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(54) Abstract Title

Mobile communication system with call diversion

(57) A communication system comprises a call routing network (1) for selectively diverting calls to a mobile unit (2) to an alternative receiving location (50) depending upon a divert setting for the call number. The mobile unit is allotted a principal call number and a priority call number. A network controller routes a call on the priority call number to the mobile unit even when the principle call number for that mobile unit has a divert setting to the alternative receiving location.

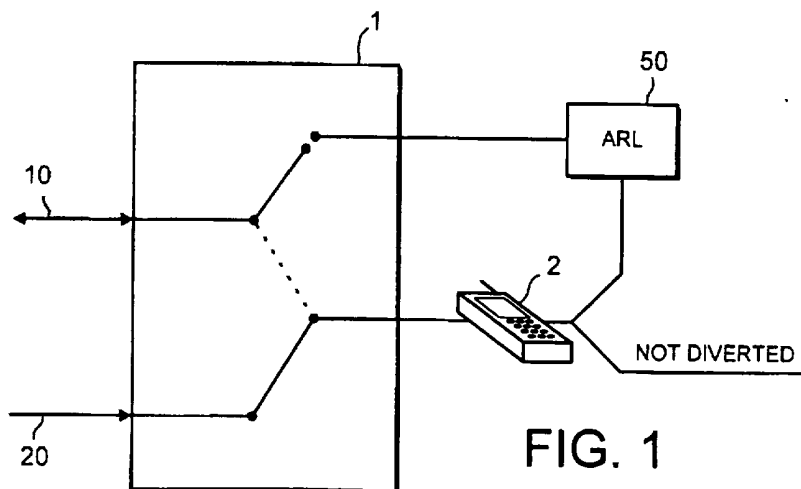
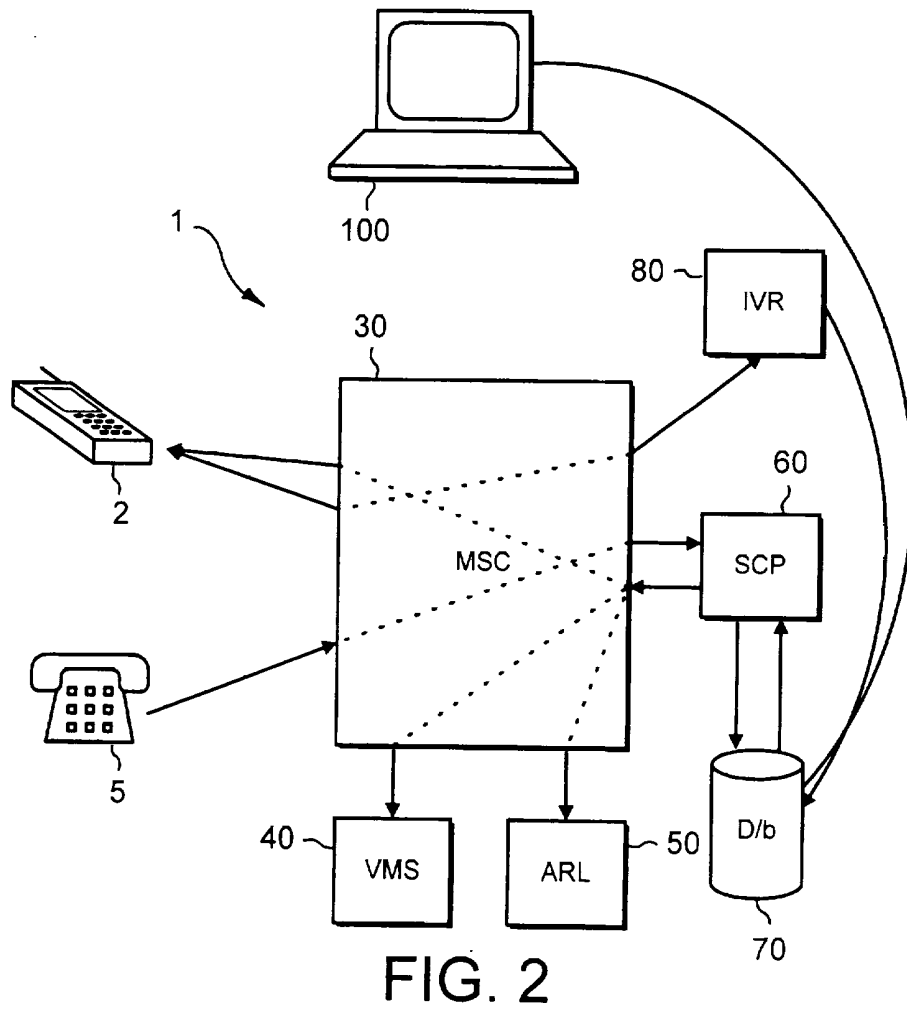
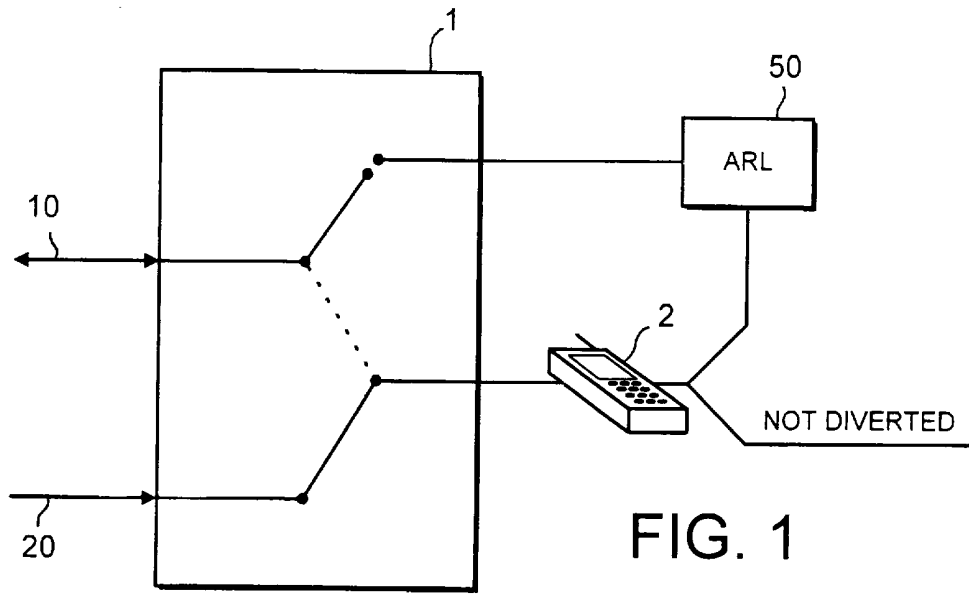
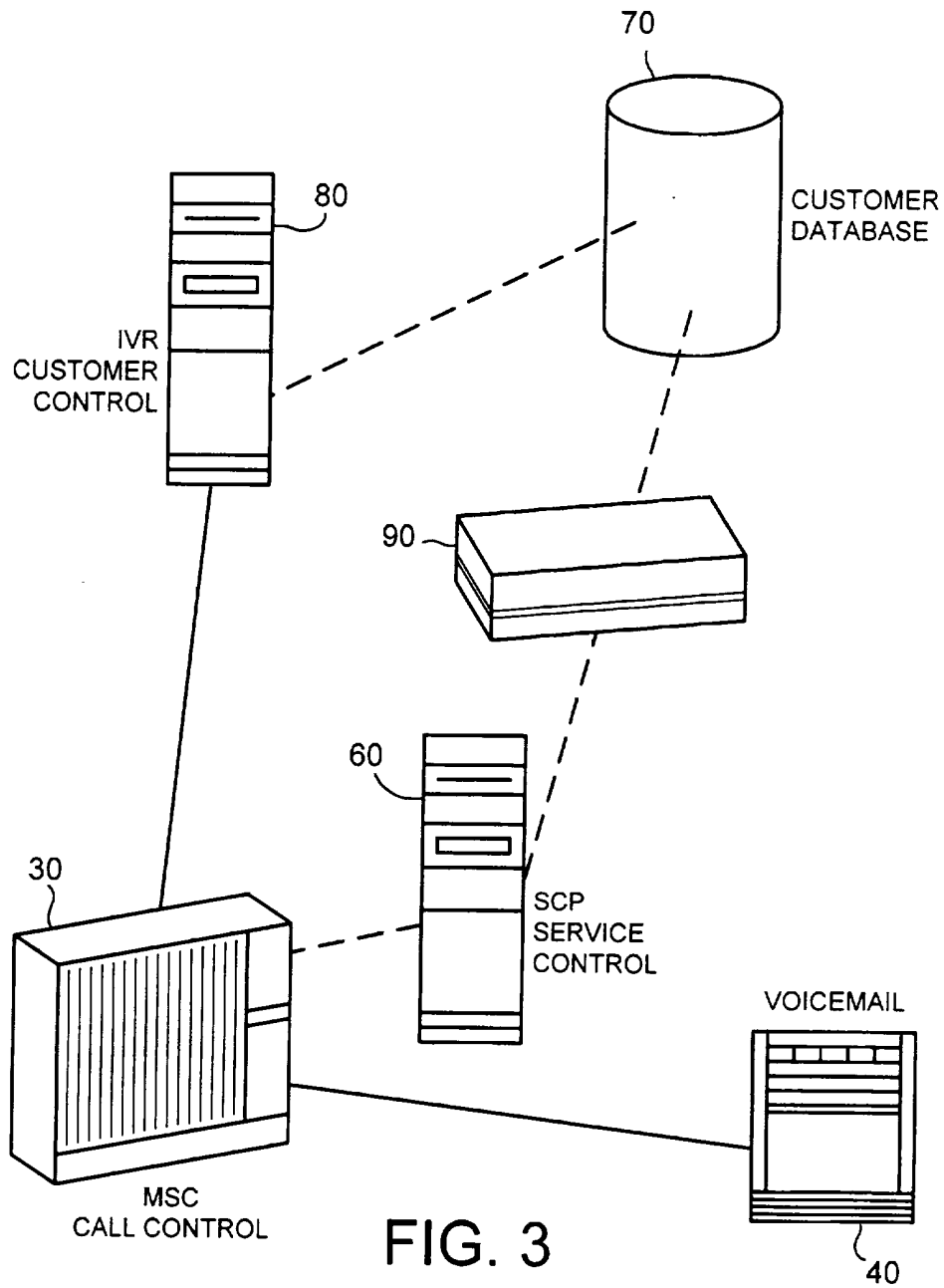


FIG. 1





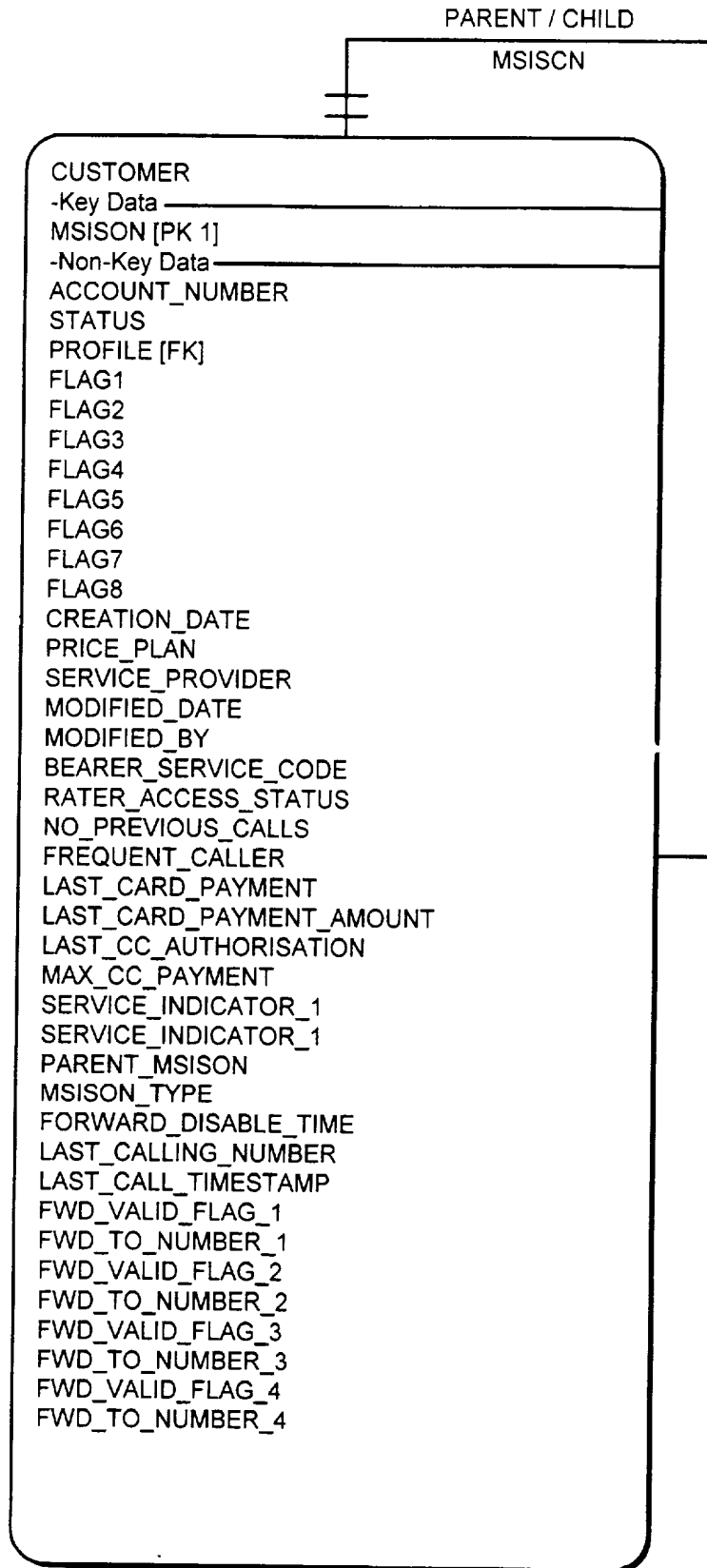
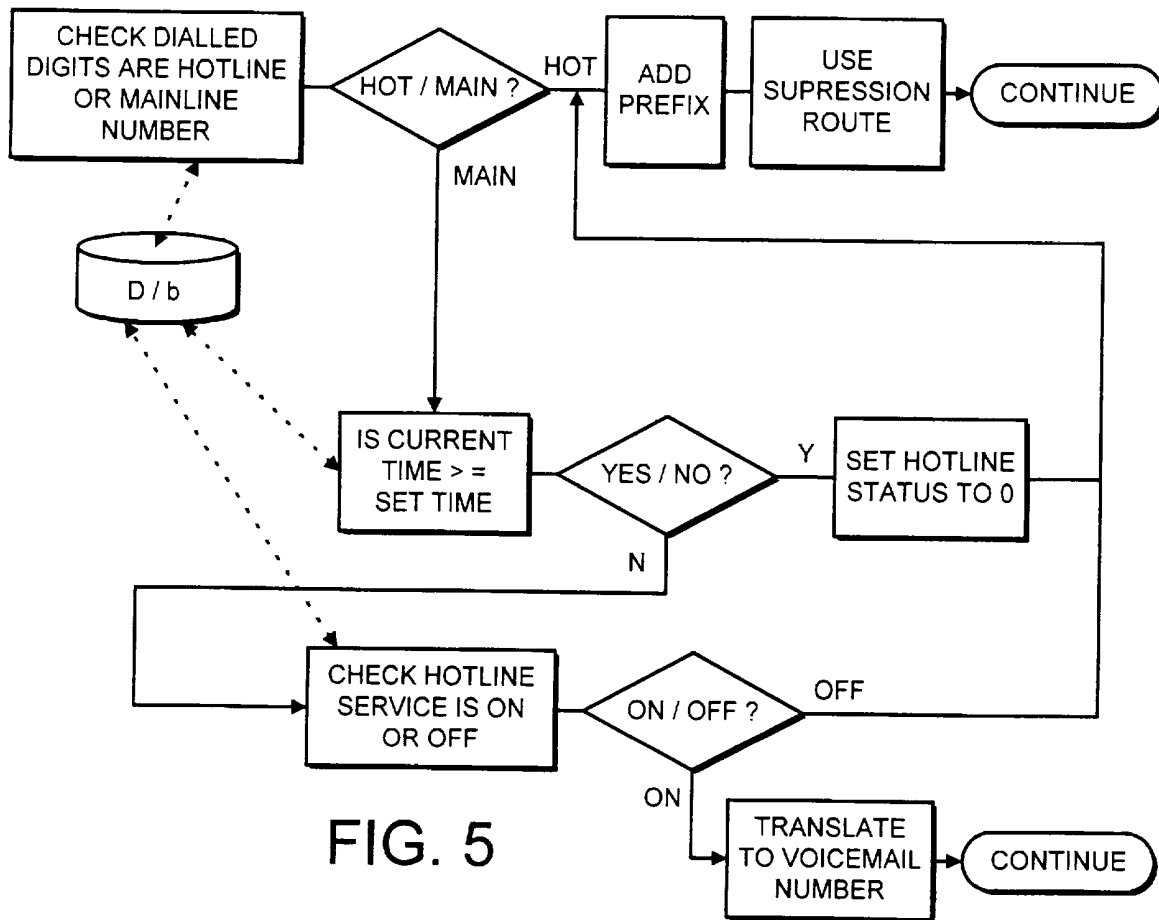


FIG. 4



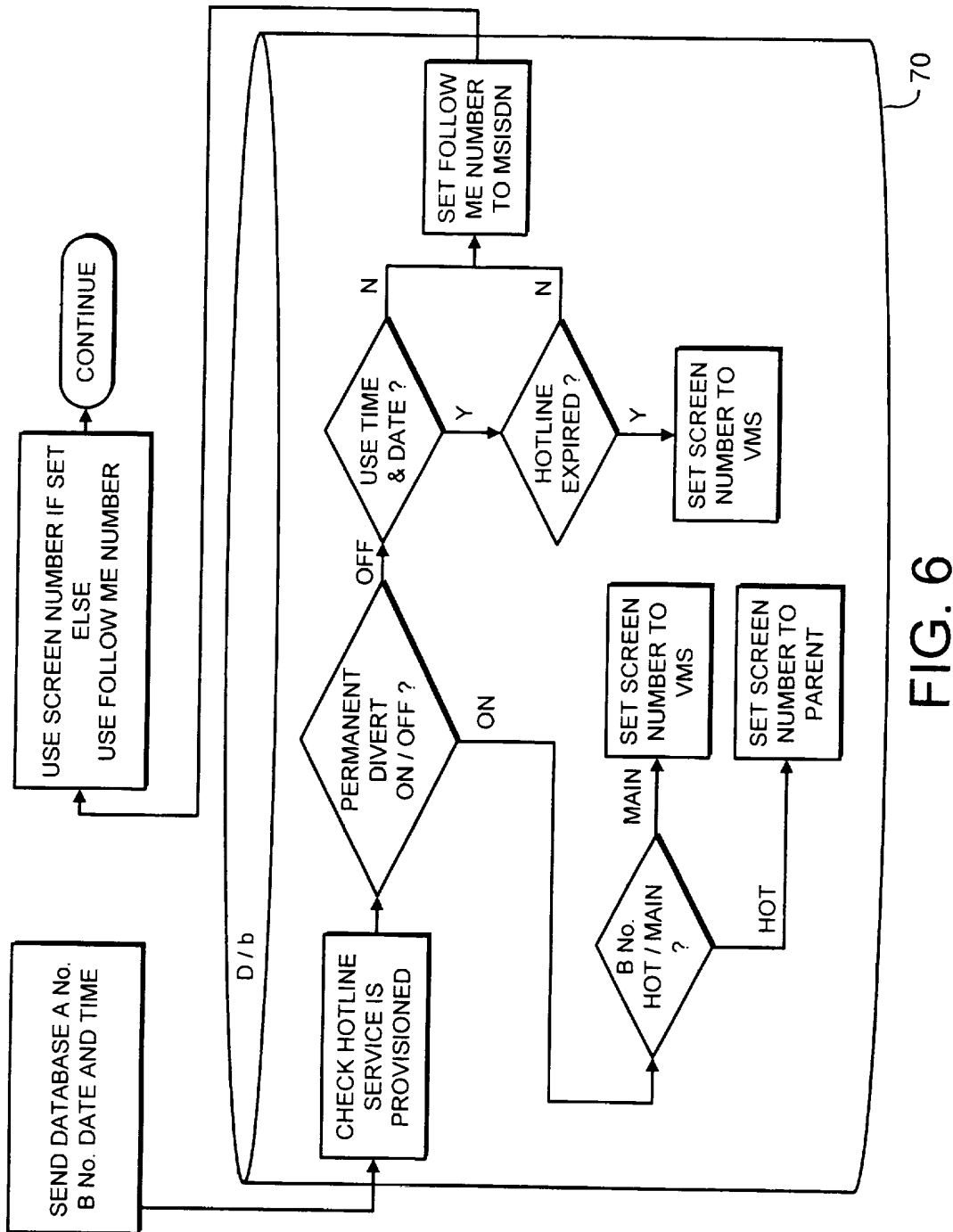
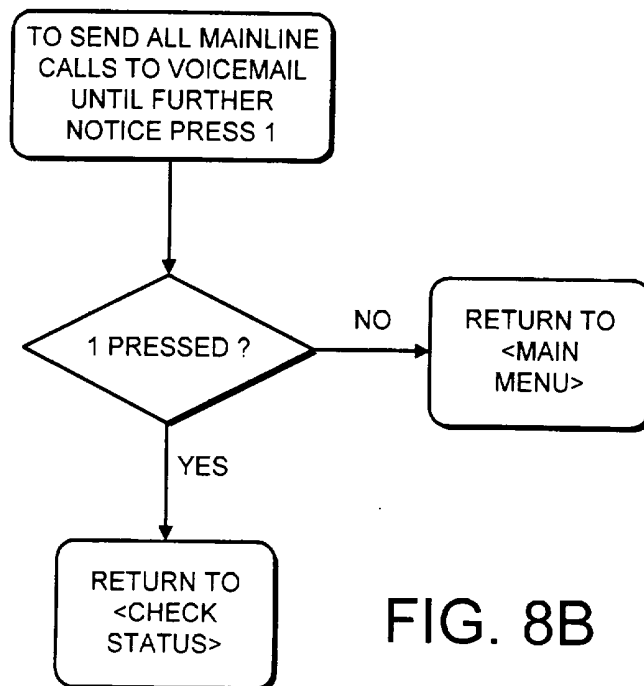
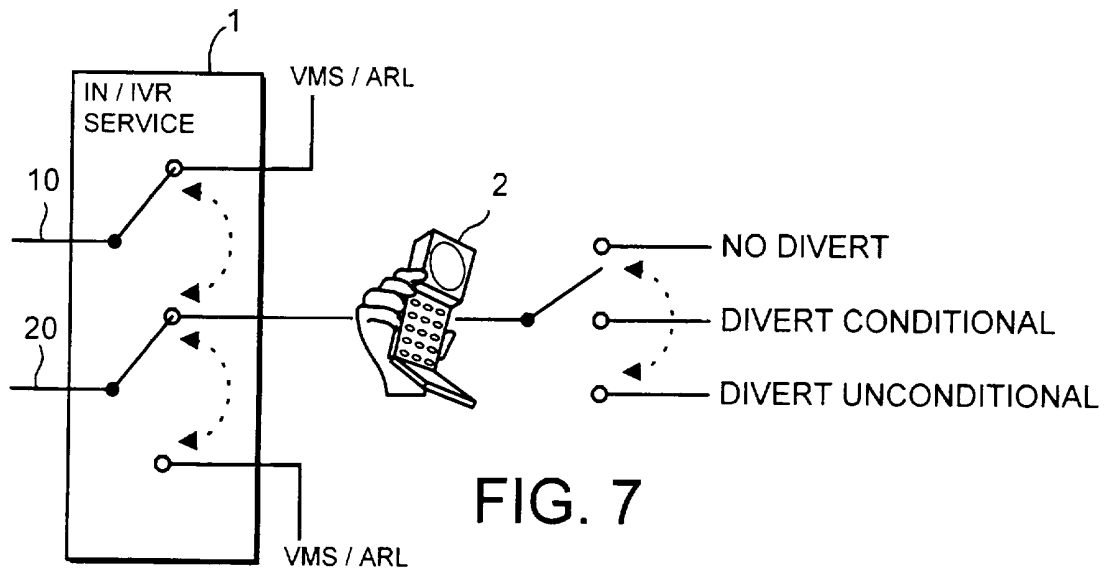


FIG. 6



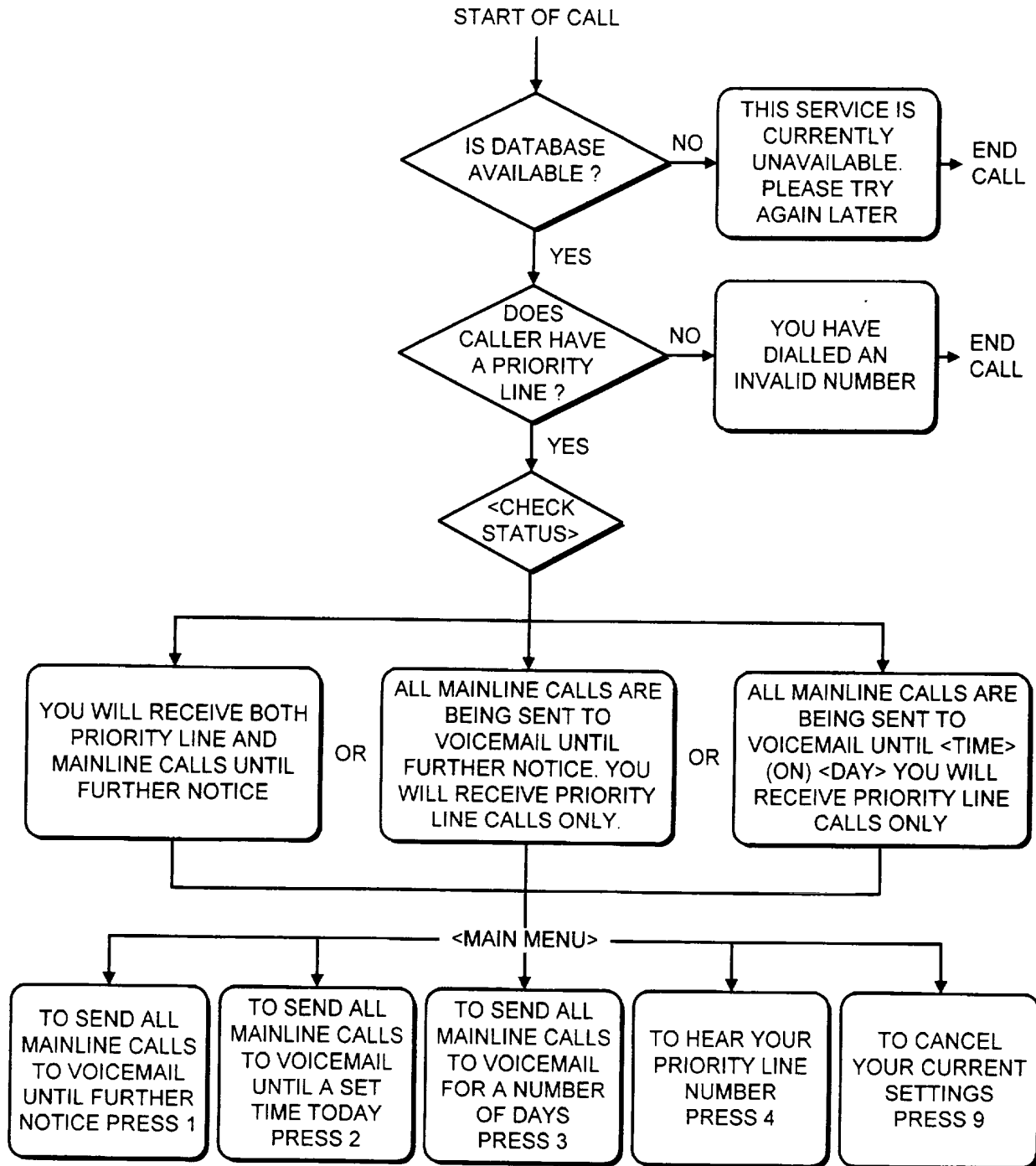


FIG. 8A

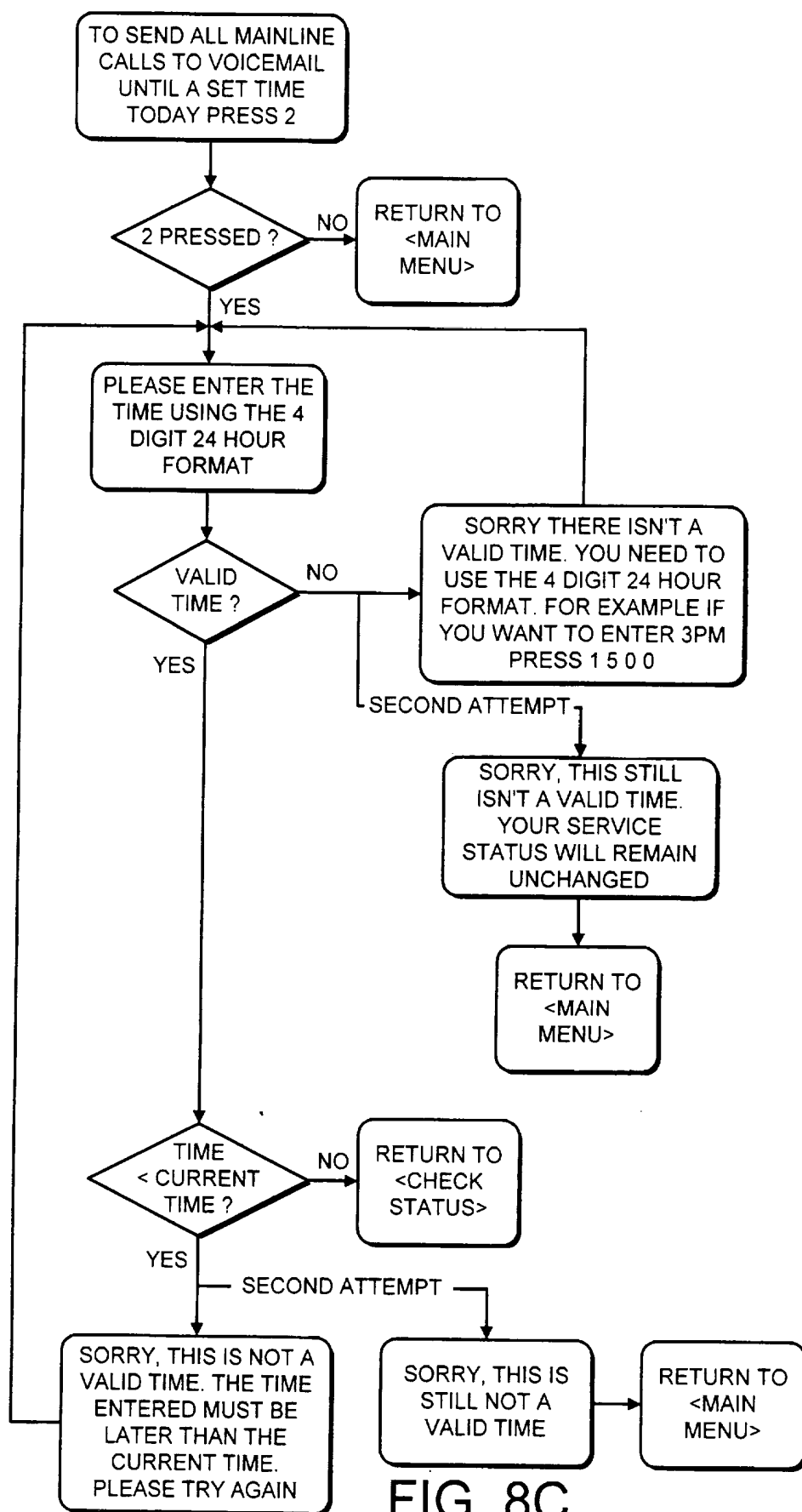


FIG. 8C

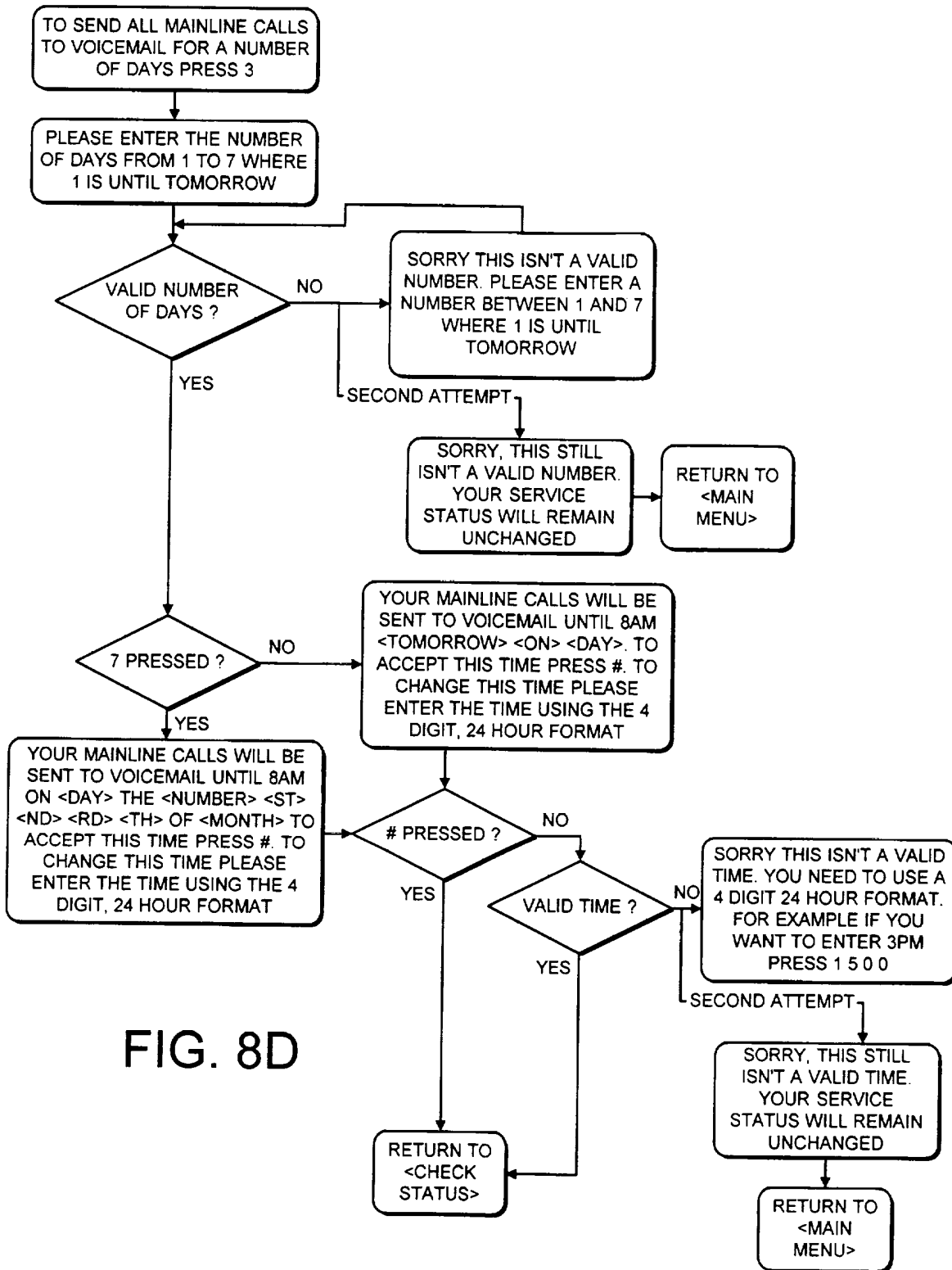


FIG. 8D

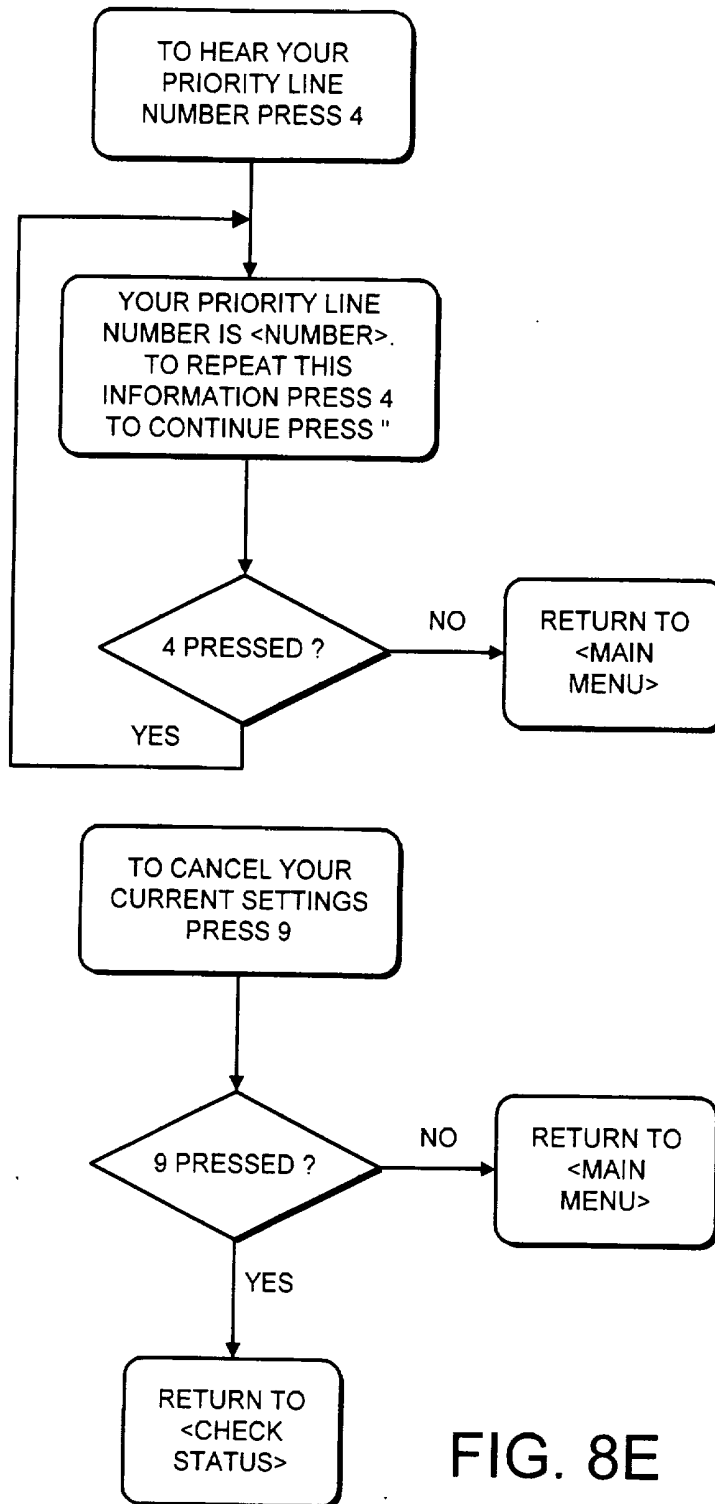


FIG. 8E

CALL ROUTING IN A TELEPHONE SYSTEM

This invention relates to call routing in a telephone system.

Some telephone systems allow subscribers to configure diverts by means of which calls to their telephone number can be automatically diverted to another number – for example the number of a messaging service such a voicemail service or the number of another telephone. However, such systems conventionally cause all the user's calls to be diverted to the other number, so even high priority calls to the user do not reach his telephone.

The GSM (global system for mobile communications) telephone system provides for an ALS (alternate line system) by means of which a user can receive calls to two separate telephone numbers at a single handset, or divert calls to either or both of those numbers to another number. However, this system has a number of problems. First, the system is difficult to configure because it generally relies on the user sending special codes to the network, possibly via a menu system built into his telephone. Second, if calls to only one of the user's numbers are diverted then because the user can still receive some of his calls it is easy for him to forget that the other number remains diverted. Therefore, it is easy for the user to forget to cancel the divert that has been set on the other number.

According to one aspect of the present invention there is provided a communication system, for example a telephone exchange, comprising: a call routing network selectively routing calls to one of a mobile unit and an alternative receiving location depending on a divert setting for the call number; means for allocating to the mobile unit a principal call number and a priority call number; and a controller for controlling the network so that an incoming call on the priority call number is routed to the mobile unit even when the principal call number for that mobile unit has a divert setting to the alternative receiving location.

Preferably, the communications system includes a call screening device which allows the divert setting to be set at the network responsive to an incoming call from a user on a predetermined divert setting number, for example 555.

The incoming divert setting call can be handled by an interactive voice unit which provides vocal user prompts to allow the divert setting to be set.

Another aspect of the invention provides a method of setting a divert setting for a call number in a communications system comprising:

- receiving an incoming call on a predetermined divert setting number,
- providing a set of vocal user prompts to allow the divert setting to be set,
- setting the divert setting at a call routing network of the communications system for a principal call number for a particular mobile unit so that calls on the principal call number are routed to an alternative location set by the divert setting but calls on a priority call number are routed to the mobile unit.

Another aspect of the invention provides a method of operating a communications system comprising:

- allocating to a mobile unit a principal call number and a priority call number,
- enabling a divert setting to be set for the principal call number, and
- routing incoming calls on the priority call number to the mobile unit even when the principal call number for that mobile unit has a divert setting to an alternative receiving location.

The alternative receiving location could be, for example, voice mail or another message receiving service.

The invention also provides a communications system comprising:

- a call routing network for selectively routing calls to one of a mobile unit and an alternative receiving location depending on a divert setting for the call

number,

a store for holding in association with call numbers respective divert settings, and

a controller for controlling the network so that calls are routed in dependence on the divert settings held in the store.

The store can hold in association with each call number a predetermined period for which the divert setting is to be active. A user can set an end time for the active phase of the divert setting at the time at which the divert setting is set by a user. That end time can be held in the store in association with the relevant call number. Additionally or alternatively, a user can set a start time for the active phase of the divert setting which is later than the time at which the divert setting is set by a user. The start time can be held in the store in association with the relevant call number.

The divert setting can be set using an interactive voice device as mentioned earlier.

The ability to set a start time, end time and/or a predetermined period for the divert setting to be active allows a user to have more flexibility about setting diverts.

The invention also provides a method of setting a divert period in a telephone system in which method either the start time or the end time or both are set at the time at which the divert period is set by a user. The start time does not need to be the same as the time at which the divert period is set by a user. Moreover, a user does not need to deactivate the divert period by operating his mobile unit. The divert period will automatically be deactivated at the end time which was preset.

The centralised setting of a call divert can be referred to as screening. It can be

used in addition to conventional call forwarding services which operate after a call has been routed to a mobile unit.

Although the invention is described in the following with reference to mobile units, it will be appreciated that it could be used with land line units as well.

For a better understanding of the invention and to show how the same may be carried into effect, reference is now made to the accompanying drawings by way of example.

Fig. 1 illustrates the basic principles according to one aspect of the present invention.

Fig. 2 illustrates the components of a call routing network in accordance with one aspect of the present invention.

Fig. 3 shows the components of an alternative call routing network in accordance with one aspect of the present invention.

Fig. 4 illustrates the relevant database fields for each of the database sectors.

Fig. 5 shows an example of a mode of operation of the call routing network according to one aspect of the present invention.

Fig. 6 shows an example of a check process undertaken by the database of the present invention.

Fig. 7 illustrates the principles of an alternative embodiment of the present invention.

Figs. 8A-8E show examples of processes followed by the user under the direction of the interactive voice response system of the present invention.

Additional features and elements of embodiments of the invention are described by way of additional examples in annex 1.

Fig. 1 shows the principles of a communications system according to one aspect

of the present invention. The box denoted 1 represents a network for a mobile telephone unit 2. The network may comprise several individual components or sub-systems which may be linked so as to jointly make up a call routing network as will be described later. The call routing network 1 provides means for allocating two separate telephone lines to the mobile unit 2. The first line is termed the principal line 10 and may have the general attributes of a conventional telephone line for a mobile unit. For example, the principal line has a principal MSISDN number allocated to it and the user is able to make outgoing calls and receive incoming calls thereon as indicated by the direction of the arrows. The second line, termed the priority line 20 has a number allocated to it which is different to the MSISDN number and has distinct attributes when compared with those of the principal line 10. In particular, the priority line may not allow outgoing calls to be made thereon.

As can be seen in fig. 1, an incoming call on the principal line 10 may be diverted within the network 1, or indeed at a location anywhere between the caller and the receiving mobile unit 2, to an alternative receiving location 50 specified by the mobile user. The act of diverting the incoming line to an alternative receiving location within the network is termed "screening". The alternative receiving location, or ARL, may be either the call number of another telephone unit, or it may be the mobile unit's own voice mailing system or VMS 40. As will be described later, the user may set up diversion settings for the principal line such as the time of the diversion period and the alternative receiving location to which the incoming call is to be routed by calling a particular divert setting number from his mobile unit and following instructions given to him.

In contrast, incoming calls on the priority line 20 are almost always routed directly to the mobile unit 2 irrespective of the screen divert status of the principal line 10. For example, if the mobile user has specified that incoming calls on the principal line will be screened to the unit's own voice mailing system, any calls incoming on the priority line will still be routed to the mobile unit.

However, the user may have an option to divert incoming priority line calls by selecting a divert setting on the mobile unit itself. By selecting the divert setting on the unit, incoming priority line calls may also be diverted to the alternative receiving location. In this instance, all incoming calls, both on the priority line and the principal line may be diverted irrespective of the screen setting of the principal line.

It can be seen, therefore, that the present invention provides versatility by allowing the user to divert calls incoming on the principal line to an alternative receiving location whilst allowing calls on the priority line to be received. Alternatively, the user may divert all incoming calls, both on the principal line and the priority line, to an alternative receiving location.

Figs 2 and 3 show the individual system components making up the network of the present invention. The main component of the network is the mobile switching centre or MSC and is represented by the box 30. The mobile switching centre 30 acts as a call router and is able to route incoming and outgoing calls to various locations within the network. The mobile switching centre is connected to a Service Control Platform or SCP 60 which acts as a second router and routes both information from the mobile switching centre to the database 70, the function of which will be described later, and return information from the database to the mobile switching centre.

The mobile switching centre may also route calls to the voice mailing system 40 of the mobile unit or to a different alternative receiving location 50. Outgoing calls from the mobile unit 2 may be routed via the mobile switching centre either to destination line 5 or to an Interactive Voice Response system or IVR 80, the function of which will be described later.

As shown in fig. 3, the network may further comprise a converter system 90

between the service control platform 60 and the database 70. This converter system acts to convert the protocol used by the services control platform to that suitable for use by the database and *vice versa*.

The database 70 is a storage device which may store the screen settings associates with the particular principal line or priority number. These settings may be either the time at which call diversions are to commence, or the time at which the diversions are to cease, or both. The database may also store details of the numbers to which the incoming calls are to be routed if the diversion settings are active (i.e. calls are to be diverted) at the time of the incoming call.

In particular, the database stores the number of the receiving line i.e. the principal line MSISDN number or the priority line number, details of whether that number represents a principal line or a priority line, the relevant time(s) and date(s) of the diversion period and any forward-to number to which the call is to be routed if the diversion settings are active. The database may also store the number of the last caller and the time and date at which the last call was received. The relevant database fields for each of the database sectors are illustrated in fig. 4.

As indicated hereinabove, the present invention allows the mobile user to specify a period of time during which all calls incoming on the principal line are screened to an alternative receiving location, which alternative receiving location may be either the user's voice mailing system or the number of a separate telephone unit.

In order to do this, according to one preferred method, the user dials a particular divert setting number which is routed via the mobile switching centre 30 to the interactive voice response system 80. The number allocated to the divert setting number is arbitrary, but may be of a nature which is easy to recall and input such as '555'.

The interactive voice response system is an interactive voice unit which provides the user with vocal prompts to allow the divert setting for the principal line to be set. Once connected to the interactive voice response system, therefore, the user is prompted to perform various actions on the mobile unit 2 in order to set the desired diversion period settings. The choices given to the user and the processes through which the user subsequently goes to set the screen divert settings are illustrated in the flow diagrams of figs 8A-8E. Once the user has set his preferred screen divert settings, the interactive voice response system calculates the absolute time and date of the start and/or end of the diversion period and then sends this data to the database 70 which stores the data in the relevant fields. The set-up process is then complete and the user may disconnect from the interactive voice response system.

A preferred operation of the network will now be described in more detail in the instance when an incoming call is made to the mobile user, an example of which is broadly illustrated in fig. 5.

The caller firstly dials the principal line 10 number of the mobile user 2 from his telephone 5. The call is received by the mobile switching centre 30 which then routes the call to the service control platform 60. The service control platform obtains the number from which the incoming call is being made (the A-number) or alternatively, determines whether the A-number is unavailable or is being withheld. The service control platform, which may have an internal clock, also determines the time and the date of the incoming call and the number which is being called i.e. the principal line or the priority line (the B-number). This information is then sent by the service control platform to the database 70. In order to send this data to the database, a data converter 90 may be used to convert the data into a form which may be understood by the database.

When the information is received by the database, the database runs through a check process, an example of which is broadly illustrated in fig. 6. The

database firstly checks whether the priority line service is available and then whether any permanent diversion settings have been made by the user. If such permanent diversion settings have been made, the database then checks to see if the B-number is the principal line MSISDN number or the priority line number.

If it is the priority line number, the database sets the screen number i.e. the number to which the call will be routed, to the principal line number. If the B-number is the principal line number, the database sets the screen number to the user's voice mailing system 40 or other alternative receiving location.

If no permanent diversion settings are found by the database, the database then performs a time comparison between the time that the incoming call was made and the time settings of the diversion period. The database then returns to the service control platform a forward-to number based on this time comparison. For example, if the time of the call is earlier than the expiry time of the diversion period, the database determines that the call must be routed to a forward-to number. If, on the other hand, the time of the call is later than the expiry time of the diversion period, the database determines that the call may be routed to the mobile unit rather than any other diversion numbers. In fact, the database may return more than one forward-to number depending on the current settings.

The forward-to numbers are sent by the database to the service control platform 60 via the data converter so that they are in a form which may be understood by the service control platform. The service control platform then routes the call to one of the forward-to numbers via the mobile switching centre 30. As can be seen in fig. 3, the call may be routed to the voice mailing system, a different alternative receiving location or to the mobile unit itself depending on the forward-to numbers determined by the database. It can be seen, therefore, that the routing information for the system lies primarily in the database whose function it is to determine where the call should be routed to. The service control platform may act merely as a routing tool, relying on the database for the necessary routing information.

An example of an alternative embodiment of the present invention is shown in fig. 7. In this case, either both of the principal line and the priority line may be screened to divert calls to an alternative receiving location. The user may set up the screening for each line individually and incoming calls may be screened to different alternative receiving locations for each line. It would still be possible for the user to set call diversions for both lines via the handset menu options.

It is envisaged that it may also be possible for the user to set the diversion settings without contacting the interactive voice response system. Instead, the user may be able to specify the desired settings via computer internet access as illustrated in fig. 2. In this instance, the user would connect to the network from, for example, a personal computer 100 via a modem link. Having accessed the relevant web site, the user would then input his user identification number, which may be his principal line MSISDN number, in order for the database to establish the user's identification. The user would then be prompted from the computer's visual display unit to input the diversion settings that he desires via the computer keyboard. Once entered, the data would then be sent to the database as previously described. It can be seen that this alternative is substantially identical to the method of setting the diversion settings described above but implements a slightly different user interface.

The system described above thus permits the implementation of a priority line service, by means of which subscribers to a cellular telephone system can keep a separate number free for urgent and important calls. Such important calls could, for example be from the subscriber's family, boss or an important customer.

Such a priority line service would thus allow prioritising of calls, by means of a second number. A subscriber may have a priority line by means of which his terminal (e.g. mobile phone) can be accessed even when the subscriber's main

line is diverted to a voicemail service. The service may be configured through the subscriber's terminal, for example by following voice or on-screen menu options accessed by the subscriber after dialling a specified number such as 555. The options may include setting the subscriber's main line to be diverted to voicemail for a specified period or indefinitely (until reassigned to cancel the voicemail setting). The priority line service can therefore be used by a subscriber to screen incoming telephone or other calls. The service can be set up easily, preferably via an IVR-driven interface. The service can be configured so that diverts of the main and/or priority line away from a user's terminal and to, for instance, a voicemail device can be cancelled automatically at a set time or after a set delay.

The service provider (e.g. the operator of the cellular service to which the subscriber subscribes) may or may not make an additional charge for each of the following independently:

- access to the priority line number,
- subscription to the priority line number,
- calls to a number used to set up the priority line service,
- calls to leave messages on the voicemail system,
- calls to access messages on the voicemail system,
- subscription to the voicemail system.

To implement the system, a subscriber may be issued with two telephone numbers: a 'main line' number, which may be printed on the subscriber's identity unit(e.g. a SIM (subscriber identity module) card), and a 'priority line' telephone number. Callers who are aware of the subscriber's priority line number may use it to place calls to the subscriber's mobile phone even when the subscriber has configured the system so that his main line number is to be diverted to a voicemail storage device to avoid him being disturbed by calls to the main line number.

To divert calls to his main line number to voicemail but still allow calls to the priority line number to reach his handset the user first dials a number (e.g. 555) from his handset. Calls to that number may be free of charge. The user may then be given voice prompts by the network, which may configure divert settings for the main number in response to the keys pressed by the user following the voice messages. The key presses may be detected by means, for example, of DTMF tones. The system is arranged so that if the user were to divert calls using menus on his handset calls to both the priority and main line numbers are diverted to voicemail. On dialling 555 the options available to a user as announced by the said voice prompts are preferably as follows:

| Key press | Followed by | Option |
|-----------|---|---|
| 1 | | To divert all main line calls to voicemail until further notice |
| 2 | xxxx (xxxx in 24 hour format); e.g. 1830 | To divert all main line calls to voicemail until a time today (e.g. 6:30 pm) |
| 3 | x# (x = number of days up to 7); e.g. 1# | To divert all main line calls to voicemail for a number of days (e.g. for 1 day from now until 8am the next day) |
| 3 | x# (x = number of days up to 7), xxxx (xxxx in 24 hour format); e.g. 5 1830 | To divert all main line calls to voicemail for a number of days and until a specific time (e.g. for 5 days until 6:30pm on the 5th day) |
| 4 | | To hear the priority line number |
| 9 | | To cancel existing voicemail divert |

The user may hang up once he has heard confirmation of his chosen option.

CLAIMS

1. A communication system comprising:

a call routing network selectively routing calls to one of a mobile unit and an alternative receiving location depending on a divert setting for the call number;

means for allocating to the mobile unit a principal call number and a priority call number; and

a controller for controlling the network so that an incoming call on the priority call number is routed to the mobile unit even when the principal call number for that mobile unit has a divert setting to the alternative receiving location.

2. A communication system as claimed in claim 1, including a call screening device which allows the divert setting to be set at the network responsive to an incoming call from a user on a predetermined divert setting number.

3. A communication system as claimed in claim 1, wherein the divert setting call is handled by an interactive voice unit which provides vocal user prompts to allow the divert setting to be set.

4. A method of setting a divert setting for a call number in a communications system comprising:

receiving an incoming call on a predetermined divert setting number,

providing a set of vocal user prompts to allow the divert setting to be set,

setting the divert setting at a call routing network of the communications system for a principal call number for a particular mobile unit so that calls on the principal call number are routed to an alternative location set by the divert setting but calls on a priority call number are routed to the mobile unit.

5. A method of operating a communications system comprising:

allocating to a mobile unit a principal call number and a priority call number,

enabling a divert setting to be set for the principal call number, and

routing incoming calls on the priority call number to the mobile unit even when the principal call number for that mobile unit has a divert setting to an alternative receiving location.

6. A method as claimed in claim 5, wherein the alternative receiving location is a message receiving service.

7. A method as claimed in claim 6, wherein the alternative receiving location is a voice mail service.

8. A communications system comprising:

a call routing network for selectively routing calls to one of a mobile unit and an alternative receiving location depending on a divert setting for the call number,

a store for holding in association with call numbers respective divert settings, and

a controller for controlling the network so that calls are routed in dependence on the divert settings held in the store.

9. A communications system as claimed in claim 8, wherein the store can hold in association with each call number a period for which the divert setting is to be active.

10. A communications system as claimed in claim 8 or 9, wherein the store can hold in association with each call number an end time for the divert setting.

11. A communications system as claimed in claim 9 or 10, wherein the divert setting and/or end time can be set by a user.

12. A communications system as claimed in any of claims 9 to 11, wherein the controller is capable of cancelling a divert after the said period and/or when the said end time is reached.

13. A communications system substantially as herein described with reference to the accompanying drawings.



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Claims searched: all

Examiner: Nigel Hall
Date of search: 19 October 1999

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.Q): H4L (LDPP)

Int Cl (Ed.6): H04Q 7/38; H04M 3/46,3/54

Other: Online: WPI, EPODOC, PAJ

Documents considered to be relevant:

| Category | Identity of document and relevant passage | Relevant to claims |
|----------|---|--------------------|
| A | US 5329578 (BRENNAN) | |
| A | US 5168517 (WALDMAN) | |
| A | FR 2771575 A1 (RICHARDIER) | |

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