -column 13, line 19 column 14, line 12 - line 53	1,8,16, 19,48 4,6,11, 21
Y	WO 97 50232 A (BELL COMMUNICATIONS RES) 31 December 1997 (1997-12-31) page 6, line 1 - line 16 page 11, line 5 - line 9 page 11, line 17 - line 27 page 15, line 1 - line 19 page 17, line 11 -page 21, line 3	4,6,11, 21

-/--

[X] Further documents are listed in the continuation of box C.

[X] 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	Date of mailing of the international search report
10 March 2000	23/03/2000

Name and mailing address of the ISA	Authorized officer
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Inter. nal Application No
PCT/US 99/28353

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