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"Radio Pager With Power-Backup Memory For Storing
Uncompleted Messages"

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5 The present invention relates to radio pagers having a memory for
6 storing messages.

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8 With conventional radio pagers, received messages are stored
9 temporarily into a memory for later retrieval. If a message is not answered
10 by a called user, it is stored in the memory and a short beep sound is
11 periodically generated to remind the user of the uncompleted page.
12 However, if the user inadvertently turns off the pager for power savings
13 purposes, uncompleted pages which might be stored in the memory will
14 be completely lost.

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15 It is therefore an object of the present invention to provide a radio
16 pager for storing uncompleted messages during turn-off periods and
17 alerting the user when the pager is turned on again.

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19 According to the present invention, the radio pager comprises a
20 receiver for detecting a paging signal addressed to the pager and a
21 power-backup memory for storing messages. The receiver is the main
22 power consuming unit of the pager and is often turned off for saving
23 battery power. On receiving a paging signal, a message contained in it is
24 stored into the memory and the user is alerted with a first sound pattern.
25 A specified label is attached to the stored message if it is not answered by
26 the user within a prescribed period of time. When the pager is turned off,
27 the message is kept in the memory and when it is turned on again, the
28 memory is searched. If a message attached with the specified label is
29 detected in the memory, the user is alerted with a second sound pattern
30 different from the first sound pattern. The different sound allows the user
to quickly recognize that he is alerted by an uncompleted page.

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1 In a preferred embodiment, each stored message is classified with a
2 first label before alerting the user with a first sound pattern, and the label of
3 the stored message is changed to a second label if the message is not
4 answered within a prescribed period of time. When the pager is turned on
5 again, the memory is searched. If a message attached with one of the first
6 and second labels is detected, the user is alerted with the second sound
7 pattern. In a further preferred embodiment, unique sound patterns are
8 respectively assigned to the messages attached with the first and second
9 labels to allow users to distinguish between the uncompleted messages.

10 BRIEF DESCRIPTION OF THE DRAWINGS

11 The present invention will be described in further detail with reference
12 to the accompanying drawings, in which:

13 Fig. 1 is a block diagram of a radio display pager of the present
14 invention;

15 Fig. 2 is a waveform diagram of sound patterns; and

16 Figs. 3A and 3B are flowcharts describing programmed instructions
17 performed by the controller of Fig. 1.

18 DETAILED DESCRIPTION

19 In a radio display pager shown in Fig. 1, paging signals recovered by
20 front end 1 are decoded by decoder 2 into a form suitable for digital
21 processing by a controller 3 which is programmed to perform instructions
22 shown in Figs. 2 and 3. A pager identifier assigned to the pager is stored
23 in ROM 4 and received messages are stored in RAM 5. A keypad 6 is
24 coupled to the controller 3 for answering incoming pages, reading the
25 contents of RAM 5, or erasing unnecessary messages. An audio-
26 frequency oscillator 7 is provided for generating an audio frequency tone
27 signal. A sound pattern generator 8 stores a plurality of predetermined
28 patterns, or cadences as shown in Fig. 2 and generates one of the stored
29 cadences to modulate the tone signal and drives a speaker 9 with the
30 modulated tone. A liquid crystal display 10 is coupled to controller 3 to

1 provide a display of a message and a time stamp attached to it. A light-
2 emitting diode 11 is activated when the user is alerted. A time-keeping
3 device 12 supplies time-of-day data to controller 3. All components of the
4 pager are powered from the battery 13. For power savings purposes, a
5 power switch 14 is connected between battery 13 and power-drain units
6 such as front end 1 and oscillator 7. In particular, RAM 5 is backed up by
7 battery 13 to prevent its contents from being inadvertently lost when the
8 pager is turned off. Controller 3 has a terminal 15 for sensing when power
9 switch 14 is turned on.

10 In operation, if a paging signal is received, it is checked for coincidence
11 between the identifier contained in it and an identifier stored in ROM 4
12 (step 20 in Fig. 3A). If they match, the message contained in the received
13 signal is stored in RAM 5 (step 21) and time-of-day data is fetched from
14 time-keeping device 12 and attached to the stored message as a time
15 stamp (step 22). The incoming message is labelled as a "pre-alert page"
16 (step 23). Sound pattern #1 (Fig. 2) is then selected by the controller from
17 sound pattern generator 8 to modulate the tone signal from oscillator 7.
18 The user is therefore alerted with sound pattern #1 if the received page is
19 of most recent arrival. On hearing this sound pattern, the user operates
20 the keypad 6 to answer the page (step 25). When this occurs, the alerting
21 sound is stopped (step 29) and the label of the stored message is changed
22 to a label "answered page" and the message and its time stamp are
23 displayed on LCD 10 (steps 30, 31). If the user fails to notice the alert
24 sound and a predetermined time-out period has lapsed (step 26), the
25 sound is automatically stopped (step 27) and the message label is
26 changed to "unanswered page" (step 28).

27 Therefore, if the user turns off the pager by operating power switch 14
28 for power savings purposes, possibility exists that uncompleted messages
29 are lost completely.

30 When the pager is turned on again (step 40, Fig. 3B), controller 3

1 knows that terminal 15 is at a specified voltage level and proceeds to check
2 the contents of RAM 5 for a message classified with a label "unanswered
3 page" (step 41). If such a message is present in memory 5, the user is
4 alerted with a sound pattern #2, indicating that there has been an
5 unanswered page (step 42). If the user operates the keypad to answer the
6 page (step 43), the sound is stopped (step 46) and the message label is
7 changed to "answered page" and the message and its time stamp are
8 displayed (steps 47, 48). The sound is also stopped when a time-out
9 period expires following execution of step 43 (steps 44, 45).

10 If the answer is negative in step 41, control branches to step 49 to
11 check to see if a message labelled "pre-alert" page is present. If the
12 answer is negative, the program execution is terminated. Otherwise, it
13 branches to step 50 to alert the user with a sound pattern #3 signifying that
14 a pre-alert page is in memory 5. If the user answers the page (step 51),
15 the alert is stopped (step 54) and the message label is changed to
16 "answered page" and the message and its time stamp are displayed (steps
17 55, 56). No answering results in the sound being halted (steps 52, 53).

18 If the user successively hears sound patterns #2 and #3, he recognizes
19 that an unanswered message and a pre-alert message have already been
20 received and stored in memory 5.

21 Following the alerting of stored messages just described, control
22 moves to step 20. If a new incoming page arrives almost at the same time
23 the pager is turned on, control advances to step 20 following the
24 prosecution of steps 40 to 56, and branches at step 20 to step 21 to
25 proceed with the alerting of the user with sound pattern #1. Thus, the
26 stored messages are retrieved first for alerting the user when the pager is
27 turned on by having an incoming page wait in a queue.



Claims:

1 1. A radio pager comprising:
2 receiver means (1) for detecting a paging signal addressed to the
3 pager, said receiver means being powered by a battery (13) through a
4 power switch (14);
5 a memory (5) arranged to be constantly powered by the battery (13);
6 and
7 control means (3) for storing into said memory (5) a message
8 transmitted by said paging signal, alerting a user with a first sound pattern,
9 attaching a label to the stored message if the message is not answered
10 within a prescribed period of time, said control means (3) being responsive
11 to said power switch for sensing that said receiver means is powered by
12 the battery, searching through said memory (5) to detect messages
13 therein, and alerting the user with a second sound pattern different from
14 the first sound pattern if a message attached with said label is detected in
15 said memory.

1 2. A radio pager comprising:
2 receiver means (1) for detecting a paging signal addressed to the
3 pager, said receiver means being powered by a battery (13) through a
4 power switch (14);
5 a memory (3) arranged to be always powered by the battery (13);
6 and
7 control means (3) for storing into said memory (5) a message
8 transmitted by said paging signal, classifying the stored message with a
9 first label and alerting a user with a first sound pattern, changing the label
10 of the stored message to a second label if the message is not answered
11 within a prescribed period of time, said control means being responsive to
12 said power switch for sensing that said receiver means (1) is powered by



13 the battery, searching through said memory (5) to detect messages
14 therein, and alerting the user with a second sound pattern different from
15 the first sound pattern if a message with one of said first and second labels
16 is detected in said memory.

1 3. A radio pager as claimed in claim 2, wherein the control means
2 alerts the user with a third sound pattern if a message classified with the
3 other of said labels is detected in said memory.