

DATA DISPLAY RADIO PAGER

BACKGROUND OF THE INVENTION

The present invention relates to a data display radio pager and, more particularly, to a data display radio pager capable of automatically protecting a particular message
5 signal over a limited period of time.

Description of the Prior Art

In a radio paging system, a data display radio pager generally has a radio frequency (RF) section for receiving an RF signal which is produced by modulating a carrier by
10 a digital paging signal including an address signal and a message signal and comes in through an antenna. The RF section converts the RF signal to an intermediate frequency (IF) signal. A demodulator demodulates the IF signal to reproduce the above-mentioned address signal. A decoder
15 decodes the paging signal to produce a call signal including an address signal and a message signal. Control means has a CPU (Central Processing Unit) as a major component thereof and controls the reception in response to the call signal. Specifically, the control
20 means determines whether or not the address signal is coincident with an address assigned to the pager and stored in a ROM. If the former is coincident with the latter, the control means reports the user of the pager



THIS SHEET HAS BEEN
REPLACED

of the reception of a call by, for example, an alert tone from a loudspeaker or vibration and/or by displaying a message on message display means.

If the received address signal is coincident with
5 the stored address, the control means stores the message signal included in the call signal in a message signal storage area of a memory which is built in the pager and capable of storing a plurality of message signals. On
10 the reception of the message signal or on the entry of a request on, for example, a switch by the user, messages corresponding to the message signals stored in the memory are sequentially displayed on the message display means. The pager further includes message signal protecting means for preventing a message signal more important than a
15 later message signal from being forced out of the message signal storage area and thereby deleted by the later or less important message signal, and message signal deleting means for deleting needless message signals in the storage area. It has been customary with this kind of pager to
20 start each of the message display, message signal protection and message signal deletion in response to the operation of a particular switch by the user. In addition, the number of messages which can be protected have heretofore been limited.

25 Assume that the user of the above-described radio pager has forgotten to delete a message (message signal)

This Sheet Has Been Replaced



THIS SHEET HAS BEEN
REPLACED

which is not necessary due to the elapse of time, e.g.,
a message relating to an appointment. Then, such an
unnecessary message signal would continuously occupy the
message signal storage area to thereby reduce the area for
5 the other message signals, obstructing the efficient use
of the message signal storage area.

Moreover, when the pager is put in the user's bag,
for example, it is likely that the switch for protecting
a message signal and/or the switch for deleting it is
10 accidentally operated due to the movement of the pager
in the bag. Then, a message signal will be protected or
deleted against the user's intention.

As stated above, the protection and deletion of a
message signal relying only on switches is not satisfactory
15 when it comes to the efficient use of message signal
storage area and the reliable protection and deletion
of a message signal.

BRIEF SUMMARY OF THE INVENTION

Objects of the Invention

20 It is, therefore, a first object of the present
invention to provide a data display radio pager which
automatically protects and deletes designated ones of
message signals.

It is a second object of the present invention to
25 provide a data display radio pager which protects and

This Sheet Has Been Replaced



deletes message signals with reliability.

It is a third object of the present invention to provide a data display radio pager which frees the user from troublesome operations for protecting and deleting
5 message signals.

It is a fourth object of the present invention to provide a data display radio pager which enhances the efficient storage of useful message signals in a message signal storage area thereof.

10 Summary of the Invention

A data display radio pager of the present invention, like a conventional pager of the type described, has an RF section, a demodulator, a decoder, a ROM, alerting means, message display means, and control means including
15 a message signal storage area capable of storing a plurality of message signals. The radio pager also has a display switch for displaying a message corresponding to a stored message signal on the message displaying means, a protect switch for preventing an important
20 message from being forced out of the storage area and automatically deleted by a succeeding message signal, and a delete switch for deleting an unnecessary message area in the storage area.

The radio pager of the present invention is mainly
25 characterized by a function of automatically protecting and deleting, among the above message signals, a designated



message signal. Specifically, the control means first detects protection information requesting the automatic protection of a stored message signal out of the message signal. The protection information consists of a protection
5 time signal indicative of a particular period of time for which the storage message signal should be protected, and a set of particular marks occurring before and after the protection time signal. On detecting the particular mark, the control means starts on checking the time by time
10 counting means and, by referencing the time being counted by the time counting means, protects the stored message with the protection information over the above-mentioned protection time. As the protection time elapses, the control means automatically cancels the protection of the
15 message signal. Before the protection time expires, the user of the pager may operate the display switch to see a message corresponding to the stored message signal on the message display means any time. On the elapse of the protection time, the stored message signal with the
20 protection information is automatically converted to a message signal without protection.

Further, the control means determines the kind of the set of particular marks and displays the stored message signal in a mode matching it. Specifically, when the
25 control means determines that the set of particular marks is of a first kind, it displays a message corresponding



THIS SHEET HAS BEEN
REPLACED

to the stored message signal from which the particular marks have been removed. When the set of particular marks is of a second kind, the control means displays a message corresponding to the entire stored message signal including the particular marks. On the cancellation of the protection, the control means converts, in response to the detection of the first kind of particular marks, the stored message signal to a message signal from which the protection information has been removed; it converts, in response to the detection of the second kind of particular marks, the stored message signal to a message signal from which only the particular marks have been removed.

The two kinds of particular marks are implemented as different characters or as different numbers of the same characters.

BRIEF DESCRIPTION OF THE DRAWINGS

The above-mentioned and other objects, features and advantages of the present invention will become more apparent from the following detailed description when taken in conjunction with the accompanying drawings, wherein:

FIG. 1 is a block diagram schematically showing a data display radio pager embodying the present invention; FIG. 2 shows a specific format of an RF signal

This Sheet Has Been Replaced



THIS SHEET HAS BEEN
REPLACED

received by the radio pager shown in FIG. 1 and specific formats of a call signal which is the output of a decoder included in the embodiment;

FIG. 3 is a flowchart demonstrating a specific
5 procedure to be executed by the embodiment for processing and displaying a message signal; and

FIG. 4 schematically shows message signals stored in a RAM included in a control section which forms part of the embodiment.

10 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1 of the drawings, a data display radio pager embodying the present invention is shown and includes an antenna 1. A radio frequency (RF) signal S1 generated by modulating a carrier by a paging signal which
15 includes an address signal and a message signal is applied to an RF section 2 via the antenna 1. The RF section 2 converts the RF signal S1 to an intermediate frequency (IF) signal S2. A demodulator 3 demodulates the IF signal S2 to produce the above-mentioned paging signal S3. A
20 decoder 4 decodes the paging signal S3 to produce a call signal which includes the address signal and message signal. A control section 6 has a control circuit 61 as a major component thereof and controls the reception in response to the call signal. Specifically, the control circuit 61
25 determines whether or not the address signal is identical

This Sheet Has Been Replaced



with an address assigned to the pager and stored in a ROM (Read Only Memory) 5 and, if the answer is positive, generates a first tone signal S8. An amplifier 8 amplifies the first tone signal S8 to output a second tone signal S9.

5 A loudspeaker 9 produces an alert tone in response to the second tone signal S8. While delivering the first tone signal S8, the control circuit 61 stores the message signal included in the paging signal S4 in a RAM (Random Access Memory) 62 which has a storage area capable of accommodating

10 a plurality of message signals. The control circuit 61 feeds a display control signal S10 associated with the stored message signal to a display 10 with the result that a message corresponding to the signal S10 appears on the display 10. In this manner, the pager informs the person

15 carrying it of the reception of a call by an alert tone and a message.

As the user of the pager presses a display switch SW1 at any desired time, the message signal stored in the RAM 62 appears on the display 10 (message displaying

20 function). Such message signals stored in the RAM 62 one after another are sequentially forced out of the RAM 62 by message signals which are received afterwards. However, the user can protect important message signals by turning on a protect switch SW2 to thereby prevent them from being

25 deleted (message signal protecting function). Further, the user can delete needless message signals by turning



on a delete switch SW3 (message deleting function).

A timer 7 is connected to the control circuit 61 to count time, particularly the time having elapsed after the reception of the message signal. The timer 7 is the major
5 characteristic feature of the embodiment, i.e., it provides time information which is the basis of the automatic protection of message signals containing information to be protected and the cancellation of the automatic protection, as will be described later specifically.

10 Referring also to FIG. 2, the RF signal 2 of the pager receives a digital paging signal (RF signal S1) of POCSAG (Post Office Standardization Advisory Group) format. The RF signal S1 has a preamble signal P and a plurality of batches following the preamble signal P. Each batch
15 of the signal S1 is made up of one frame of frame synchronization signal F, and eight frames of address signal A or message signal M that follows the signal F. The RF section 2 and demodulator 3 receive, demodulate and decode the consecutive batches of the RF signal S1
20 in a single frame which is assigned to the pager, thereby producing a call signal S4 made up of an address signal A and a message signal M. The message signal M of each batch is constituted by five characters C (alphabets, numerals, and marks).

25 The message signal M constituted by the characters C may have three different kinds of signal formats, as follows.



THIS SHEET HAS BEEN
REPLACED

A message signal Md1 having a first format does not include a particular mark "*". When such a message signal Md1 is received, the control circuit 61 does not automatically protect the message Md1. A message signal Md2 having
5 a second format contains protection information, i.e., a protection time signal aa indicative of a time for which the signal Md2 should be protected and a particular mark "*" (protection indication signal) which occurs once before and once after the signal aa to show that
10 the signal Md2 is a message signal M to be protected. Further, a message signal Md3 having a third format contains protection information, i.e., a protection time signal bb and a particular mark "*" occurring twice before and once after the signal bb.

15 If desired, the message signal Md3 having the third format may be replaced with a message signal Md3A, as also shown in FIG. 2. The message signal Md3A has a protection indication signal in the form of a particular mark "[" in place of the mark "*". The mark "[" occurs
20 once before and once after the protection time signal bb.

A reference will also be made to FIGS. 3 and 4 for describing a specific operation of the embodiment for automatically protecting the above-stated specific message signal M and automatically cancelling the protection.
25 When the address signal included in the paging signal S4 is coincident with the address stored in the ROM 5

This Sheet Has Been Replaced



THIS SHEET HAS BEEN
REPLACED

(step 301), the control circuit 61 delivers the first tone signal S8 to the amplifier 8 to thereby produce an alert tone through the loudspeaker 9. At the same time, the control circuit 61 stores the message signal M contained
5 in the paging signal S4 in the RAM (message signal storage area) 62 (302). Then, the control circuit 61 determines whether or not the message signal M having been stored in the RAM 62 includes the mark "*" (303). Assuming the message signal Mdl which does not include the mark "*",
10 the control circuit 61 generates the display control signal S10 to display a message corresponding to the message signal Mdl on the display 10 (304) while automatically cancelling protection meant for the signal Mdl (313). Regarding the message signal Mdl, only the characters C
15 are stored in the RAM 62, as represented by a message signal No. M01, FIG. 4. The user of the pager may turn on the protect switch SW2 to protect the message Mdl or may turn on the delete switch SW3 to delete it, as desired. Such message signals Mdl which do not need protection are
20 sequentially forced out of the RAM 62 by succeeding message signals M and thereby automatically deleted, the message signal Mdl having the largest message number being first. Specifically, in FIG. 4, a message signal No. M16 which is protected is not deleted, and the other message signal
25 Nos. 15, 14 and so forth are sequentially deleted in this order.

This Sheet Has Been Replaced



Assume that the message signals Md2 and Md3 are stored in the RAM 62 as message signals M. Then, since both the message signals Md2 and Md3 include the particular mark "*" (303), the control circuit 61 starts the timer 7 by a control signal S7a and reads the time information being counted by the timer 7 by a control signal S7b (305). The control circuit 61 counts the mark or marks which occur for the first time in the message signal Md2 (306).

Since only one mark "*" appears for the first time in the message signal Md2, the control circuit 61 displays only the characters C of the message signal Md2 on the display 10 by removing the protection information "*aa*", while automatically protecting the message signal Md2 having been stored in the RAM 62 (307). It is to be noted that the RAM 62 stores all the characters of the message signal Md, as represented by a message signal No. M02, FIG. 4. Subsequently, the control circuit 61 continuously compares the protection time aa of the message signal Md2 having been automatically protected and the time information which it obtains from the timer 7, until they coincide (308). When they coincide, i.e., on the elapse of the protection time, the control circuit 61 deletes the protection information "*aa*" from the message signal Md2 stored in the RAM 62 (309). As a result, only the characters C included in the message signal Md2 are left in the RAM 62, as represented by a message signal



THIS SHEET HAS BEEN
REPLACED

No. M014, FIG. 4. Hence, the automatic protection of the message signal Md2 is automatically cancelled in a step 313. When the user turns on the display switch SW1 to see the message before the above-mentioned protection time expires, 5 the control circuit 6 causes the display 10 to show a message corresponding only to the characters C.

On the other hand, since the mark "*" appears twice for the first time in the message signal Md (306), the control circuit 61 displays the protection time signal bb 10 and characters C on the display 10 by removing three marks "*" from the message signal M3 in total. At the same time, the control circuit 61 automatically protects the message signal Md3 stored in the RAM 62 (310). At this instant, the RAM 62 stores all the characters of the message signal 15 Md3, as represented by a message signal No. M03, FIG. 4. Subsequently, the control circuit 62 checks the protection time bb, as in the case with the message signal Md2. On the elapse of the protection time bb, the control circuit 61 deletes the three marks "*" of the message signal Md3 20 stored in the RAM 62 to thereby convert the signal Md3 to a message signal No. M15, FIG. 4 (312). As a result, the protection time signal bb of the message signal Md3 has the same meaning as the other characters C, whereby the protection of the message signal Md3 is automatically 25 cancelled (313).

When the message signals Md2 and Md3A are the

This Sheet Has Been Replaced



protection signal formats of the message signal M, the message signal M can be automatically protected and freed from the protection as stated above if the decision on the continuation of the mark "*" is replaced with the decision
5 on the marks "*" and "[".

In summary, in the illustrative embodiment, the control circuit 61 can cause, on detecting protection information of a message signal M stored in the RAM 6, i.e., a protection time and a particular mark, the display
10 10 to display a message including or not including the protection information. The control circuit 61 protects message signal M over the protection time and, on the elapse of the protection time, automatically deletes it in the RAM 6. This prevents needless message signals
15 from occupying the storage area of the RAM 6 and thereby enhances the effective use of the storage area. Since the message signal M containing protection information is forcibly protected until the protection time expires, it is prevented from being deleted in the storage area
20 against the user's intention. Moreover, the embodiment free the user from troublesome operations for protecting the message signal, which is valid only for a limited protection time, and cancelling the protection by turning on switches.

25 Although the invention has been described with reference to the specific embodiment, this description



THIS SHEET HAS BEEN
REPLACED

is not meant to be construed in a limiting sense. Various
modifications of the disclosed embodiment, as well as
other embodiments of the invention, will become apparent
to persons skilled in the art upon reference to the
5 description of the invention. It is therefore contemplated
that appended claims will cover any modifications or
embodiments as fall within the true scope of the invention.

This Sheet Has Been Replaced



THIS SHEET HAS BEEN
REPLACED

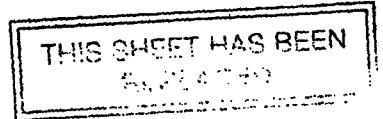
What is claimed is:



1. In a data display radio pager comprising receiving means for demodulating a radio frequency (RF) signal received via an antenna to produce a paging signal, decoding means for producing a call signal including an address signal and a message signal in response to said paging signal, ROM means storing an address assigned to said pager, alerting means for performing an alerting operation in response to an alert signal, display means for displaying a message in response to a message control signal, and control means responsive to said call signal for outputting, if said address signal and said address stored in said ROM means are identical, said alert signal, storing said message signal in a message storage area, and outputting said message control signal associated with said message signal stored in said ROM means;
- said control means comprising:
- protection information detecting means for detecting from said stored message signal protection information made up of a protection time signal indicative of a time over which said message signal should be protected and a set of particular marks occurring before and after said protection time signal; and
- message signal protecting means responsive to said protection information for protecting said stored message signal until said protection time elapses.

This Sheet Has Been Replaced





2. A radio pager as claimed in claim 1, wherein said protection information detecting means comprises particular mark discriminating means for determining the kind of said particular mark;

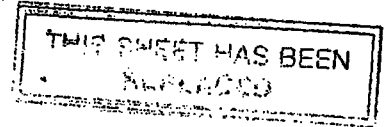
5 said control means feeding to said display means a message indication associated with the kind of said particular mark determined by said particular mark discriminating means.

3. A radio pager as claimed in claim 2, wherein said particular mark discriminating means discriminates a first kind of particular mark in the form of the same character which occurs once before and once after said
5 protection time signal, and a second kind of particular mark in the form of said character which occurs twice before and once after said protection time signal.

4. A radio pager as claimed in claim 2, wherein said particular mark discriminating means discriminates a first kind of particular mark in the form of the same character which occurs once before and once after said
5 protection time signal, and a second kind of particular mark in the form of a character different from said character and occurring once before and once after said protection time signal.

This Sheet Has Been Replaced





5. A radio pager as claimed in claim 3, wherein said character comprises a numeral.

6. A radio pager as claimed in claim 2, wherein said message indication associated with said first kind of particular mark discriminated and occurring within said protection time accords to said message control signal
5 associated with said message signal from which said particular marks have been removed, while said message indication associated with said second kind of particular mark and occurring within said protection time accords to the message control signal associated with said entire
10 message signal.

7. A radio pager as claimed in claim 6, wherein on the elapse of said protection time, said stored message signal corresponding to said first kind of particular mark has said protection information thereof entirely deleted,
5 while said stored message signal corresponding to said second kind of particular mark has only said particular marks thereof deleted.

8. A radio pager as claimed in claim 3, wherein said message indication associated with said first kind of particular mark discriminated and occurring within said protection time accords to said message control signal





THIS SHEET HAS BEEN
REPLACED

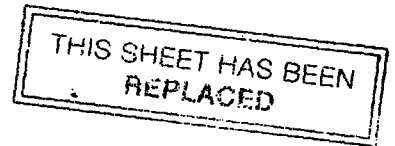
5 associated with said message signal from which said
particular marks have been removed, while said message
indication associated with said second kind of particular
mark and occurring within said protection time accords to
said message control signal associated with said entire
10 message signal

9. A radio pager as claimed in claim 8, wherein on the
elapse of said protection time, said stored message signal
corresponding to said first kind of particular mark has
said protection information thereof entirely deleted,
5 while said stored message signal corresponding to said
second kind of particular mark has only said particular
marks thereof deleted.

10. In a data display radio pager comprising receiving
means for demodulating an RF signal received via an antenna
to produce a paging signal, decoding means for producing
a call signal including an address number signal and a
5 message signal in response to said paging signal, ROM
means storing an address assigned to said pager, alerting
means for performing an alerting operation in response to
an alert signal, display means for displaying a message
in response to a message control signal, and control means
10 responsive to said call signal for outputting, if said
address signal and said address stored in said ROM means

This Sheet Has Been Replaced





are identical, said alert signal, storing said message
signal in a message storage area, and outputting said
message control signal associated with said message signal
15 stored in said ROM means;

said control means comprising:

protection information detecting means for detecting
from said stored message signal protection information
made up of a protection time signal indicative of a time
20 over which said message signal should be protected and a
set of particular marks occurring before and after said
protection time signal;

time counting means for counting, in response to said
protection information, a time having expired after the
25 reception of said message signal;

comparing means for reading, in response to said
protection information, said protection time from said
stored message signal and comparing said protection time
with the time being counted by said time counting means;

30 message protecting means responsive to the result of
comparison for protecting said stored message signal until
said protection time elapses; and

protection cancelling means responsive to the result
of comparison for cancelling the protection of said stored
35 message signal after said protection time has elapsed.

11. A radio pager as claimed in claim 10, wherein said

This Sheet Has Been Replaced





control means further comprises particular mark

discriminating means for discriminating the kind of said
particular marks detected from said stored message signal;

- 5 said control means delivering the message control
signal which gives a message indication corresponding to
the kind of said discriminated particular marks.

12. A radio pager as claimed in claim 11, wherein said
particular mark discriminating means discriminates a first
kind of particular mark in the form of the same character
occurring once before and once after said protection time
5 signal, and a second kind of particular mark in the form
of said character occurring twice before and once after
said protection time.

13. A radio pager as claimed in claim 11, wherein said
particular mark discriminating means discriminates a first
kind of particular mark in the form of the same character
occurring once before and once after said protection time,
5 and a second kind of particular mark in the form of a
character different from said character and occurring
once before and once after said protection time.

14. A radio pager as claimed in claim 12, wherein said
character comprises a numeral.





THIS SHEET HAS BEEN
REPLACED

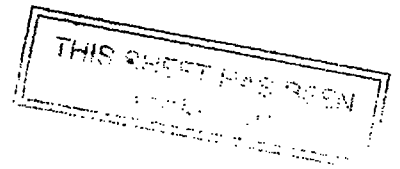
15. A radio pager as claimed in claim 11, wherein said message indication corresponding to said first kind of particular mark discriminated accords to said message control signal associated with said message signal from
5 which said particular mark has been removed, while said message indication corresponding to said second kind of particular mark discriminated accords to said message control signal associated with said entire message signal.

16. A radio pager as claimed in claim 15, wherein on the elapse of said protection time, said stored message signal corresponding to said first kind of particular mark has said protection information thereof deleted, while said
5 stored message signal corresponding to said second kind of particular mark has only said particular marks thereof deleted.

17. A radio pager as claimed in claim 12, wherein said message indication corresponding to said first kind of particular mark discriminated accords to said message control signal associated with said message signal from
5 which said particular marks have been removed, while said message display corresponding to said second kind of particular mark discriminated accords to said message control signal associated with said entire message signal.

This Sheet Has Been Replaced





18. A radio pager in accordance with claim 17, wherein
on the elapse of said protection time, said stored message
signal corresponding to said first kind of particular mark
has said protection information thereof deleted, while
5 said stored message signal corresponding to said second
kind of particular mark has only said particular marks
thereof deleted.

This Sheet Has Been Replaced

