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Pedersen

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(54) **METHODS AND TERMINAL DEVICES**

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(52) **U.S. Cl.** **455/518**; 455/517; 455/456.1; 455/414.1; 455/457

(58) **Field of Classification Search** 455/456.1, 455/517, 414.1, 404.2, 518, 457
See application file for complete search history.

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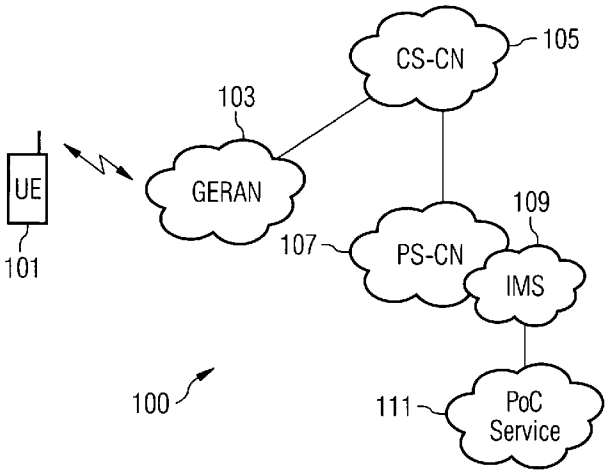
(57) **ABSTRACT**

A method and terminal device are provided which effect the steps of receiving a message indicating that a user of another terminal device has pressed a talk button, the message including a geographical location of the other terminal device, or any information derived therefrom; and indicating the geographical location of the other terminal device to a user of the terminal device. A further method and terminal device are provided which effect the steps of: in response to a user of a terminal device pressing a talk button, writing information describing the geographical location of the terminal device, or any information derived therefrom, into a message; and sending the message to another terminal device or to a communications network.

10 Claims, 6 Drawing Sheets



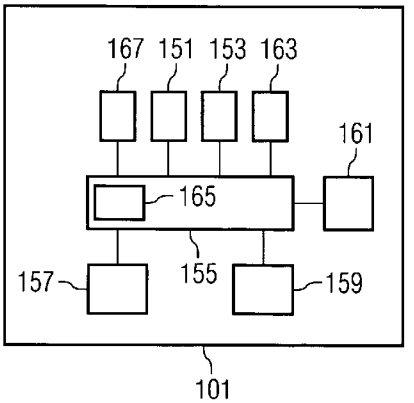


FIG 1A

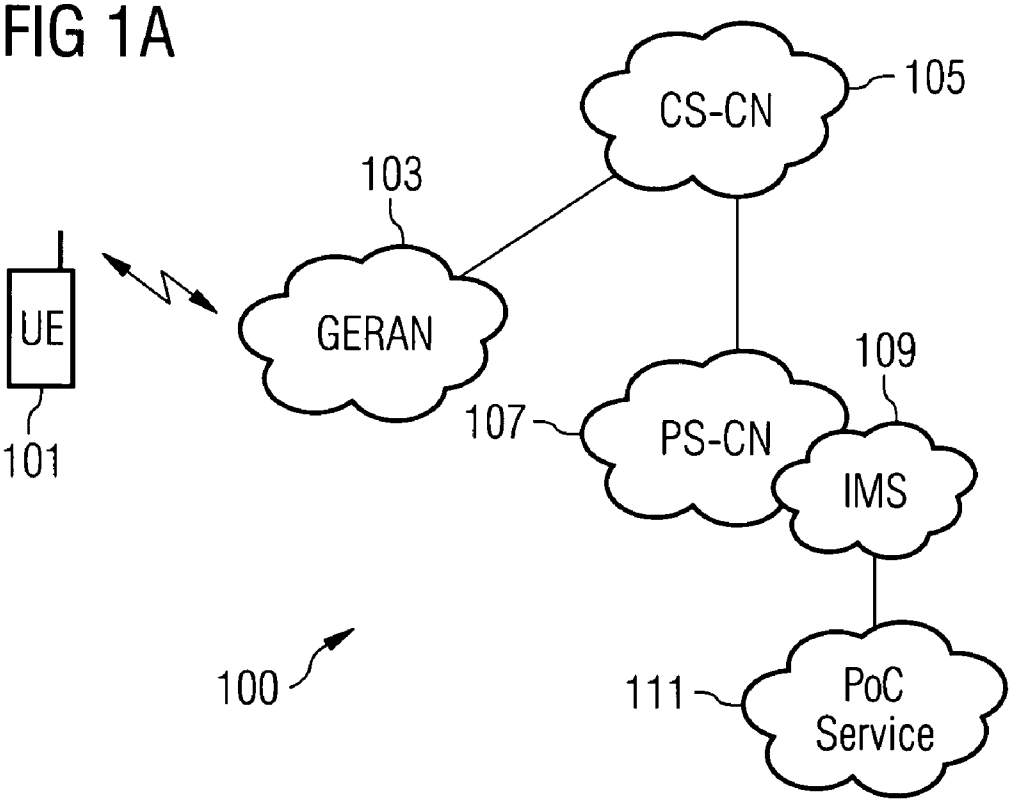

CS-CN
105
103
UE
GERAN
109
107
PS-CN
IMS
101
100
111
PoC
Service

FIG 1B

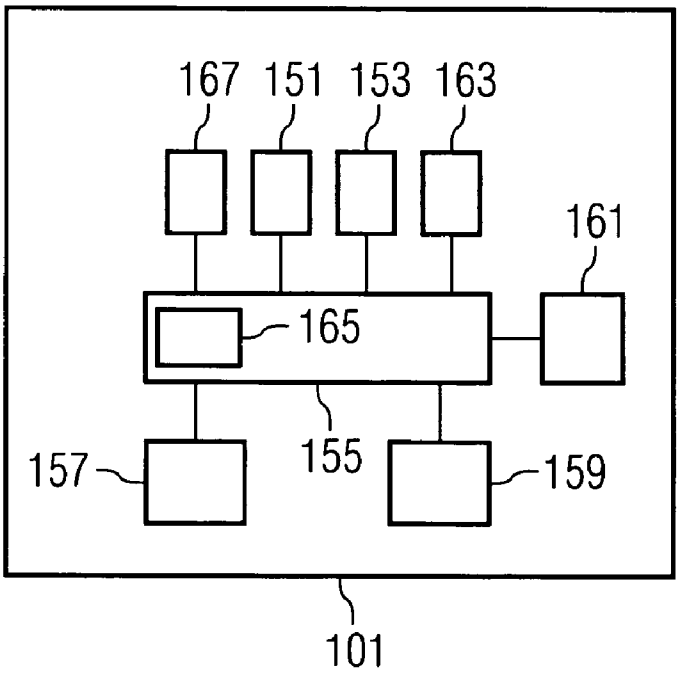

167
151
153
163
161
165
157
155
159
101

FIG 2

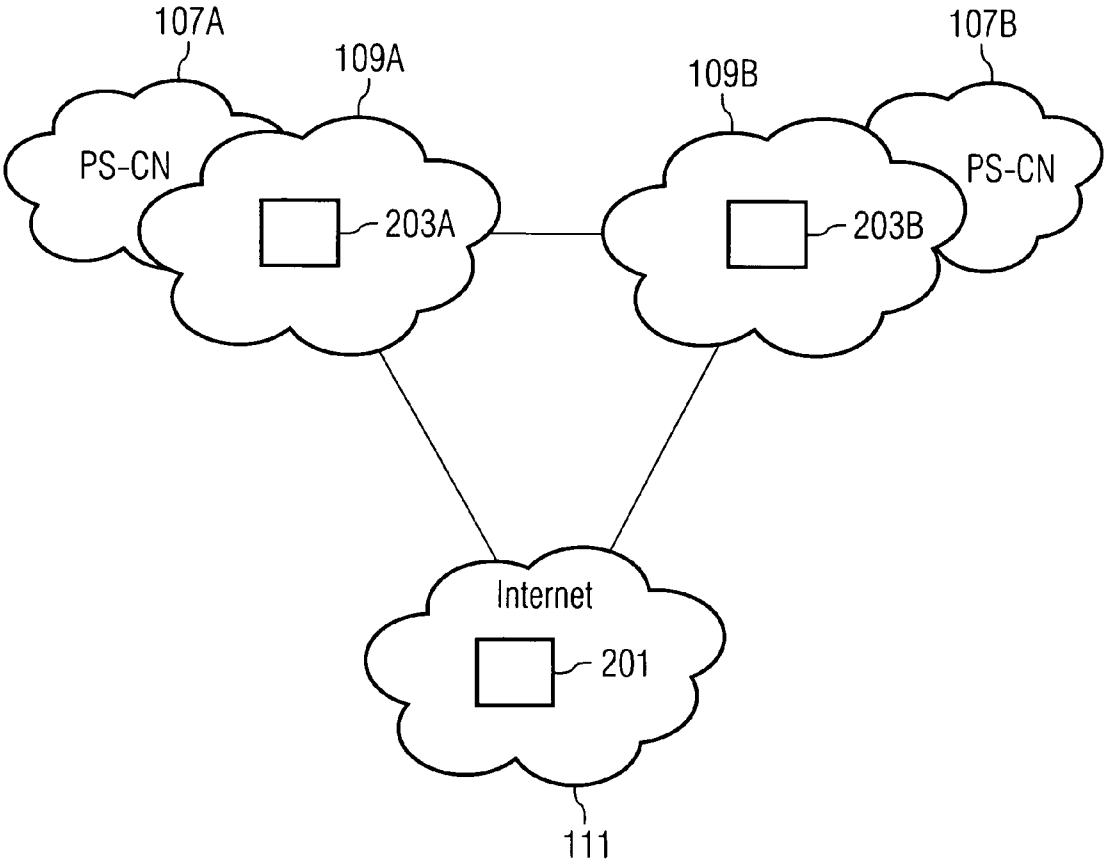
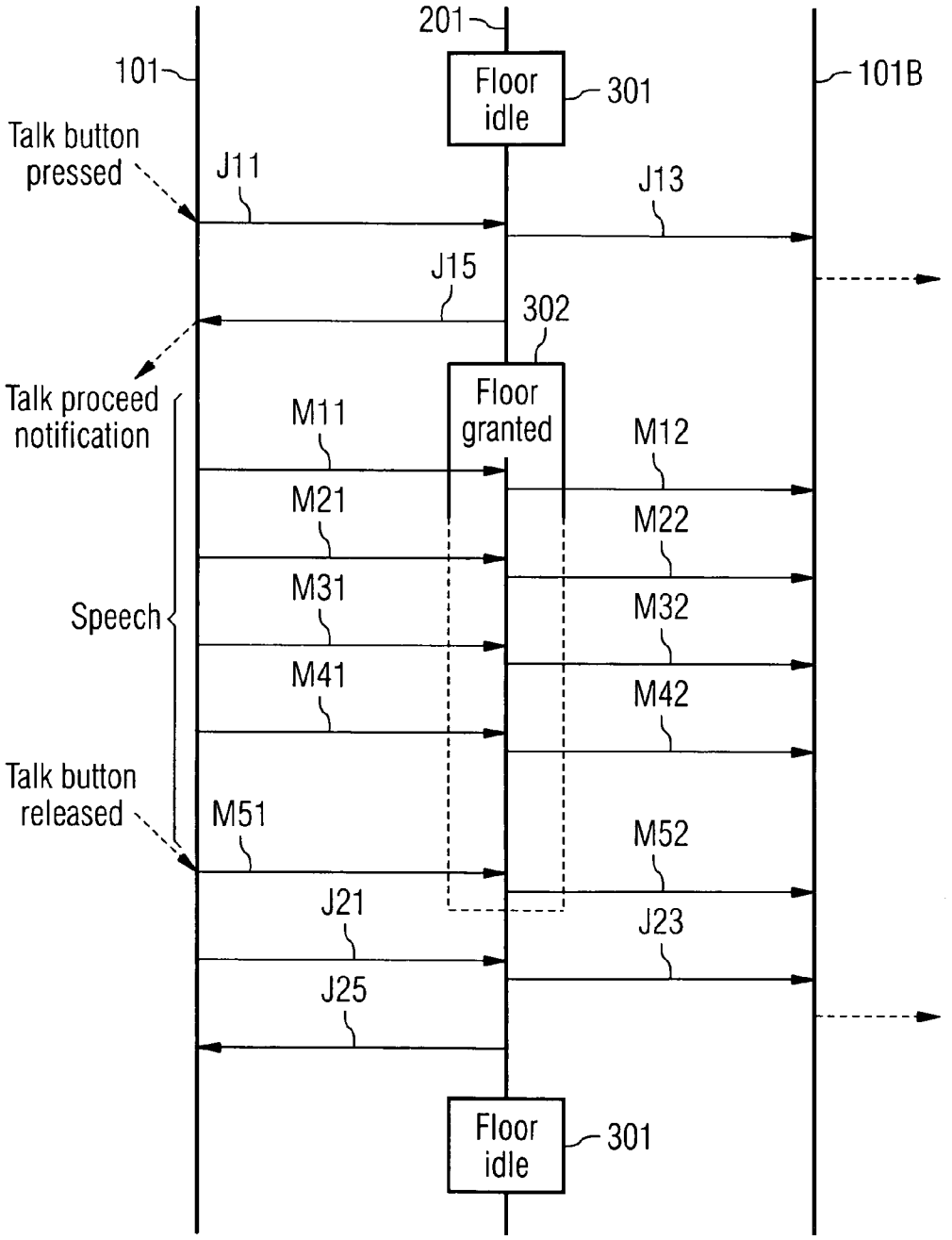


FIG 3


201
101
Floor idle
301
101B
Talk button pressed
J11
J13
J15
302
Talk proceed notification
Floor granted
M11
M12
M21
M22
Speech
M31
M32
M41
M42
Talk button released
M51
M52
J21
J23
J25
Floor idle
301

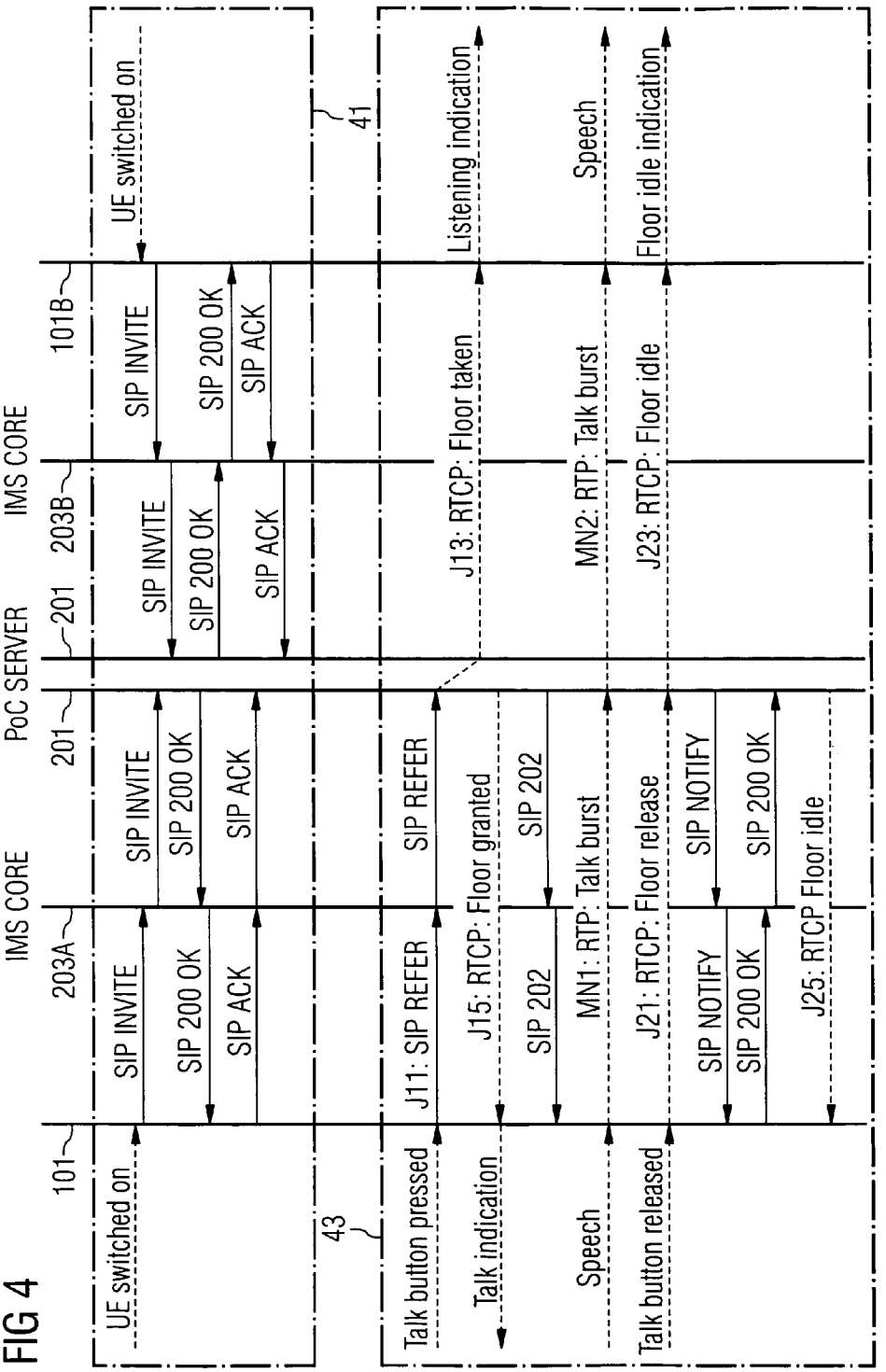

IMS CORE
PoC SERVER
IMS CORE
101
203A
201
201
203B
101B
UE switched on
SIP INVITE
SIP 200 OK
SIP ACK
SIP INVITE
SIP 200 OK
SIP ACK
SIP INVITE
SIP 200 OK
SIP ACK
41
43
Talk button pressed
J11: SIP REFER
SIP REFER
J13: RTCP: Floor taken
Listening indication
Talk indication
J15: RTCP: Floor granted
SIP 202
SIP 202
Speech
MN1: RTP: Talk burst
MN2: RTP: Talk burst
Speech
Talk button released
J21: RTCP: Floor release
SIP NOTIFY
SIP NOTIFY
J23: RTCP: Floor idle
Floor idle indication
SIP 200 OK
SIP 200 OK
J25: RTCP Floor idle

FIG 4

FIG 5

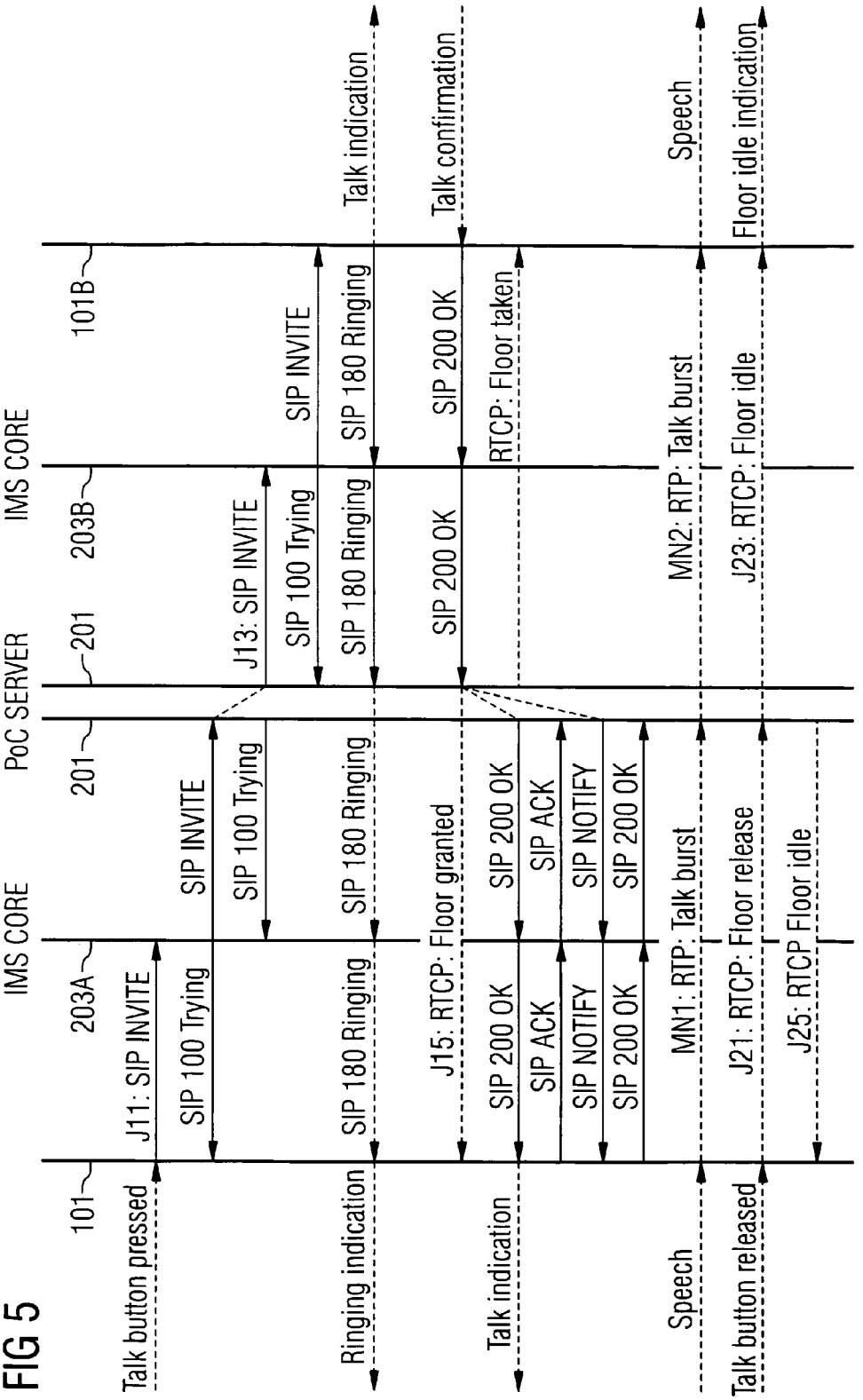

101
IMS CORE
203A
PoC SERVER
201
IMS CORE
203B
201
101B
Talk button pressed
J11: SIP INVITE
SIP 100 Trying
SIP INVITE
SIP 100 Trying
J13: SIP INVITE
SIP 100 Trying
SIP INVITE
SIP 180 Ringing
Talk indication
Talk confirmation
Ringing indication
SIP 180 Ringing
SIP 180 Ringing
SIP 180 Ringing
SIP 180 Ringing
SIP 200 OK
SIP 200 OK
SIP 200 OK
RTCP: Floor taken
Talk indication
J15: RTCP: Floor granted
SIP 200 OK
SIP ACK
SIP NOTIFY
SIP 200 OK
Speech
MN1: RTP: Talk burst
MN2: RTP: Talk burst
Speech
Talk button released
J21: RTCP: Floor release
J23: RTCP: Floor idle
Floor idle indication
J25: RTCP Floor idle

FIG 6A

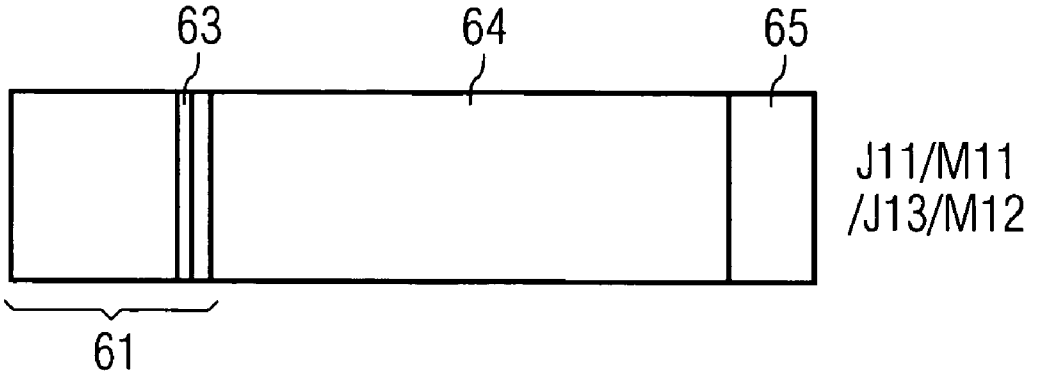
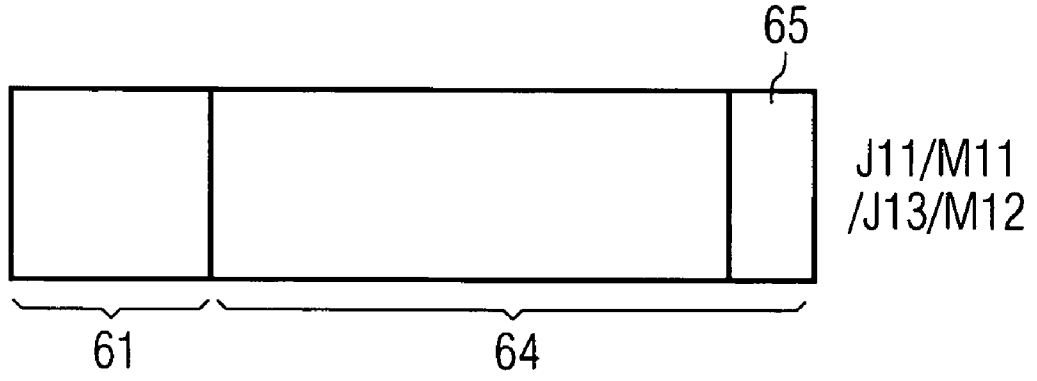


FIG 6B



METHODS AND TERMINAL DEVICES

BACKGROUND OF THE INVENTION

Push-to-Talk over Cellular, PoC, is a relatively new service offered in some cellular networks, and has gradually gained more success on the market. In PoC, one subscriber can transmit speech to another subscriber or a group of subscribers simply by pressing a speak button. The transmission is half-duplex only; i.e., only one party can speak at a time.

The communication channel between the parties of the conversation is usually a packet-switched communication channel which is preferably established at the very beginning of the service. As a consequence, a speech message, having speech coded at the terminal device, usually can be transferred almost instantaneously without an annoying delay due to the establishment of the packet switched communication channel between the individual speech messages that are to be transmitted.

A user receiving a Push-to-Talk over Cellular message cannot know the geographical location of the talking party without asking it from the speaker, which is time-consuming and, when PoC is used as a group service, can be annoying to the others who then hear the reply as well.

SUMMARY OF THE INVENTION

The present invention is therefore directed toward enabling a party of a conversation to obtain location information of another party in a convenient way.

If the geographical location information is received at a terminal in a message that indicates that a user of another terminal device has pressed a talk button, it is clearly advantageous that one party of the conversation does not need to ask the other party about his or her whereabouts. Furthermore, the geographical location information may become important for the recipient only at the point when the user of the other terminal device is going to say or is saying something, and has therefore pressed the talk button. In this manner, it can be ensured that the user obtains the geographical location when he or she needs it or has any interest in it, not too early or not too late.

Indicating the geographical location can be performed in many ways. This is particularly useful if the geographical location is indicated to the user of the terminal device in relation to his or her own geographical location. This helps the party receiving the speech message to sense the direction where the speech is actually coming from. This may improve the user's feeling of mutual understanding, or help to locate the other user in a crowded area. Particularly advantageous embodiments for carrying out this feature are: indicating a direction of the terminal device from the geographical location of the other terminal device; indicating a distance of the terminal device from the other terminal device; indicating the geographical location of the terminal device on a map together with the location of the other terminal device; and indicating the coordinates of the terminal device as well as those of the other terminal device.

If the geographical location information is written into a message that is transmitted to another terminal device either directly or via a network, it is advantageous that one party of the conversation does not need to tell the other party about his or her whereabouts.

Nevertheless, in order to avoid privacy problems and any conflicts with the legislator in some countries, it may become necessary to enable user control over the decision whether or not geographical location information may be sent.

Therefore, by setting a parameter controllable by a user of the terminal device, sending the geographical location information can be disabled or enabled. In this manner, it is also possible to use, for example, the PoC service without revealing the address.

Furthermore, if the parameter controllable by a user of the terminal device shows that the geographical location may be indicated to another device to which the message, or any message derived therefrom, is going to be sent, partial anonymity can be guaranteed. In this manner, for example, parents may ensure that the child's geographical location is transmitted to parents and/or trusted friends only, but not to unknown people that might cause harm to the child.

Common to all embodiments of the present invention is that if the message is a message that would, in any case, be sent to the other party, some traffic can be avoided since no dedicated geographical location messages need to be transmitted any more.

If the present invention is used in connection with PoC, such messages are then preferably Push-to-Talk over Cellular messages. Some special cases of these messages are a REFER message, a Floor taken message, or a Talk burst, since they are sent, in any case, if a speech message is transmitted between two terminal devices.

Additional features and advantages of the present invention are described in, and will be apparent from, the following Detailed Description of the Invention and the Figures.

BRIEF DESCRIPTION OF THE FIGURES

FIG. **1**A shows a modern network architecture for enabling a PoC service.

FIG. **1**B shows a simplified functional block diagram of a terminal device.

FIG. **2** illustrates the implementation of a PoC service.

FIG. **3** shows an exemplary signalling diagram for PoC.

FIGS. **4** and **5** show more detailed signalling diagrams for PoC.

FIG. **5** is another model case for PoC.

FIGS. **6**A and **6**B illustrate possible structures of the message carrying geographical location information.

Same reference numerals refer to similar elements throughout **10** the Figures.

DETAILED DESCRIPTION OF THE INVENTION

FIG. **1**A shows a modern network architecture for enabling the PoC service. A terminal device **101**, sometimes denoted as user equipment, such as a mobile terminal or a portable digital assistant, can be in wireless connection with a communications network **100** or with another terminal device.

The communications network **100** may include a GSM/EDGE Radio Access Network **103** which is further connected to a Circuit-Switched Core Network **105** and a Packet-Switched Core Network **107**. The latter is further connected to an IP-based Multimedia Subsystem IMS **109** which resembles, more or less, the Internet. The PoC service can be located in the Internet **111** or in any IP-based network.

FIG. **1**B shows a simplified functional block diagram of a terminal device **101**. The terminal device **101** includes receiving part **151**, transmitting part **153**, processing unit **155**, memory **161**, voice input part **157** and voice output part **159**, visual indication part **163**, and push button **167**. The processing unit can run application **165** for offering the PoC service. The receiving part **151** and the transmitting part **153** may

enable the terminal device **101** to be in communication with the communications network **100** or with another terminal device.

An example of the voice input part **157** is a microphone, and an example of the voice output part **159** a loudspeaker. A skilled person appreciates that some fundamental components (e.g., rechargeable battery or any other energy source, amplifiers, antennas, etc.) have been omitted from FIG. **1**B for clarity. These features are nevertheless rather well known per se such that omitting them does not make understanding the present invention any more difficult.

FIG. **2** illustrates the implementation of the PoC service. The Packet-Switched Core Network **107**A, through which the terminal device **100** can have its connections, is connected to the IMS **109**A Most messages are routed via IMS core **203**A. The PoC server **201** can be in the Internet **111**.

Another terminal device can be connected either to the same Packet-Switched Core Network **107**A or to another Packet-Switched Core Network **107**B; e.g., of another communications network **100**B. The Packet-Switched Core Network **107**B is connected to the IMS **109**B which further includes IMS Core **203**B. The IMS **109**A may communicate with the IMS **109**B either directly or via the Internet **111**.

FIG. **3** shows an exemplary signalling diagram for PoC. The user at the terminal device **101** presses the talk button **167**. The terminal device **101** sends a request to the PoC server **201** which is in "Floor Idle" state (step **301**). The PoC server **201** notifies the other terminal device **101**B by sending a notification J**13**, grants the floor and notifies the terminal device **101** by sending an acknowledgement J**15**. Then the terminal device **101** signals the user Talk proceed-notification; e.g., by alerting the user with voice output part **159**. The user starts speaking, and speech received by the voice input part **157** is coded and transmitted in packets M**11**, M**21**, M**31**, M**41**, . . . , M**51** to the PoC server **201** which further forwards the messages to the other terminal device **101**B as packets M**12**, M**22**, M**32**, M**42**, . . . , M**52**.

The user can speak as long as the talk button **167** is pressed. After releasing the talk button **167**, the terminal device **101** signals the release of the talk button to the PoC server **201** by sending a message J**21**. The PoC server **201** notifies the other terminal device **101** by sending a message J**23**, and then sends an acknowledgement J**25** to the terminal device **101**. Then, the PoC server **201** returns to the Floor Idle state, as designated at step **301**.

FIGS. **4** and **5** show more detailed signalling diagrams for PoC.

FIG. **4** shows a case where both terminal devices have enabled so-called early session and automatic answer.

Dashed box **41** shows how a session is created. When terminal device **101** is switched on, it sends an SIP INVITE message to the IMS core **203**A which further forwards the message to PoC server **201**, which responds with SIP 200 OK that is forwarded by the IMS core **203**A to the terminal device **101**. The terminal device **101** responds with an acknowledgement SIP ACK. The other terminal **101**B performs similar messaging with the PoC server **201**.

Dashed box **43** shows how a PoC is then used. When the talk button **167** is pressed at a terminal device **101**, the terminal device **101** sends message J**11**, which is a SIP REFER message. The IMS core **203**A forwards message J**11** to PoC server which transmits message J**13** that is RTCP: Floor taken message to the other terminal device **101**B. The other terminal device **101**B indicates that it is now listening to the terminal device **101**; e.g., by playing a suitable acoustic signal.

The PoC server **201** responds with message J**15** that is RTCP: Floor Granted. Then, the terminal device **101** indicates to the user that he or she can now talk; e.g., by playing a suitable acoustic signal. The PoC furthermore sends an SIP 202 message to the terminal device **101**.

Speech packets MN**1** coded at the terminal device **101** are transmitted as RTP: Talk bursts through the IMS core **203**A to the PoC server **201**. The PoC server **201** forwards them as speech packets MN**2**, transmitting them as RTP: Talk bursts to the other terminal device **101**B through the IMS core **203**B. The other terminal device **101**B receives the speech packets MN**2**, decodes them, and converts them to an audible form so that the user of the other terminal device **101**B can hear a reproduction of the speech coded by the terminal device **101**.

When talk button **167** is released at the terminal device **101**, the terminal device sends message J**21** that is RTCP: Floor release message. The PoC server **201** sends message J**23** that is RTCP: Floor idle message to the other terminal device **101**B. The other terminal device indicates to the user that the floor is now idle; i.e., that he or she may press the push button **167** of his or her terminal device **101**B.

The PoC server **201** responds with SIP NOTIFY, and the terminal acknowledges by sending SIP 200 OK message. The PoC server **201** responds once more by sending message J**25** that is RTCP:

Floor idle message.

FIG. **5** shows late media and manual answer for one-to-one communication using PoC. Now responsive to terminal device **101** detecting a pressing of talk button **167**, it sends message J**11** that is SIP INVITE to IMS core **203**A. The IMS core **203**A forwards the SIP INVITE to PoC server **201** that sends message J**13** that is SIP invite to IMS core **203**B. The IMS core **203**B forwards the SIP INVITE to the other terminal device **101**B, and passes SIP 100 Trying message to PoC server which forwards it through the IMS core **203**A to the terminal device **101**.

Upon receiving SIP INVITE, the other terminal device **101**B indicates that a talk is intented, such as by playing a suitable audible signal, and passes SIP 180 Ringing message through the IMS core **203**B, the PoC server **201**, and the IMS core **203**A to the terminal device **101**. The terminal device **101** alerts the user.

When a user of the other terminal device **101**B accepts the talk, such as by pressing a suitable button, the other terminal **101**B transmits SIP 200 OK message through the IMS core **203**B to the PoC server **201** which then sends message J**15** which is RTCP: Floor granted message to the terminal device **101**. The SIP 200 OK is furthermore passed to the terminal device **101**, after which the terminal device **101** alerts the user. Some acknowledgements and other SIP messages furthermore may be transmitted. The transmission of speech packets in messages MN**1** and MN**2** nevertheless takes place in a very similar manner than in the example discussed with reference to FIG. **4**.

FIGS. **6**A and **6**B illustrate possible structures of the message carrying geographical location information. The message can be J**11** (signalling from terminal device **101** to the PoC server **201** that a talk button **167** has been pressed), M**11** (any speech packet or particularly the first speech packet from the terminal device **101**), J**13** (signalling from PoC server **201** to the other terminal device **101**B that a talk button **167** has been pressed at the terminal device **101**), or M**12** (any speech packet or particularly the first speech packet from the PoC server **201** to the other terminal device **101**B).

The first terminal device **101** finds out its geographical location **65**. For doing this, it may use any suitable locationing method. Currently, terminal devices with assisted Global

Positioning System A-GPS receivers are under development. A-GPS enables quick & accurate location finding for the terminal device.

When the user of the first terminal device **101** pushes the talk button **167** in order to use the push-to-talk service, the first terminal device **101** requests the network for a permission to speak, and finally the push-to-talk message is generated by coding microphone input. The request for a permission to speak (message J**11**) or any of the speech messages (MN**1**, especially M**11**) may include the geographical location information **65**.

As shown in FIG. **6**A, the push-to-talk message J**11**, M**11**, J**13**, or M**12** may include a flag **63** "location information present" in the header field **61** indicating that the geographical location **65** follows. As an alternative, as illustrated in FIG. **6**B, the least-significant bits of the speech message **64** having coded speech may be used to indicate the geographical location **65**. The latter possibility enables a proprietary solution.

The other terminal device **101**B receives the push-to-talk message. After checking the flag **63** in the header field **61** or the least significant bits **65**, an application, such as the PoC application **165**, extracts the geographical location information **65**.

The other terminal device **101**B knows its own geographical location **65**B.

The other terminal device **101**B compares its own geographical location **65**B with the geographical location **65** of the terminal device **101**. Information based on a comparison result is shown to the user of the other terminal device **101**B. This information may include any of the following: direction of the terminal device **101** (may require use of a digital compass in the other terminal device **101**B); distance of the terminal device **101** from the other terminal device **101**B; show on a map the geographical location **65** of terminal device **101** vs. its own geographical location **65**B; or just displaying the geographical location **65** of terminal device **101** vs. its own geographical location **65**B.

It is by no means necessary that the geographical location **65** is received as such at the other terminal device **101**B. The other terminal device **101**B may transmit, such as by responding to any one of messages J**13** or MN**2** (particularly M**12**) its own geographical location **65**B to a network unit; e.g., to the PoC server **201** which then computes the difference and transmits information based thereon to both the terminal device **101** and the other terminal device **101**B.

The terminal device **101**, for example, in one of its applications, such as the PoC application **165**, may have a settings menu for setting a "push-to-talk" item, under which a user can tick on/off the following items:

send own location with push-to-talk; and

show talking party's direction/location.

In other words, the user sending his or her own location has full control over whether or not the location is to be sent or, as described above, the parents or employer, for example, can control the transmission of the geographical location information.

Although the present invention has been described with reference to specific embodiments, those of skill in the art will recognize that changes may be made thereto without departing from the spirit and scope of the present invention as set forth in the hereafter appended claims.

The invention claimed is:

1. A method for receiving location information, the method comprising:

receiving a Push-to-Talk over Cellular message (PoC) at a first PoC terminal device indicating that a user of a second PoC terminal device has pressed a PoC talk button, the message including a geographical location of the second PoC terminal device;

indicating the geographical location of the second PoC terminal device to a user of the first PoC terminal device;

indicating a direction of the first PoC terminal device from the geographical location of the second PoC terminal device;

indicating a distance of the first PoC terminal device from the second PoC terminal device;

indicating a geographical location of the first PoC terminal device on a map together with the geographical location of the second PoC terminal device; and

indicating coordinates of both the first PoC terminal device and the second PoC terminal device.

2. A method for receiving location information as claimed in claim **1**, wherein the Push-to-Talk over Cellular message is one of a REFER message and a Floor taken message.

3. A method for transmitting location information, the method comprising:

determining whether a parameter controllable by a user of a first PoC terminal device allows for indicating a geographical location of the first PoC terminal device to another PoC terminal device to which a message maybe sent;

writing information into the message, in response to the user of the first PoC terminal device pressing a PoC talk button, the information indicating the user pressed the PoC talk button and, only if the parameter allows, indicating the geographical location of the first PoC terminal device wherein the information describing the geographical location of the first PoC terminal device is written, into the message only if a parameter controllable by the user of the first PoC terminal device shows that the geographical location is indictable; and

transmitting the message to one of a second PoC terminal device and a communications network.

4. A method for transmitting location information as claimed in claim **3**, wherein the message is a Push-to-Talk over Cellular message.

5. A method for transmitting location information as claimed in claim **4**, wherein the Push-to-Talk over Cellular message is one of a REFER message and a Floor taken message.

6. A PoC terminal device, comprising:

a receiver, the receiver receiving a PoC message indicating, that a user of a further PoC terminal device has pressed a PoC talk button, the PoC message including a geographical location of the further PoC terminal device; and

an indicator, the indicator indicating the geographical location of the further PoC terminal device to a user of the PoC terminal device, the indicator additionally indicating at least one of:

a direction of the PoC terminal device from the geographical location of the further PoC terminal device;

a distance of the PoC terminal device from the further PoC terminal device;

a geographical location of the PoC terminal device on a map together with a geographical location of the further PoC terminal device; and

coordinates of both the PoC terminal device and the further PoC terminal device,

wherein the PoC message includes the geographical location of the further PoC terminal device and the indicator

only if a parameter controllable by the user of the further PoC terminal device shows that the geographical location is indictable.

7. A PoC terminal device as claimed in claim **6**, wherein the Push-to-Talk over Cellular message is a Floor taken message.

8. A PoC terminal device, comprising:

a parameter under control of a user of the PoC terminal device for determining whether the PoC terminal device allows for indicating a geographical location of the PoC terminal device to another PoC terminal device to which a message is to be sent;

a message generator, the message generator writing-information into the message, responsive to a user of the PoC terminal device pressing a PoC talk button, the information indicating the user pressed the PoC talk button and, only if the parameter allows, indicating the geographical location of the PoC terminal device, wherein the information describing the geographical location of the PoC terminal device is written into the message only if a parameter controllable by the user of the PoC terminal device shows that the geographical location is indictable; and

a transmitter, the transmitter transmitting the message to one of a further PoC terminal device and a communications network.

9. A PoC terminal device as claimed in claim **8**, wherein the message is a Push-to-Talk over Cellular message.

10. A PoC terminal device as claimed in claim **9**, wherein the Push-to-Talk over Cellular message is a REFER message.

* * * * *