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

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
31 January 2002 (31.01.2002)

PCT

(10) International Publication Number
WO 02/08703 A1

(51) International Patent Classification[7]: G01F 1/84, 25/00

(21) International Application Number: PCT/US01/22995

(22) International Filing Date: 20 July 2001 (20.07.2001)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
09/620,750 21 July 2000 (21.07.2000) US

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(81) Designated States *(national)*: AU, BR, CA, CN, ID, IN, JP, KR, MX, PL, RU, SG.

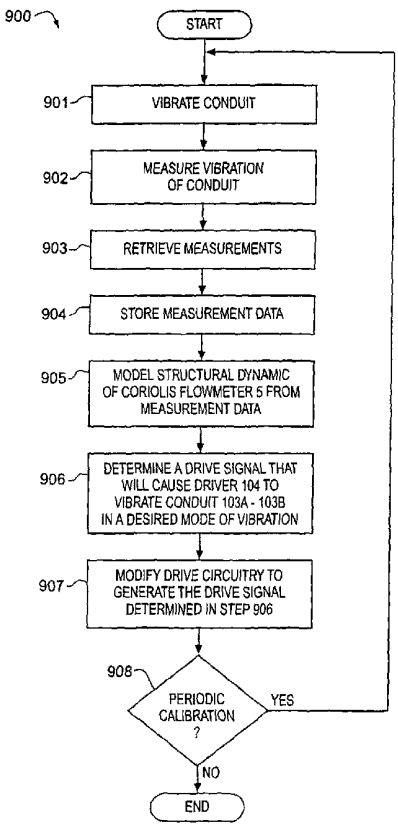
(84) Designated States *(regional)*: European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR).

Published:
— *with international search report*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

WO 02/08703 A1

(54) Title: A SYSTEM FOR CALIBRATING A DRIVE SIGNAL IN A CORIOLIS FLOWMETER



(57) Abstract: A system for calibrating a drive signal applied to a driver affixed to a conduit to cause the driver to apply a force that vibrates the conduit in a desired mode of vibration. The calibration is completed by first developing a mathematical model of the apparatus and then using the model to mathematically calculate a proper drive signal voltage. The development of a model of the dynamics and calculation of the drive signal voltage are completed by vibrating the conduit, measuring the vibrations of the conduit, detecting physical characteristics of the apparatus from the measured vibrations, and determining a drive signal that causes the driver to oscillate the conduit in a desired mode of vibration responsive to determining the physical characteristics of the apparatus.

A SYSTEM FOR CALIBRATING A DRIVE SIGNAL IN A CORIOLIS FLOWMETER

FIELD OF INVENTION

This invention relates to telephone answering systems and, more specifically, to cellular telephone answering system messaging. This invention also relates to telephone caller identification methods.

BACKGROUND

Telephone answering systems have been popular for several years. These systems have given telephone customers the ability to leave a general message when they are not available and to record messages left by callers. Answering system capabilities have been extended to various radio telephone formats by utilizing network calling centers instead of the stand alone equipment typically used for wire-based telephones. These answering systems provide callers, along with other functions, the ability to leave voice and text messages. The answering systems allow the customer to playback voice mail messages, display text messages or save messages for future access.

Caller identification systems have become increasingly popular because of the added security afforded by being able to identify

callers before having to answer incoming calls. The caller identification systems provide an incoming caller's name, telephone number and other listed information on a readout display. Most consumer radiotelephone networks offer caller identification features.

A drawback of current answering system technology is that a customer must choose one message to be played back for all incoming callers. Current answering systems do not typically distinguish between incoming callers, so the customer does not likely have a secure option for leaving private or sensitive information in a playback message. Some answering systems can let customers save a variety of messages and choose between them to suit various situations. For example, one message could be played for situations when a customer is on another line or too busy to accept a call and another when the customer is not home or out of the office. The customer chooses between recorded playback messages through a user interface, but does not have the option to select messages for playback based on the identity of the caller. However, with caller identification, it is possible for a customer, or an answering system, to obtain information about an incoming caller.

A method has been devised for automatically delivering an incoming calling line identification to a remotely located paging device. An incoming call with caller identification information is received and completed either to an answering machine or other type of voice mail system. When the line has cleared at the end of the incoming call, the answering system dials the telephone number, and any requisite personal identification number or other code number, for the customer's paging service and then sends the caller identification information to the service

causing the information to be displayed on the customer's pager. An example of this method is described in U.S. Pat. No. 5,857,016 to Jedlicka et al. One disadvantage of this method is that although it can alert the customer about who is specifically calling, it does not provide a method for the customer to personally respond to the caller with a unique message. A method is needed to provide for the unique characterization of answering system messages for specific callers.

SUMMARY OF THE INVENTION

The present invention overcomes the above-described problems in the prior art by providing a method for the unique characterization of cellular telephone answering machine messages.

The present invention overcomes the problems of the prior art by providing a cellular telephone answering system that can utilize caller identification information to alert an incoming caller that a unique playback message may be available. The answering system may utilize any number of methods to answer telephone calls like those currently used in the art.

Generally described, the present invention provides a method for characterizing radiotelephone answering system messages by utilizing caller identification information. A secondary security protocol may be used to help ensure that the correct recipient receives the unique message.

The customer first calls the cellular telephone answering system and programs in certain information about the parties for which the customer wants to leave a unique message. The customer then

records playback messages for the specific parties. When a caller calls the customer's cellular telephone and is transferred to the answering system, the system will recognize if the caller identification information matches any identification information from the customer's saved messages. The message with the matching identification information would be played back for the caller. Alternatively, there could be no identification match and the system would then play the customer's default message for the caller.

One embodiment of the present invention provides for a personal identification number or a password to provide an extra measure of security. In this embodiment, the customer assigns a personal identification number or a password to each unique message. A caller with matching caller identification information will have to provide a matching personal identification number to ensure they are the intended recipient of the message. The answering system utilizes voice recognition technology in continuous digit (or speech) recognition mode for the caller to speak out the personal identification number or password.

In another embodiment of the present invention, the caller can use a touch tone keypad to enter the personal identification number or password.

In another embodiment of the present invention, the caller can provide the personal identification number or password to a live operator. If the correct personal identification number or password is entered, the system will playback the caller's unique message. The caller could then record a message in the same manner as other

answering systems by methods well known by those of ordinary skill in the art or, alternatively, end the call.

In yet another embodiment of the present invention, the cellular telephone answering system is integrated into the handset. The customer can use a user interface to access the answering machine functions.

Other objects, features and advantages of the present invention will become apparent upon reading the following detailed description of the preferred embodiments of the invention, when taken in conjunction with the accompanying drawings and appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a system diagram that illustrates an exemplary environment suitable for implementing various embodiments of the present invention.

Fig. 2A is a system diagram that illustrates a high-level exemplary environment suitable for implementing various embodiments of the present invention.

Fig. 2B is a system diagram that illustrates another high-level exemplary environment suitable for implementing various embodiments of the present invention.

Fig. 3 is a flow chart illustrating the steps of an exemplary embodiment of the programming aspect of the present invention.

Fig. 4A is a flow chart illustrating the steps of the operation of an exemplary embodiment of the present invention.

Fig. 4B is a flow chart illustrating the steps of the operation of another exemplary embodiment of the present invention.

DETAILED DESCRIPTION

Referring now in detail to the drawings in which like numerals refer to like parts throughout the several views, Fig. 1 is a system diagram that illustrates an exemplary environment suitable for implementing various embodiments of the present invention. Fig. 1 and the following discussion provide a general overview of a platform onto which the invention may be integrated or implemented. Although in the context of the exemplary environment the invention will be described as consisting of instructions within a software program being executed by a processing unit, those skilled in the art will understand that portions of the invention, or the entire invention itself may also be implemented by using hardware components, state machines, or a combination of any of these techniques. In addition, a software program implementing an embodiment of the invention may run as a stand-alone program or as a software module, routine, or function call, operating in conjunction with an operating system, another program, system call, interrupt routine, library routine, or the like. The term "program module" will be used to refer to software programs, routines, functions, macros, data, data structures, or any set of machine readable instructions or object code, or software instructions that can be compiled into such, and executed by a processing unit.

Those skilled in the art will appreciate that the system illustrated in Fig. 1 may take on many forms and may be directed towards performing a variety of functions. Examples of such forms and

functions include cellular telephones, radio telephones, portable telephones, two-way pagers, personal computers, hand-held devices such a personal data assistants and calculators, consumer electronics, note-book computers, lap-top computers, and a variety of other applications, each of which may serve as an exemplary environment for embodiments of the present invention.

The exemplary system illustrated in Fig. 1 includes a computing device **110** that is made up of various components including, but not limited to a processing unit **112**, non-volatile memory **114**, volatile memory **116**, and a system bus **118** that couples the non-volatile memory **114** and volatile memory **116** to the processing unit **112**. The non-volatile memory **114** may include a variety of memory types including, but not limited to, read only memory (ROM), electronically erasable read only memory (EEROM), electronically erasable and programmable read only memory (EEPROM), electronically programmable read only memory (EPROM), electronically alterable read only memory (EAROM), FLASH memory, bubble memory, and battery backed random access memory (RAM). The non-volatile memory **114** provides storage for power on and reset routines (bootstrap routines) that are invoked upon applying power or resetting the computing device **110**. In some configurations the non-volatile memory **114** provides the basic input/output system (BIOS) routines that are utilized to perform the transfer of information between elements within the various components of the computing device **110**.

The volatile memory **116** may include, but is not limited to, a variety of memory types and devices including, but not limited to,

random access memory (RAM), dynamic random access memory (DRAM), FLASH memory, EEPROM, bubble memory, registers, or the like. The volatile memory **116** provides temporary storage for routines, modules, functions, macros, data etc. that are being or may be executed by, or are being accessed or modified by the processing unit **112**. In general, the distinction between non-volatile memory **114** and volatile memory **116** is that when power is removed from the computing device **110** and then reapplied, the contents of the non-volatile memory **114** remain intact, whereas the contents of the volatile memory **116** are lost, corrupted, or erased.

The computing device **110** may access one or more external display devices **130** such as a CRT monitor, LCD panel, LED panel, electro-luminescent panel, or other display device, for the purpose of providing information or computing results to a user. In some embodiments, the external display device **130** may actually be incorporated into the product itself. The processing unit **112** interfaces to each display device **130** through a video interface **120** coupled to the processing unit **110** over the system bus **118**.

The computing device **110** may send output information, in addition to the display **130**, to one or more output devices **132** such as a speaker, modem, printer, plotter, facsimile machine, RF or infrared transmitter, computer or any other of a variety of devices that can be controlled by the computing device **110**. The processing unit **112** interfaces to each output device **132** through an output interface **122** coupled to the processing unit **112** over the system bus **118**. The output interface may include one or more of a variety of interfaces, including

but not limited to, an RS-232 serial port interface or other serial port interface, a parallel port interface, a universal serial bus (USB), an optical interface such as infrared or IRDA, an RF or wireless interface such as Bluetooth, or other interface.

The computing device **110** may receive input or commands from one or more input devices **134** such as a keyboard, pointing device, mouse, modem, RF or infrared receiver, microphone, joystick, track ball, light pen, game pad, scanner, camera, computer or the like. The processing unit **112** interfaces to each input device **134** through an input interface **124** coupled to the processing unit **112** over the system bus **118**. The input interface may include one or more of a variety of interfaces, including but not limited to, an RS-232 serial port interface or other serial port interface, a parallel port interface, a universal serial bus (USB), an optical interface such as infrared or IrDA, an RF or wireless interface such as Bluetooth, or other interface.

It will be appreciated that program modules implementing various embodiments of the present invention may be stored in the non-volatile memory **114**, the volatile memory **116**, or in a remote memory storage device accessible through the output interface **122** and the input interface **124**. The program modules may include an operating system, application programs, other program modules, and program data. The processing unit **112** may access various portions of the program modules in response to the various instructions contained therein, as well as under the direction of events occurring or being received over the input interface **124**.

The computing device **110** may transmit signals to, or receive signals from, one or more communications systems **136** such as a cellular network, RF network, computer network, cable network, optical network or the like. The processing unit **112** interfaces to each communications system **136** through a transmitter **126** and a receiver **128**, both coupled to the processing unit **112** over the system bus **118**. The transmitter **126** and the receiver **128** may include one or more of a variety of transmission techniques such as a radio frequency interface (AM, FM, PSK, QPSK, TDMA, CDMA, Bluetooth or other technique) or an optical interface such as infrared or IrDA.

Fig. 2A is a system diagram that illustrates a high-level exemplary environment suitable for implementing various embodiments of the present invention. A cellular telephone answering system **200** consists of a specific center that coordinates answering system functions for the several network users **202**. A customer can use the computing device **110**, commonly in the form of a handset, to access the cellular telephone answering system **200** to, among other functions, record, read, save or organize messages. The cellular telephone answering system **200** can be accessed by placing a call or by pressing a dedicated "messages" button on the handset **110**. The call is routed through the communications system **136** to the answering center in the same manner as typical cellular telephone calls. The implementation of a cellular telephone answering system **200** can be accomplished in numerous ways well known to those of ordinary skill in the art.

Fig. 2B is a system diagram that illustrates another high-level exemplary environment suitable for implementing various

embodiments of the present invention. The cellular telephone answering system **200** can be integrated into the handset **110**. The customer can use an input device **134** such as a keypad to access the functions of the cellular telephone answering system **200**. The implementation of a cellular telephone answering system **200** within a handset **110** can be accomplished in numerous ways well known to those of ordinary skill in the art.

Fig. 3 is a flow chart illustrating the steps of an exemplary embodiment of the present invention. The customer will be prompted by the cellular telephone answering system to record a message **300**. After the customer records the message **302**, the system will present a choice of whether the customer would like to save the recorded message for a specific caller or not **304**. If the customer does not want to save the call for a specific caller then the system will save the message as the default message **314**. If the customer does want to save the message for a specific caller then the system will prompt the customer to type or say the phone number of the specific caller **306**. To add an extra measure of security to the message, the system will prompt the customer if he or she would like to add a personal identification number or password **308**. If the customer wishes not to add extra security, the system will save the message for the specific caller **312**. If the customer wishes to add an extra measure of security, then the system will prompt the customer to type or speak out a personal identification number or password that would be associated with the message **310**. The system would then save the message for the caller **312**.

Fig. 4A is a flow chart illustrating the steps of the operation of an exemplary embodiment of the present invention. When a caller calls the customer's cellular telephone **400** and the customer is not able to accept the call **402**, the cellular telephone answering system determines whether the incoming call contains caller identification information by a method well known by those skilled in the art **404**. If the call does not contain caller identification information, the system will playback the standard recorded message **418**. The caller will then either record a message or end the call **420**. If the incoming call does contain caller identification information, the system will compare the call information with the unique message identification information that was saved by the customer **406**. The system will be able to determine whether the caller information matches the saved message information **408**. If the caller information matches the saved message information, the system will prompt the caller to enter or say additional security information in the form of a personal identification number or password **410**. If the caller information does not match the saved message information, the system will play the standard message **418** and allow the caller to record a response or end the call **420**.

When a matching caller enters the additional security information (and verifies that the additional security information is correct), the system will determine whether the caller's entered information matches any saved unique message identification information **412**. If the caller's information matches the unique message information, the system will play the corresponding unique message **414**.

The caller can then record a response after an audible tone or voice instruction or hang up and end the call **420**.

If the caller's information does not match any of the saved unique message information, the system will prompt the caller to enter or say the additional security information again **410** if the caller's attempt to enter matching information did not exceed a predetermined number of attempts **416**. For example, the system could be programmed to limit the number of attempts to three. Therefore, after a third failed attempt, the system would play the standard playback message **418**. Again, the caller would be able to record a response or end the call **420**.

Fig. 4B is a flow chart illustrating the steps of the operation of another exemplary embodiment of the present invention. Implemented with only one level of security, the cellular telephone answering system unique messaging capability would rely on the caller identification information from the incoming call **400**. Again, when the customer does not accept the call **402**, the system determines whether the incoming call contains caller identification information **404**. If the call does not have any caller identification information, the system will play back the standard message **418**. If the call does contain caller identification information, the system will compare the caller identification information with the unique message identification information **406**. The system will then be able to determine whether the caller has a unique recorded message **408**. If so, the unique message will be played back for the caller **414**. If not, the system will play the default message **418**. At the end of either playback message, the caller will have the opportunity to record a message or end the call **420**.

While this invention has been described in detail with particular reference to preferred embodiments thereof, it will be understood that variations and modifications can be effected within the scope of the invention as defined in the appended claims.

CLAIMS

What is claimed is:

1. A method for characterizing playback messages for specific callers within a radio telephone answering system, the method comprising the steps of:

providing a playback message to the radio telephone answering system;

providing message identification information to the radio telephone answering system to characterize the playback message;

comparing the message identification information with incoming caller identification information within the radio telephone answering system; and

if the message identification information and the caller identification information match, playing back the message with said matching identification information for the caller.

2. The method of Claim 1, further comprising the step of providing a password to the radio telephone answering system for verifying a caller's identity.

3. The method of Claim 2, wherein the password is provided to the caller independent of any system components.

4. The method of Claim 2, wherein the caller provides the password to the radio telephone answering system audibly and the radio telephone answering system detects the password utilizing a voice recognition system.

5. The method of Claim 2, wherein the caller provides the password to the radio telephone answering system utilizing a keypad.

6. The method of Claim 2, wherein the password is a personal identification number.

7. The method of Claim 1, wherein the password is provided to the caller independent of any system components.

8. The method of Claim 1, wherein the message identification information consists of the intended message recipient's name.

9. The method of Claim 1, wherein the message identification information consists of the intended message recipient's telephone number.

10. The method of Claim 1, wherein the caller identification information consists of the caller's name.

11. The method of Claim 1, wherein the caller identification information consists of the caller's telephone number.

12. A system for characterizing a playback message comprising:

a communications network for receiving telephone calls;

a caller identification detector to characterize the playback message for a specific caller; and

a telephone answering system being operative to:

(a) record answering system messages;

(b) compare message identification information with caller identification information; and

(c) if message identification information and

caller identification information match, playback the characterized message.

13. The system of Claim 12, wherein the communications network is a radio telephone network.

14. The system of Claim 12, wherein the communications network is a wire-based telephone network.

15. The system of Claim 12, wherein the communications network is a pager network.

16. An apparatus comprising:

a memory device;

an input interface;

a processing unit; and

a program module stored in the memory device and including instructions which when executed cause the processing unit to be operative to:

(a) compare message identification information with caller identification information; and

(b) if message identification information and caller identification information match, playback a characterized message.

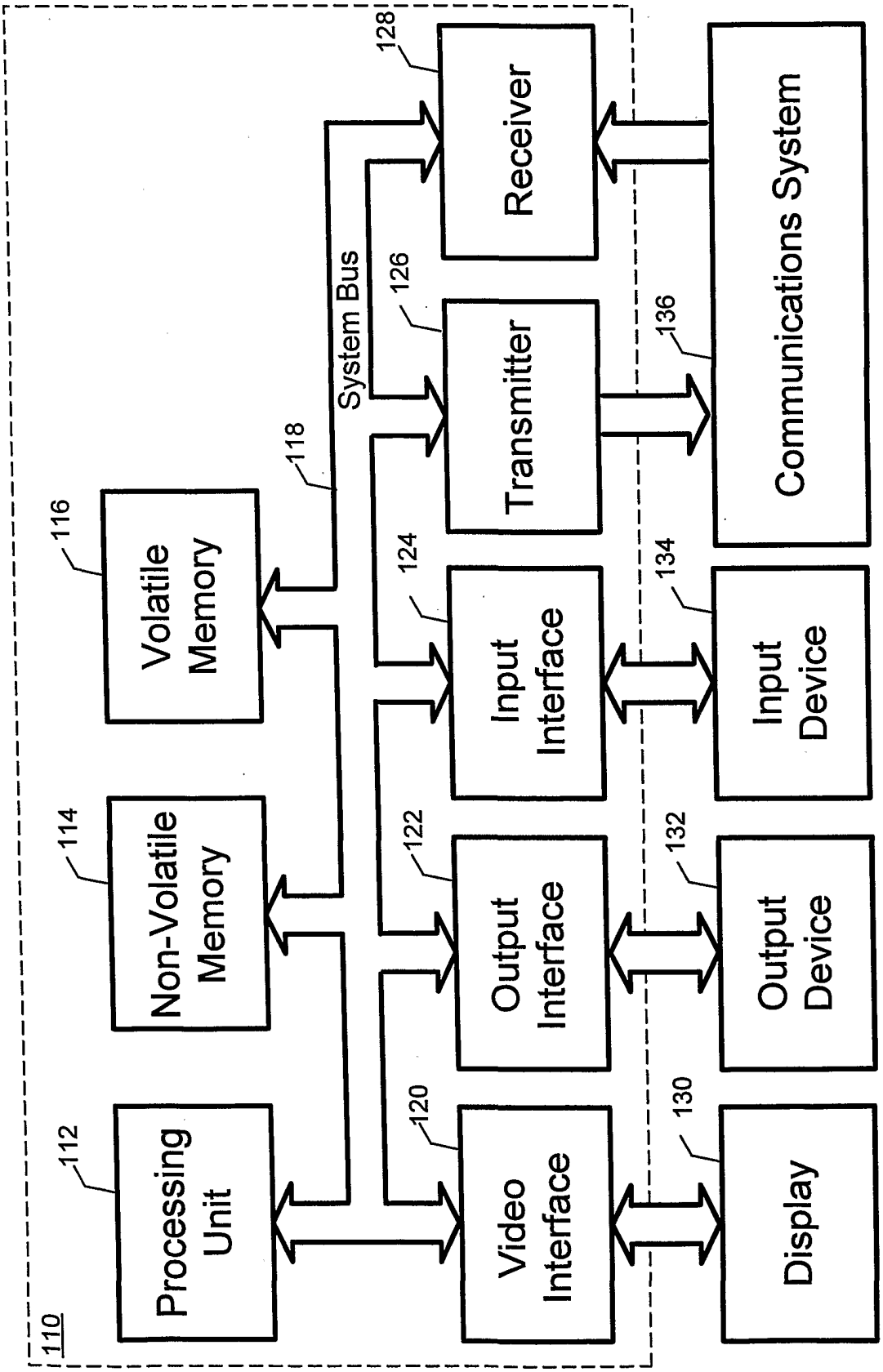

110
Processing Unit
112
Non-Volatile Memory
114
Volatile Memory
116
118
System Bus
Video Interface
120
Output Interface
122
Input Interface
124
Transmitter
126
Receiver
128
Display
130
Output Device
132
Input Device
134
136
Communications System

Fig. 1

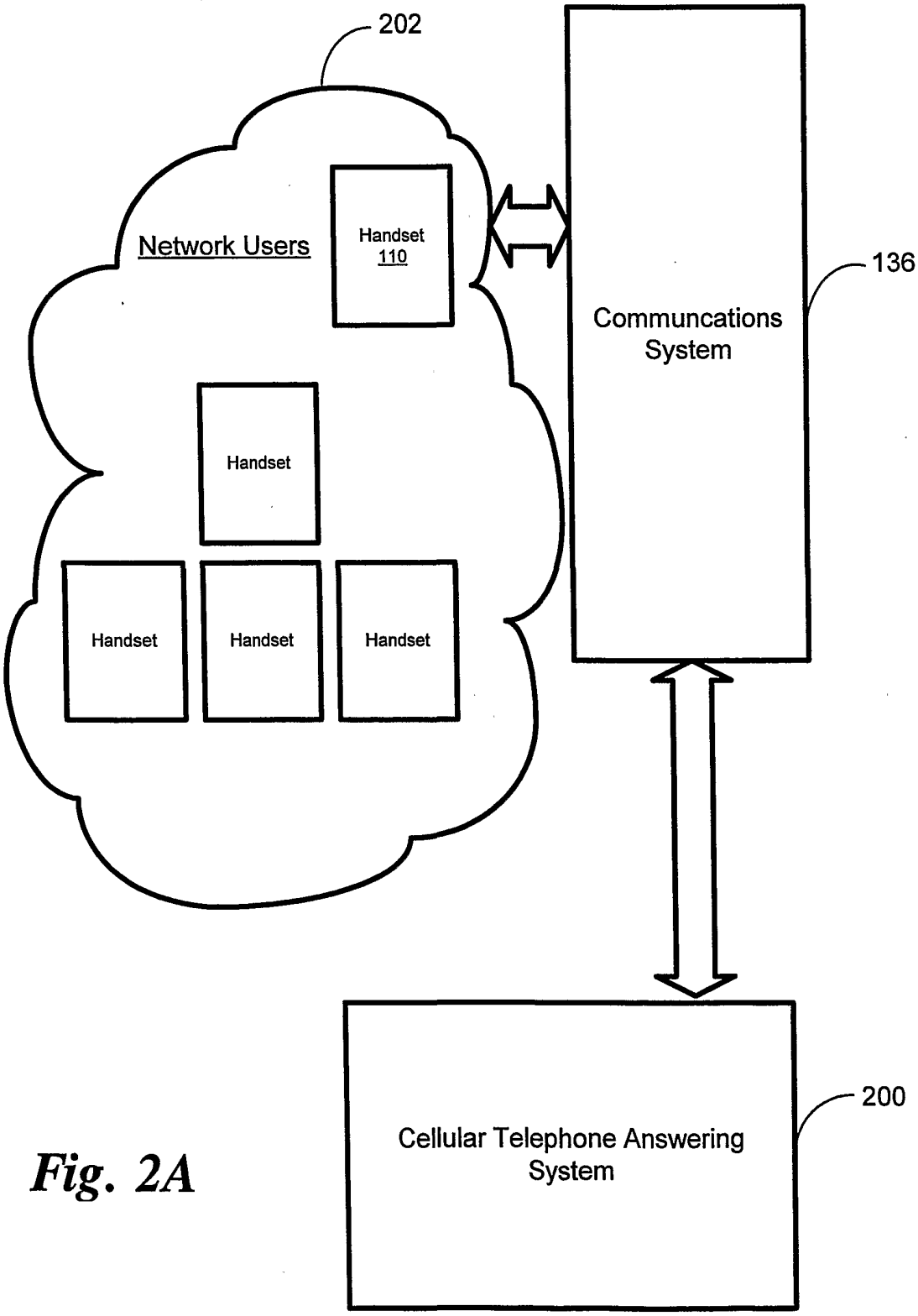

202
Network Users
Handset
110
Handset
Handset
Handset
Handset
Communcations
System
136
Cellular Telephone Answering
System
200

Fig. 2A

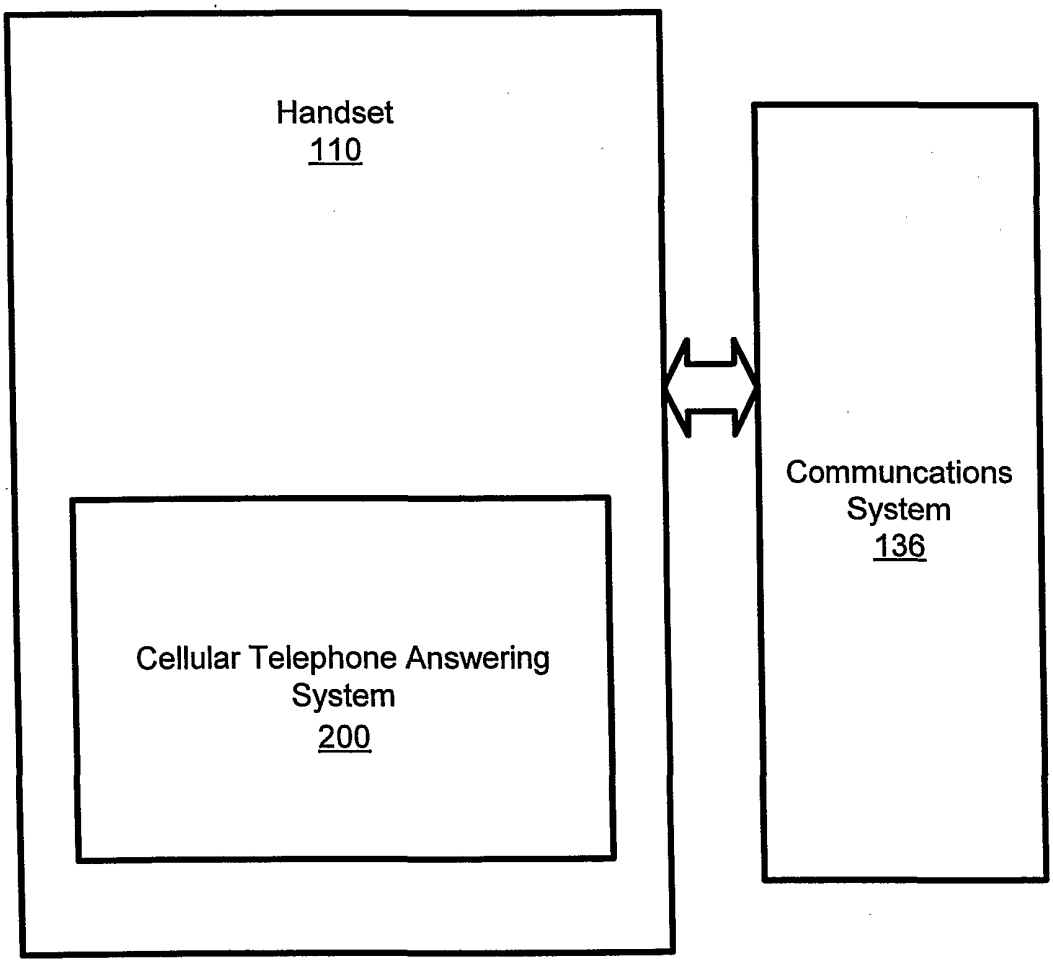

Handset
110
Cellular Telephone Answering System
200
Communcations System
136

Fig. 2B

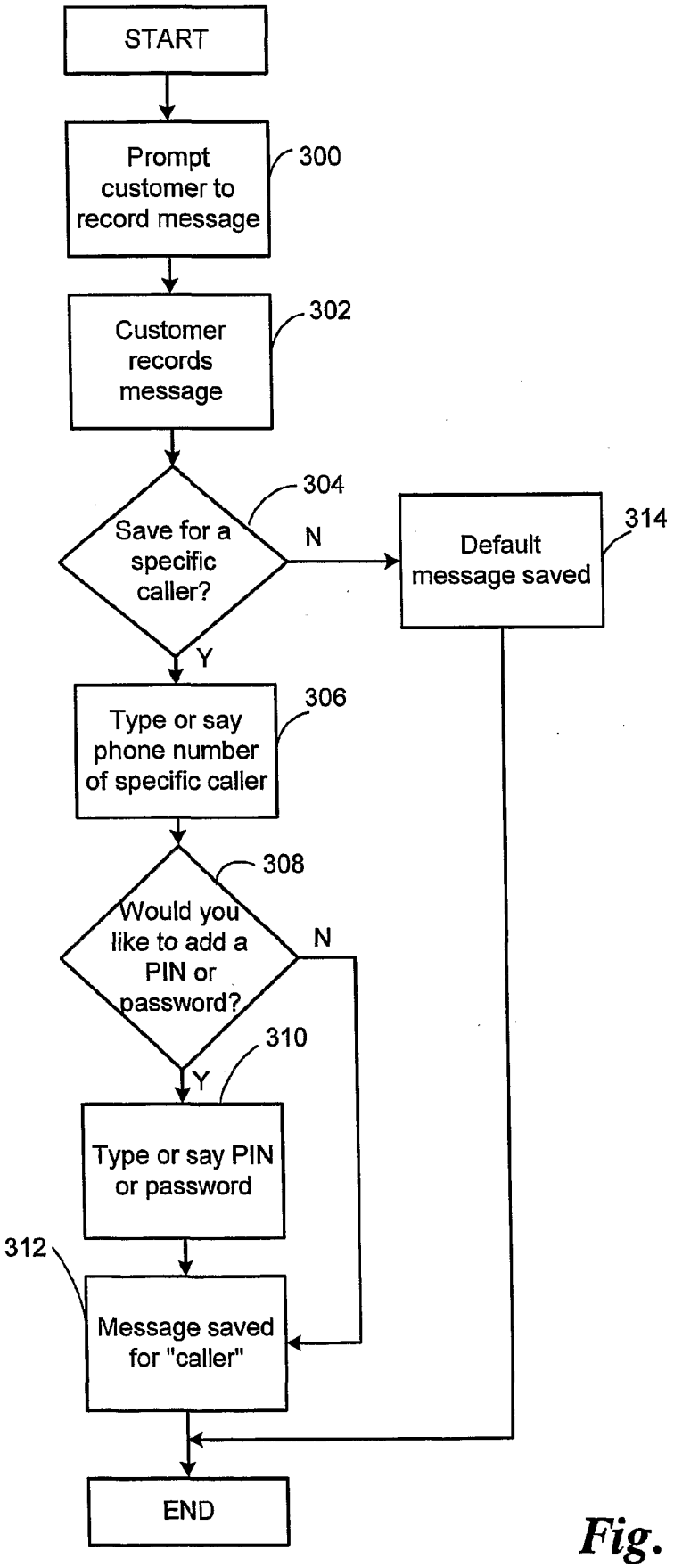

START
Prompt customer to record message
300
Customer records message
302
Save for a specific caller?
304
N
Default message saved
314
Y
Type or say phone number of specific caller
306
Would you like to add a PIN or password?
308
N
Y
310
Type or say PIN or password
312
Message saved for "caller"
END

Fig. 3

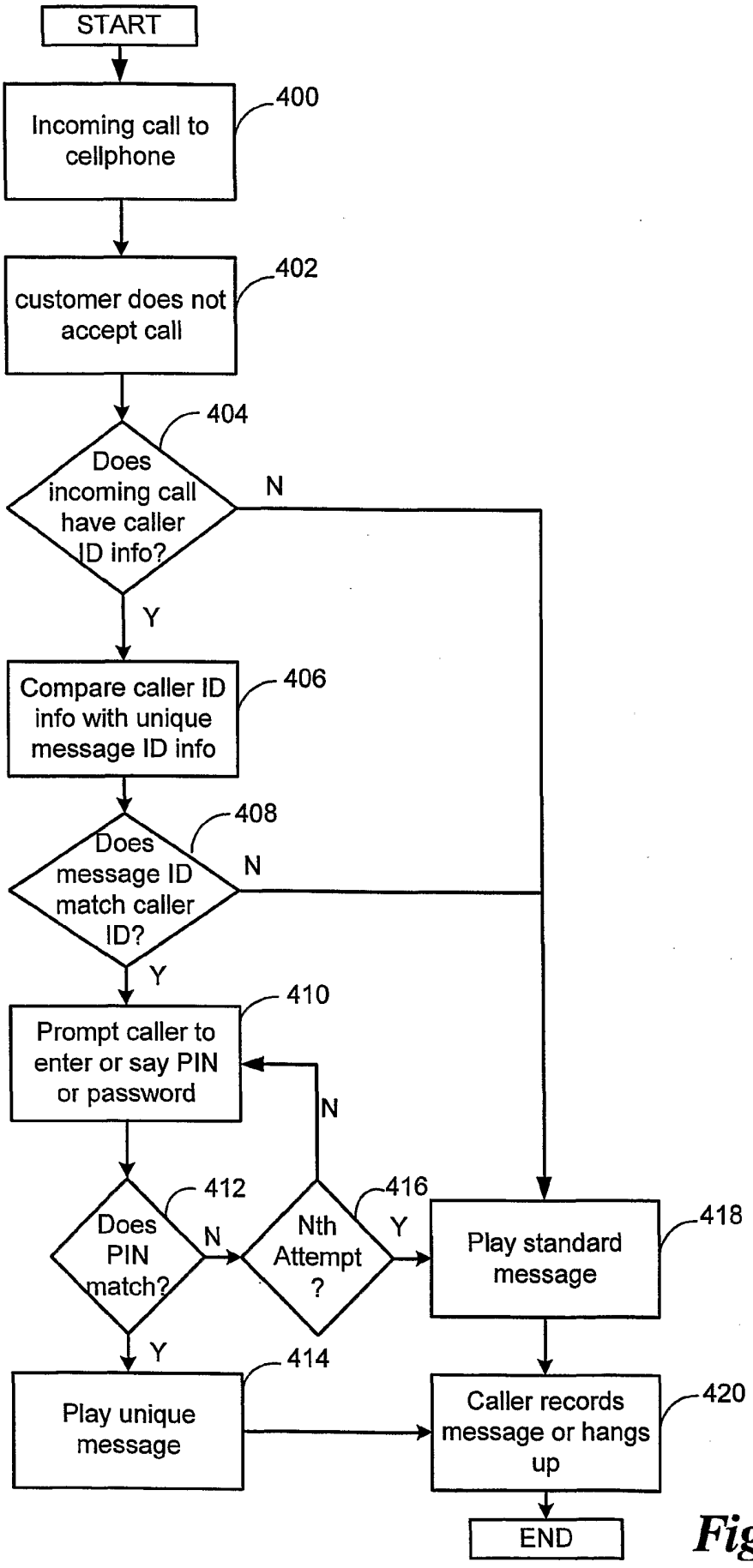

START
Incoming call to cellphone
400
customer does not accept call
402
Does incoming call have caller ID info?
404
N
Y
Compare caller ID info with unique message ID info
406
Does message ID match caller ID?
408
N
Y
Prompt caller to enter or say PIN or password
410
N
Does PIN match?
412
N
Nth Attempt ?
416
Y
Play standard message
418
Y
Play unique message
414
Caller records message or hangs up
420
END

Fig. 4A

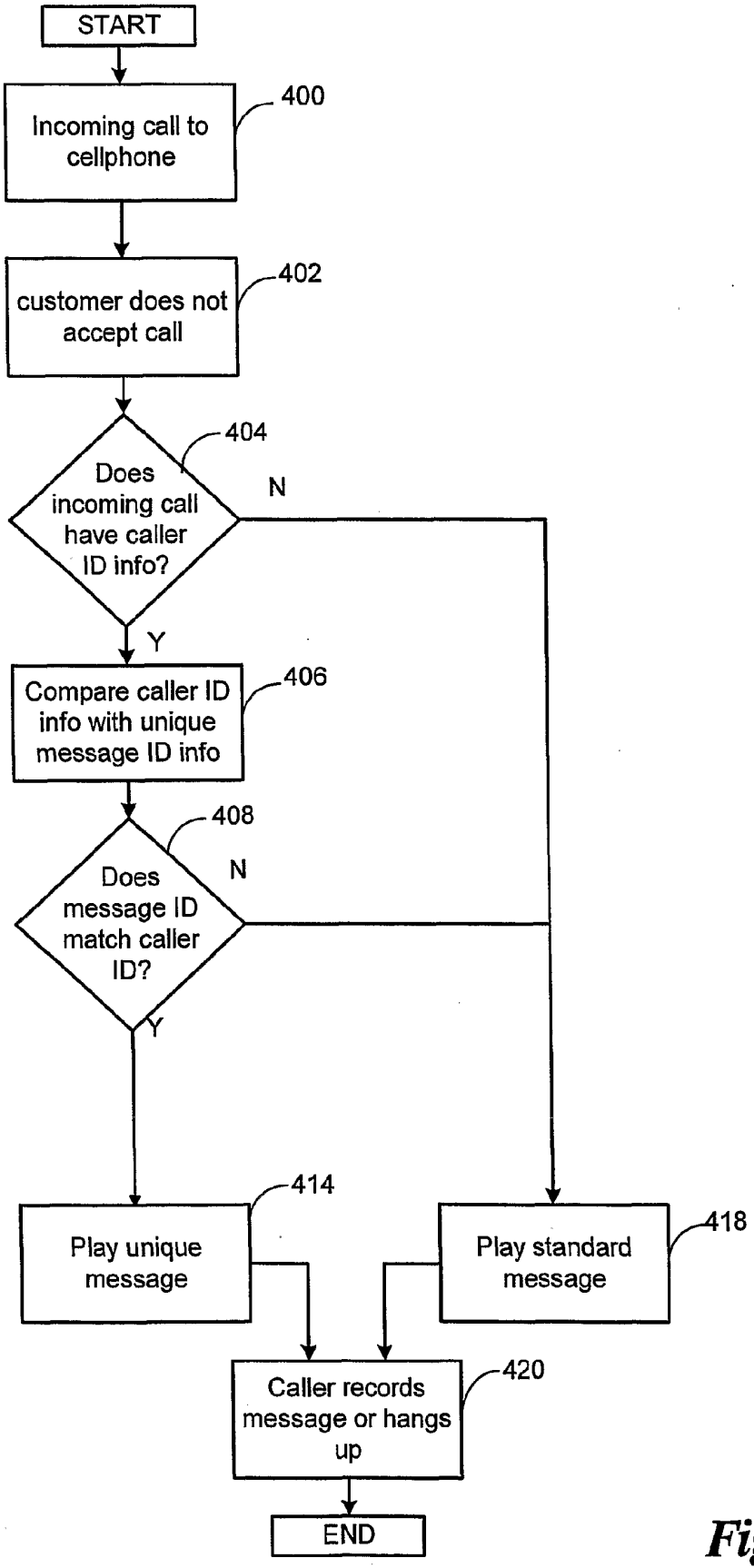

START
Incoming call to cellphone
400
customer does not accept call
402
Does incoming call have caller ID info?
404
N
Y
Compare caller ID info with unique message ID info
406
Does message ID match caller ID?
408
N
Y
Play unique message
414
Play standard message
418
Caller records message or hangs up
420
END

Fig. 4B

INTERNATIONAL SEARCH REPORT

Inter al Application No
PCT/US 01/22995

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 G01F1/84 G01F25/00

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 G01F

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)
PAJ, WPI Data, EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 926 473 A (ABB KENT-TAYLOR LTD) 30 June 1999 (1999-06-30) abstract; claim 1; figure 2	10
A	---	1,17
A	US 5 231 884 A (ZOLOCK. M.J) 3 August 1993 (1993-08-03) cited in the application abstract; figures 3A,3B -----	1,10,17

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

☒ Patent family members are listed in annex.

° Special categories of cited documents :

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

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

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

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

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

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

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

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

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
11 October 2001	23/10/2001

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Vorropoulos, G

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

rmation on patent family members

Inte al Application No
PC.. .5 01/22995

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