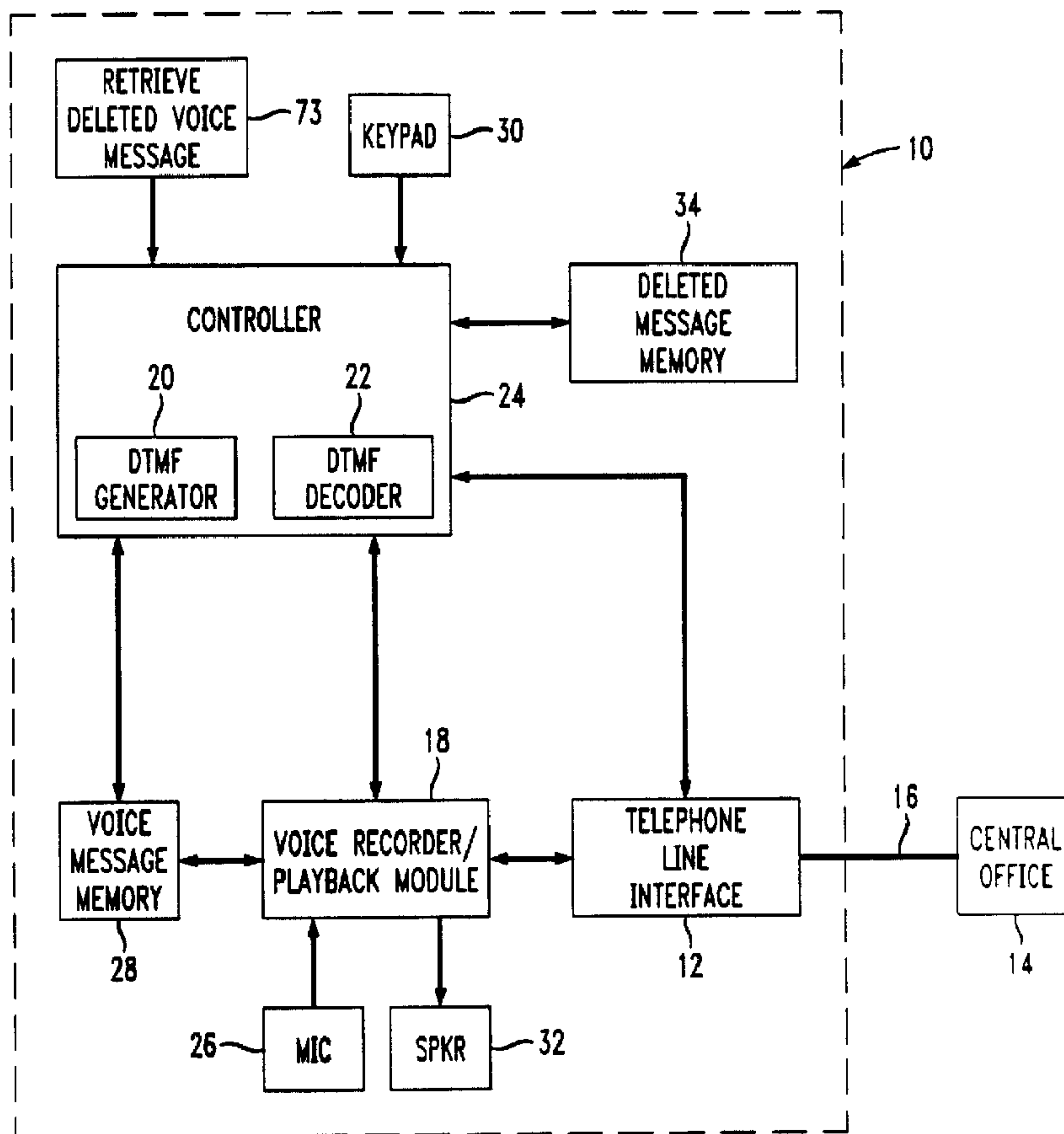




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 (72) Inventeurs/Inventors:
 ALI, SYED S., US;
 GREYBUSH, JAMES J., US;
 JAMPANABOYANA, LAKSHMI NARAYANA, US
 (73) Propriétaire/Owner:
 LUCENT TECHNOLOGIES INC., US
 (74) Agent: KIRBY EADES GALE BAKER

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 (54) Title: RETRIEVAL OF DELETED VOICE MESSAGES IN VOICE MESSAGING SYSTEM



(57) Abrégé/Abstract:

Apparatus and method to allow retrieval of voice messages deleted from the voice message memory of a voice messaging system. A voice messaging system such as a telephone answering device includes a deleted voice message memory for storing voice

(57) Abrégé(suite)/Abstract(continued):

messages deleted from the voice message memory. The deleted voice messages stored in the deleted voice message memory are retrievable by the user for review subject to rules for permanent deletion of the deleted voice messages (e.g., after a period of time, when the deleted voice message memory approaches capacity, periodically, etc.)

RETRIEVAL OF DELETED VOICE MESSAGES IN VOICE MESSAGING SYSTEM

Abstract

Apparatus and method to allow retrieval of voice messages deleted from
5 the voice message memory of a voice messaging system. A voice messaging
system such as a telephone answering device includes a deleted voice
message memory for storing voice messages deleted from the voice message
memory. The deleted voice messages stored in the deleted voice message
memory are retrievable by the user for review subject to rules for permanent
10 deletion of the deleted voice messages (e.g., after a period of time, when the
deleted voice message memory approaches capacity, periodically, etc.)

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RETRIEVAL OF DELETED VOICE MESSAGES IN VOICE MESSAGING SYSTEM

Field of the Invention

This invention relates generally to a voice messaging system. More particularly, it relates to a voice messaging system such as a telephone answering device which is capable of allowing a user to retrieve deleted messages.

Background of Related Art

Voice messaging systems (e.g., telephone answering devices (TADs)) are useful devices for both the home and office. Larger voice messaging systems in general work in conjunction with a private branch exchange (PBX) unit to provide voice mailboxes for a large number of users. Smaller voice messaging systems, e.g., telephone answering devices typically operate on a single telephone line and answer an incoming call to an unused (i.e., on-hook) telephone after a predetermined number of rings.

Voice messaging systems and telephone answering devices cause a telephone line to enter an off-hook condition, then play an outgoing greeting message to the caller. After the outgoing greeting message is completed, the caller is allowed to record a voice message on the voice messaging system, e.g., telephone answering device. At a later time, the voice message is replayed by the user, either local to the telephone answering device or via remote connection from another telephone through the public switched telephone network (PSTN).

Fig. 4 illustrates a conventional telephone answering device capable of answering an incoming call on a telephone line.

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In Fig. 4, a telephone answering device **11** is connected to a telephone company central office **13** via a telephone line **15**. A telephone line interface (TLI) **17** in the telephone answering device **11** provides the conventional isolation, DC and AC impedance as required by telephone company standards.

5 The telephone line interface **17** also provides a ring detect signal to a controller **19**. The controller **19** can be any suitable processor, e.g., microprocessor, microcontroller, or digital signal processor (DSP). The ring detect signal indicates to the controller **19** the ringing of an incoming call on the telephone line **15**.

10 After a predetermined number of ring signals typically set at the voice messaging system or telephone answering device, the telephone answering device **11** causes the telephone line interface **17** to place the telephone line in an off-hook state. A voice recorder/playback module **21** plays an outgoing greeting message over the telephone line **15** to the caller. Upon completion of
15 the outgoing greeting message, the caller may record a voice message in voice message memory **23** under the control of the controller **19** and through the voice recorder/playback module **21**. A keypad **25** allows the user to select various modes of operation, including the playback of voice messages, and the deletion of certain voice messages.

20 In some instances, either before reviewing the voice message, during the review of the voice message, or subsequent to reviewing the voice message, the user may either accidentally or intentionally delete a particular voice message from the telephone answering device **11** that they later wish they hadn't deleted. While the conventional telephone answering device **11**
25 allows a user to review recorded voice messages as many times as desired before deletion, if a voice message is deleted, either accidentally or intentionally, the voice message is no longer accessible for review by the user, and is erased from the voice message memory **23**.

Accordingly, there exists a need for an improved voice messaging system and technique which allows a user to retrieve deleted voice messages.

Summary Of The Invention

5 In accordance with the principles of the present invention, a voice messaging system comprises a telephone line interface, a controller, a voice message memory, and a deleted voice message memory. A voice message is initially stored in the voice message memory, and upon deletion of the voice message from said voice message memory, the voice message is stored in the deleted voice message memory.

10 A method for retrieving deleted voice messages from a voice messaging system in accordance with another aspect of the present invention comprises storing deleted voice messages in a deleted voice message memory, and retrieving the deleted voice messages from the deleted voice message memory for playback.

15 In accordance with one aspect of the present invention there is provide a voice messaging system, comprising: a controller; a user accessible voice message memory to store at least one user accessible voice message; and a deleted voice message memory to store at least one user deleted voice message; wherein a voice message is initially stored in said user accessible
20 voice message memory, and upon a user selecting a keypad option to delete said user accessible voice message from said user accessible voice message memory, said voice message is automatically compressed to a higher compression ratio to require less space than in said voice message memory, moved and restored in said deleted voice message memory.

25 In accordance with another aspect of the present invention there is provided a voice messaging system, comprising: a controller; a user accessible voice message memory to store at least one user accessible voice message; and a deleted voice message memory to store at least one user deleted voice

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message; wherein a voice message is initially stored in said user accessible voice message memory, and upon deletion of said voice message from said user accessible voice message memory, said voice message is compressed at a higher compression ratio to require less space than in said voice message
5 memory, moved and restored in said deleted voice message memory; and wherein a total storage space allocated to each of said user accessible voice message memory and said deleted voice message memory from a common total memory space is dynamically adjusted to optimize a space available for said user accessible voice message memory and said deleted voice message memory.

10 **Brief Description Of The Drawings**

Features and advantages of the present invention will become apparent to those skilled in the art from the following description with reference to the drawings, in which:

15 Fig. 1 illustrates an embodiment of a voice messaging system, e.g., a telephone answering device capable of allowing a user to retrieve deleted voice messages from a deleted voice message memory, in accordance with the principles of the present invention.

20 Fig. 2 is a flow chart illustrating an exemplary process by which a user can retrieve a deleted voice message from the deleted voice message memory of the telephone answering device shown in Fig. 1.

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Fig. 3 is a flow chart illustrating an exemplary process by which a user can permanently delete voice messages from the deleted voice message memory of the telephone answering device shown in Fig. 1.

Fig. 4 illustrates a conventional telephone answering device capable of recording and deleting voice message with respect to voice message memory.

Detailed Description Of Illustrative Embodiments

The present invention provides a voice messaging system (e.g., a telephone answering device) and method which maintains deleted voice messages and subsequently allows a user to retrieve deleted voice messages from the telephone answering device.

In operation, a calling party would call a user who ultimately fails to answer the telephone. After a predetermined number of rings, a telephone answering device in accordance with the principles of the present invention would automatically answer the telephone call by placing the telephone line in an off-hook condition, and initiate a pre-recorded outgoing greeting message. Thereafter, the calling party would record a voice message in voice message memory in the telephone answering device using a voice recorder/playback module. After the voice message is recorded, the calling party hangs up and is disconnected from the telephone line and the telephone answering device. This recording process may occur for a plurality of callers, to establish a plurality of recorded voice messages.

In accordance with the principles of the present invention, a user of the telephone answering device can thereafter playback the recorded voice messages and delete certain voice messages as desired. However, in accordance with the principles of the present invention, upon deletion, a voice message is moved into a "trash can" memory area called a deleted voice message memory for maintained storage until permanently deleted.

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The retrieved, deleted voice messages may be played back directly from the deleted voice message memory, or may be recovered into an appropriate coding and/or format commensurate with undeleted voice messages, and moved back to the voice message memory for playback therefrom.

5 In this way, a user is given a second opportunity to retrieve and playback a particular voice message which they (or another user of the same telephone answering device) deleted earlier.

For efficiency purposes, the voice messages moved to the deleted voice message memory may be more highly compressed than when they were stored
10 in the voice message memory. To this end, a deleted voice message may be re-encoded and/or re-compressed by an appropriate program in the controller in the deletion process of movement from the voice message memory to the deleted voice message memory.

Accordingly, if a deleted voice message is later desired for playback, a
15 user may still be able to retrieve it for playback, subject to rules for permanent deletion of the voice message from the deleted voice message memory (e.g., after a period of time from initial deletion, on a periodic basis, etc.), in accordance with the principles of the present invention.

Although the present invention is shown embodied in a telephone
20 answering device, the present invention is equally applicable to voice messaging systems in general, including voice mail systems.

Fig. 1 illustrates a telephone answering device, indicated generally at
25 **10**, capable of recording voice messages from callers, and of allowing a user to retrieve and playback a deleted voice message memory, in accordance with the principles of the present invention.

In particular, in the embodiment of Fig. 1, the telephone answering device **10** includes at least one telephone line interface **12** for interconnection

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with a telephone company central office **14** via a telephone line **16**. The telephone line interface **12** interconnects the telephone line **16** with a voice recorder/playback module **18**.

The telephone answering device **10** further includes voice message
5 memory **28** where the voice recorder/playback module **18** initially stores
recorded voice messages, and deleted message memory **34** where the
controller **24** moves deleted voice messages from the voice message memory
28 upon deletion. Preferably, deleted voice messages stored in the deleted
message memory **34** are maintained and thus not allowed to be overwritten by
10 other voice messages.

The user can, if desired, locally record an outgoing greeting message
into the telephone answering device **10** through a microphone **26** connected to
the voice recorder/playback module **18**. In operation, after a desired number of
ring signals, the telephone answering device **10** causes the telephone line
15 interface **12** to place the telephone line **16** in an off-hook state, and instructs
the voice recorder/playback module **18** to play an outgoing greeting message
(e.g., stored in voice message memory **28**) on the telephone line **16** to the
calling party.

Upon completion of the outgoing greeting message being played to the
20 calling party, the calling party can typically record a voice message in the voice
message memory **28** under the control of a controller **24** and through the voice
recorder/playback module **18**.

The voice message memory **28** is preferably formed in a non-volatile
memory, e.g., Flash memory or ARAM, but can also be volatile memory in
25 some applications. In the given example, a given amount of non-volatile
memory (e.g., 16 Mb) is partitioned between the voice message memory **28**
and a deleted voice message memory **34**. The capacity of each of the voice
message memory **28** and/or the deleted voice message memory **34** can be

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adjusted to suit the needs of the particular application. Moreover, the principles of the present invention apply to voice message memory **28** and deleted voice message memory **34** of any capacity.

Moreover, the capacity of each of the voice message memory **28** and/or
5 the deleted voice message memory **34** can be adjusted dynamically. For instance, when the voice message memory **28** passes a threshold amount of use indicating that it is filled to capacity with non-deleted voice messages, a portion of the deleted voice message memory **34** can be allocated for use to store non-deleted voice messages. Then, when the voice messages are
10 deleted from the voice message memory **28**, the size of the deleted voice message memory **34** can be enlarged as necessary to store the deleted voice messages. In the preferred embodiment, the new, non-deleted voice messages have priority for storage over deleted voice messages, so that if both the voice message memory **28** and the deleted voice message memory **34**
15 become filled to capacity, certain deleted voice messages, e.g., the oldest, will be automatically deleted as necessary to make room for storage of a newly recorded voice message, or messages deleted based on call related information (e.g., Caller ID information).

The telephone answering device **10** may further include a dual tone
20 multiple frequency (DTMF) generator **20** and/or a DTMF decoder **22** implemented within or external to the controller **24**. The DTMF generator **20** provides touch tone signals for use by the telephone answering device **10** to dial out on the telephone line **16** as directed by the user of the telephone answering device **10**. The DTMF decoder **22** provides a conventional
25 mechanism for detection of DTMF commands input from a remote telephone via a touch tone keypad at a remote telephone.

The controller **24** controls the overall functions of the telephone answering device **10**, including interpretation of commands from the user,

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including activation of keypad commands directing the playback and/or deletion of recorded voice messages from a conventional keypad **30**, and interpretation of the directed retrieval of a deleted voice message using a retrieve deleted voice message button **73** or similar control. The retrieve deleted voice message button **73** may cause the retrieval of all currently deleted voice messages maintained in the deleted voice message memory **34**, which is most appropriate if deleted voice messages are permanently removed from the deleted voice message memory **34** on a regular basis. If deleted voice messages are allowed to build up in the deleted voice message memory **34**, it may be more desirable to implement the retrieve deleted voice message button **73** to allow selection of a particular deleted voice message. To this end, it may be desirable to include a display and scrolling control to allow review of currently maintained deleted voice messages for selection of only a particularly desired deleted voice message. Alternatively, all voice messages may be played from deleted voice message memory **34**, and when a RETRIEVE or similar button is activated, a particular voice message may be retrieved or moved from deleted voice message memory **34** back to the voice message memory **28**.

It is also within the principles of the present invention to provide a control mechanism (e.g., a manual "permanently delete" button) to allow the user to bypass movement of a deleted voice message to the deleted voice message memory **34**, thereby causing permanent, irretrievable deletion of the voice message.

The controller **24** may be any suitable processor, e.g. a microprocessor, a digital signal processor, or a microcontroller.

The keypad **30** allows the user to select various conventional modes of operation, including the playback of voice messages through a speaker **32**

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connected to the voice recorder/playback module **18**, and/or the initial deletion of voice messages from the voice message memory **28**.

Upon deletion of a voice message from the voice message memory **28** of the telephone answering device **10**, the deleted voice message is moved to
5 the deleted voice message memory **34** for maintained storage as a deleted voice message, in accordance with the principles of the present invention.

It is within the scope of the present invention to increase the amount of effective capacity in the deleted voice message memory **34** by compressing or re-compressing deleted voice messages using an appropriate low bit rate
10 speech coder. Higher compression of deleted voice messages with respect to undeleted voice messages allows a relatively larger number of voice messages to be stored in the deleted voice message memory **34** as desired by the user.

Fig. 2 is a flow chart illustrating an exemplary process by which a user can retrieve a deleted voice message from the deleted voice message memory
15 of the telephone answering device shown in Fig. 1.

In particular, with reference to Fig. 2, an incoming caller leaves a voice message on the telephone answering device **10** in step **202**. After a predetermined number of rings, the telephone answering device **10** answers the incoming call by causing the telephone line interface **12** to place the
20 telephone line **16** in an off-hook condition. The telephone answering device **10** plays an outgoing greeting message such as "I'm not available right now, please leave a message" or other similar greeting, and the caller records a voice message for storage in the voice message memory **28** of the telephone answering device **10**.

25 In step **204**, the user retrieves the voice message, either remotely or locally, from the voice message memory **28**.

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In step **206**, the user plays back as desired one or more recorded voice messages stored in the voice message memory **28** of their telephone answering device **10**.

5 In step **208**, the user determines whether the played back voice message is to be deleted from the voice message memory **28** of the telephone answering device **10**. If the user does not desire to delete the voice message, the voice message remains stored in the voice message memory **28**, at least for a period of time, until the user deletes the voice message from the voice message memory **28** or until the telephone answering device otherwise
10 automatically deletes the recorded voice message (e.g., after 30 days).

In step **210** the user causes the deletion of the voice message from the voice message memory **28**. Upon deletion of the voice message from the voice message memory **28**, the voice message is moved automatically by the telephone answering device **10**, either immediately or at an appropriate later
15 time when the telephone answering device is relatively inactive, to the deleted voice message memory **34**.

Later, as shown in step **212**, the user determines whether they want to retrieve a particular voice messages from the deleted voice message memory **34**.

20 As shown in step **214**, if the user desires to retrieve a particular deleted voice message stored in the deleted voice message memory **34**, they simply activate the appropriate button and/or enter the appropriate code into the telephone answering device **10** via the keypad **30**, and the telephone answering device **10** automatically retrieves the desired deleted voice message
25 from the deleted voice message memory **34**.

In accordance with the principles of the present invention, there are several ways in which deletion of voice messages from the deleted voice

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message memory **34** can be accomplished by the user of the telephone answering device **10**. For instance, the voice messages in the deleted voice message memory **34** can be deleted manually, either individually or as a group, from the deleted voice message memory **34** by the user through input into the controller **24** via the keypad **30**. For instance, at any desired time and/or when the deleted voice message memory **34** becomes full or about full, the user of the telephone answering device **10** may permanently delete one or more of the deleted voice messages stored in the deleted voice message memory **34** to allow additional voice messages deleted from the voice message memory **28** to be stored in the deleted voice message memory **34**.

Alternatively, the deleted voice messages maintained in the deleted voice message memory **34** can be automatically deleted at certain predetermined time intervals, e.g., every twenty-four (24) hours, once a month, a period of time after the message was initially deleted, etc.

Yet another technique for permanently deleting deleted voice messages from the deleted voice message memory **34** provides that when the number of voice messages in the deleted voice message memory **34** exceeds a predetermined number of message as determined by the telephone answering device **10** itself and/or the user.

Another technique for permanently deleting deleted voice messages in the deleted voice message memory **34** can be automatically deleted when the utilized portion of the deleted voice message memory **34** reaches a predetermined capacity, e.g., ninety-percent full, etc.

In yet another technique, the deleted voice message memory **34** functions as a first in, first out (FIFO) type device wherein the oldest stored deleted voice messages is overwritten by the newest stored deleted voice message.

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Finally, deleted voice messages can be permanently removed based on a comparison of associated call related information (e.g., Caller ID information) received with the original recording of the deleted voice message with, e.g., a specialized table of telephone numbers to be maintained (all others deleted), a
5 memory area such as that which contains the speed dial numbers for the particular voice messaging system.

Fig. 3 shows an exemplary process by which deleted voice messages may be permanently deleted from the deleted voice message memory **34**, in accordance with the principles of the present invention.

10 In particular, with reference to Fig. 3, in step **302**, the user of the telephone answering device **10** initially deletes one or more voice messages from the voice message memory **28** to the deleted voice message memory **34**.

As shown in decision step **304**, the user determines whether any voice messages stored in the deleted voice message memory **34** should be
15 permanently deleted from the deleted voice message memory **34**.

If the user determines to delete any or all of the voice messages from the deleted voice message memory **34**, in step **306**, the user enters the appropriate manual command(s) into the controller **24** of the telephone answering device **10** via the keypad **30**.

20 Thus, in accordance with the principles of the present invention, a deleted voice message from the voice message memory **28** of the telephone answering device **10** is maintained in deleted voice message memory **34** to allow retrieval of the deleted voice message subject to rules established by the user for permanent deletion of deleted voice messages. Thus, the user is
25 capable of retrieving and playing back even previously deleted voice messages, which is particularly useful in the case of accidentally deleted voice

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messages which may be important to the user. Furthermore, even intentionally deleted voice messages can be retrieved for playback by the user.

While the invention has been described with reference to the exemplary embodiments thereof, those skilled in the art will be able to make various
5 modifications to the described embodiments of the invention without departing from the true spirit and scope of the invention.

Claims

1. A voice messaging system, comprising:
 - a controller;
 - a user accessible voice message memory to store at least one user
 - 5 accessible voice message; and
 - a deleted voice message memory to store at least one user deleted voice message;

wherein a voice message is initially stored in said user accessible voice message memory, and upon a user selecting a keypad option to delete said user

 - 10 accessible voice message from said user accessible voice message memory, said voice message is automatically compressed to a higher compression ratio to require less space than in said voice message memory, moved and restored in said deleted voice message memory.
2. The voice messaging system according to claim 1, further comprising:
 - 15 a telephone line interface over which said voice message is initially received by said voice messaging system.
3. The voice messaging system according to claim 1, wherein:
 - said voice message stored in said deleted voice message memory is retrievable for playback by a user.
- 20 4. The voice messaging system according to claim 1, wherein:
 - said voice message stored in said deleted voice message memory is removable from said deleted voice message memory to affect permanent deletion.
5. The voice messaging system according to claim 4, wherein:
 - 25 said voice message is permanently deletable from said deleted voice message memory via input from a keypad.

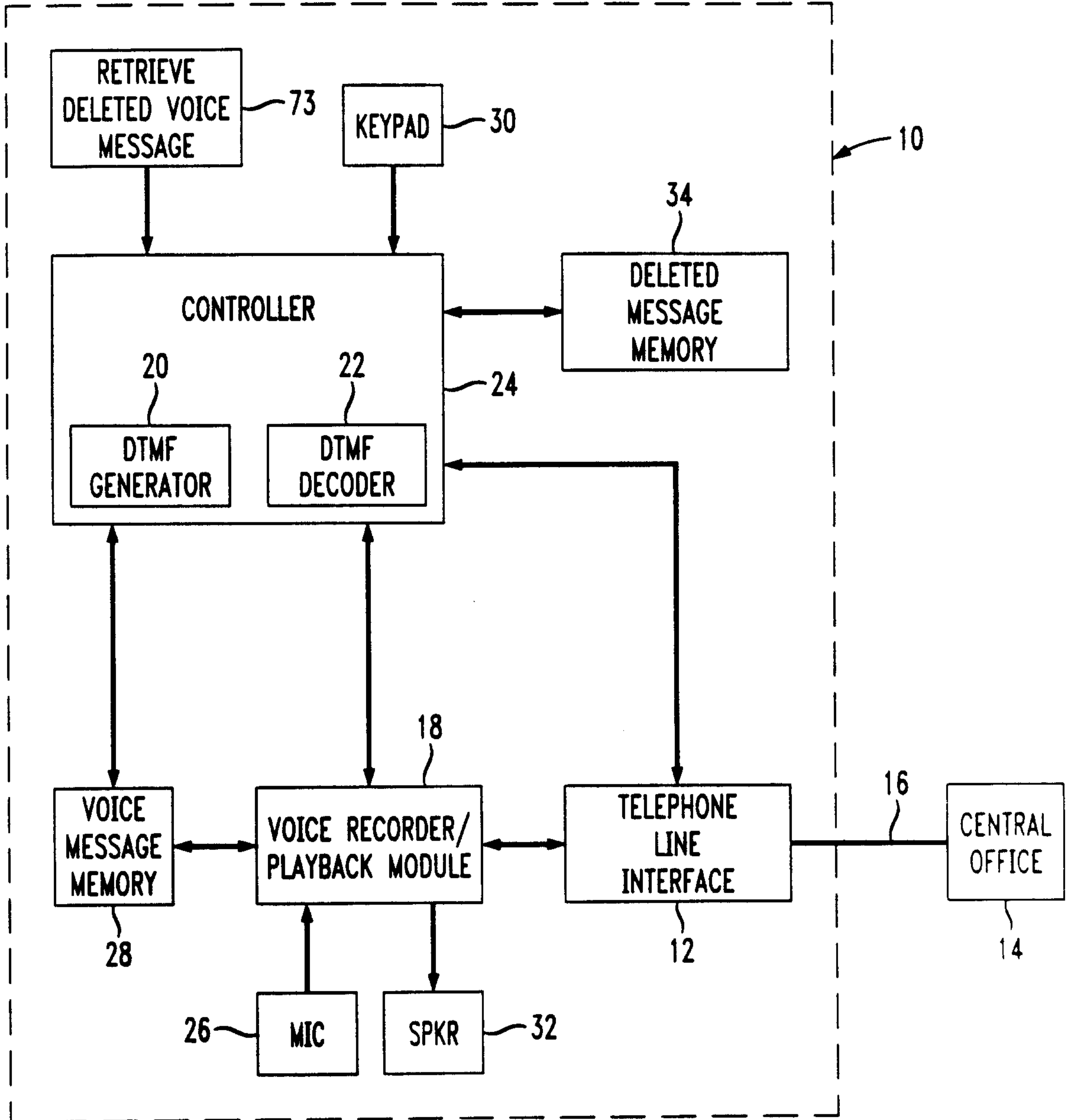
6. The voice messaging system according to claim 4, wherein:
said voice message is removed from said deleted voice message memory
and permanently deleted at a predetermined time interval.
7. The voice messaging system according to claim 4, wherein:
5 said voice message is removed from said deleted voice message
memory upon reaching a predetermined number of voice messages being
simultaneously stored in said deleted voice message memory.
8. The voice messaging system according to claim 7, wherein:
said removed voice message is an oldest stored voice message in said
10 deleted voice message memory.
9. The voice messaging system according to claim 4, wherein:
said voice message is removed from said deleted voice message memory
upon reaching a predetermined percentage use of a memory capacity of said
deleted voice message memory.
- 15 10. The voice messaging system according to claim 1, wherein:
said voice message in said deleted voice message memory is
compressed using a bit rate which is lower than a bit rate of voice messages
stored in said voice message memory.
11. A voice messaging system, comprising:
20 a controller;
a user accessible voice message memory to store at least one user
accessible voice message; and
a deleted voice message memory to store at least one user deleted voice
message;
- 25 wherein a voice message is initially stored in said user accessible voice
message memory, and upon deletion of said voice message from said user
accessible voice message memory, said voice message is compressed at a

higher compression ratio to require less space than in said voice message memory, moved and restored in said deleted voice message memory; and

wherein a total storage space allocated to each of said user accessible voice message memory and said deleted voice message memory from a
5 common total memory space is dynamically adjusted to optimize a space available for said user accessible voice message memory and said deleted voice message memory.

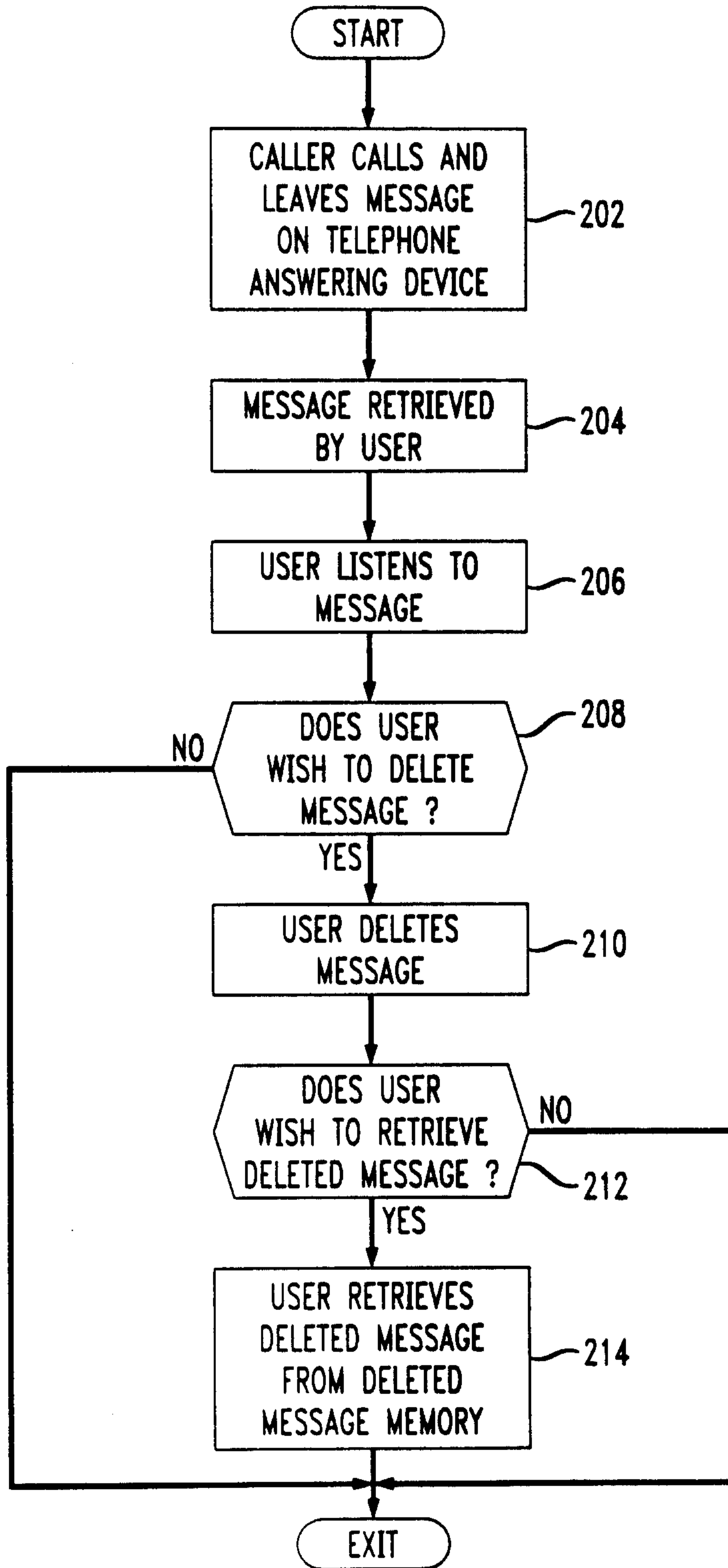
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FIG. 1



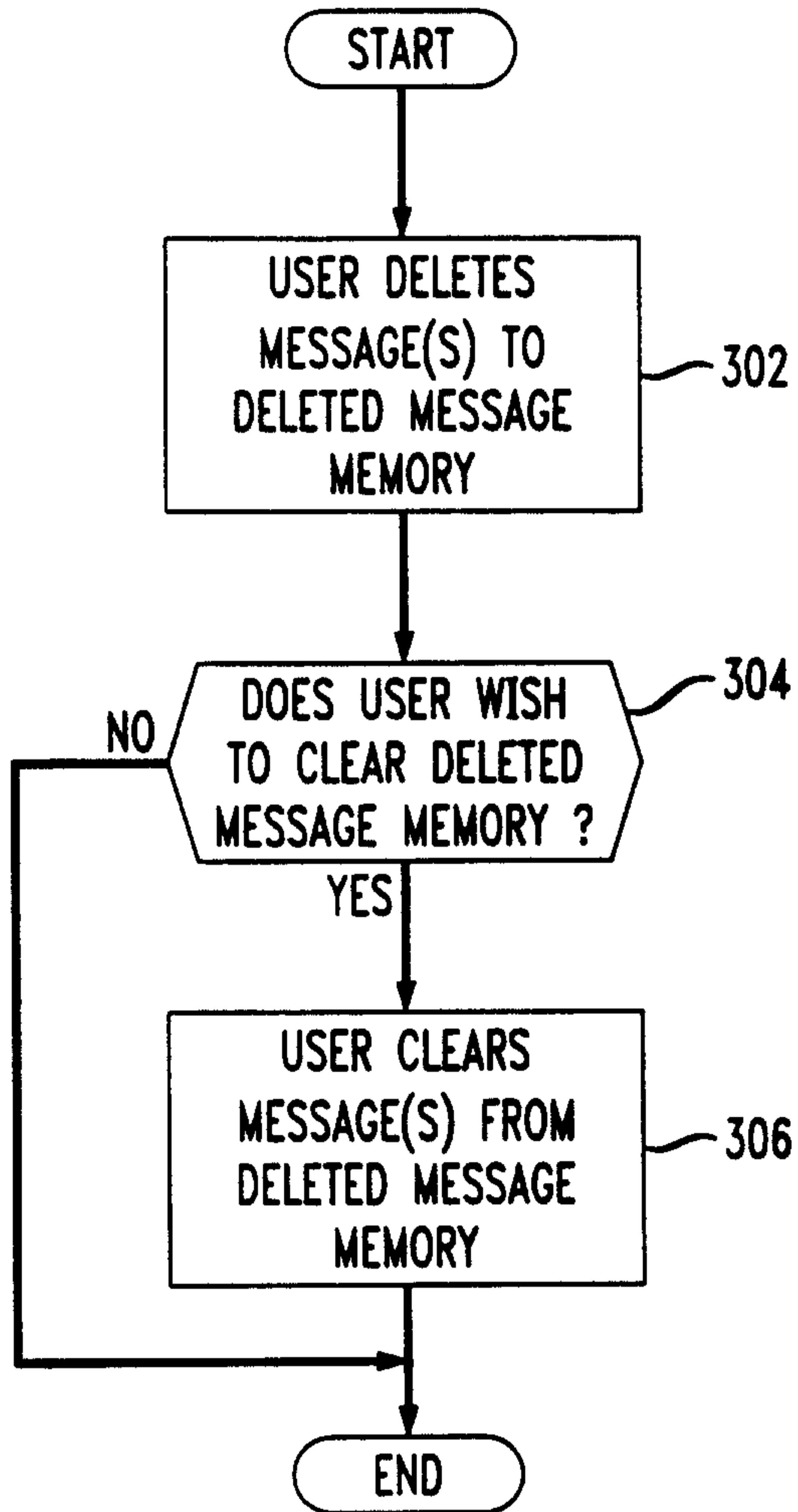
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FIG. 2



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FIG. 3



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FIG. 4

