A portable receiver (20) has a time of day clock (36) and receives a signal indicative of the location of the portable receiver. The portable receiver has a memory means (38) which has a plurality of locations with corresponding time zones. Upon reception of the location signal, the receiver determines the time zone of the location and the time zone of the time of day clock. The time of day clock is then adjusted to correspond to the time zone of the location. The location signal may also be used to adjust the operating frequency of the receiver.
DESIGNATIONS OF "DE"

Until further notice, any designation of "DE" in any international application whose international filing date is prior to October 3, 1990, shall have effect in the territory of the Federal Republic of Germany with the exception of the territory of the former German Democratic Republic.

| AT  | Austria       | ES  | Spain       | MC  | Monaco       |
| AU  | Australia     | FI  | Finland     | MG  | Madagascar  |
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Automatic Time Zone Adjustment of Portable Receiver

Background of the Invention

This invention relates generally to the area of portable receivers with time of day clocks. In particular this invention relates to a portable receiver receiving a signal indicating a location, the portable receiver determining a time zone corresponding the the location and adjusting the time of day clock in response thereof.

The features of portable receivers such as paging receivers has expanded to include time of day clocks. Additionally, the use of paging receivers within nation wide systems having location signals has become a valuable tool for the traveling business person. As the traveling business person travels between time zones, the time displayed on the clock must be adjusted. This constant adjustment in the course of traveling can become a tedious operation, and if neglected can result in disastrous conclusions. A business person using a clock hours away from the correct time can miss scheduled appointments.

Prior art paging systems which transmit time of day information suffer from several problems. First, a pager entering a new time zone resets its clock to correspond to the time of day signal of new time zone. However, a person cannot choose to operate their clock several minutes fast as many people desire. Second, in order to transmit the time of day signal, transmitters must be able to guarantee that the transmission of the time of day signal is in coincidence with the accurate time of day. This can become an enormous problem when retrofitting the time signals into the existing queuing structure for messages within a paging terminal. Third, the time of day signals consume valuable information channel capacity which could otherwise be used for the transmission of paging messages. And fourth, the time signal must be transmitted in every location that the
business person travels. This can be a difficult requirement to impose on nation wide systems operating in conjunction with independently operated local paging systems.

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Summary of the Invention

It is therefore an object of the present invention to alleviate the aforementioned problems.

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It is an object of the present invention to provide for the automatic correction of the time zone of a receiver having a time of day clock without the necessity of a time of day signal.

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It is an object of the present invention to adjust the time of day clock for the proper time zone in response to determining the location of the time of day clock and determining the time zone corresponding to the location.

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It is yet another object of the present invention to display the time zone in which a receiver operates.

In accordance with the present invention, a portable receiver comprises a receiving means receiving a location signal, the location signal being indicative of a location, a time keeping means for keeping time of day, and an adjusting means responsive to the location signal for adjusting said time keeping means.

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Brief Description of the Drawings

This invention can be more fully understood from the following detailed description when taken in conjunction with the accompanying drawings.

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Figure 1 shows a block diagram of a paging receiver which operates in accordance with the present invention.
Figure 2 shows a flowchart of the adjustment of a time of day clock in accordance with the present invention.

Figure 3 shows an example of a display on a paging receiver operating in accordance with the present invention.

Description of a Preferred Embodiment

Figure 1 shows a block diagram of a paging receiver 20 which operates in accordance with the present invention. The paging receiver receives a signal having a location signal included therein. The location signal includes the location of the city or locality in which the paging receiver is operating. An enabling description of such a pager is included within U.S. Patent No. 4,644,347 to Lucas et al. which is hereby incorporated by reference. The paging receiver additionally has a time of day clock, and an enabling description of a paging receiver having a time of day clock is included in allowed U.S. Patent Application No. 07/141,458 to DeLuca et al., which is also hereby incorporated by reference.

The paging signal is collected by antenna 22 and demodulated by receiver 24. The demodulated paging signal is processed by an address decoding means 26 which searches for an address signal matching a predetermined address signal assigned to the pager. In response to the detection of the address, message decoding means 28, decodes information associated with the address. The address and information comprise a message which may be displayed on a display means 30 in a known manner.

The demodulated information is also processed by a means for detecting the location signal 32. The location signal identifying a city or locality may be included within a unique preamble signal, a unique start code (SC), or location of a unique binary word appended within the preamble signal. The local area decoder 32 and the
receiver 24 operate as a receiving means receiving for a location signal. The location signal may be made available to a frequency adjusting means 33 which adjusts the receive frequency of receiver 24 to correspond to the proper local frequency, as described in the aforementioned Lucas et al. patent. The location signal is also made available to time zone adjusting means 34 which adjusts the time of day clock 36 in response to the location signal and on the basis of information included within a memory means 38.

It should be appreciated that address decoder 26, message decoder 28, local area decoder 32, adjusting means 34, time keeping means 36 and memory means 38 may be implemented within a host microcomputer. A preferred host microcomputer for the present invention is the Motorola MC68HC05L6 microcomputer. This microcomputer combined with the references and description incorporated herein provides and enabling description of the invention.

Figure 2 shows a flowchart of the adjustment of a time of day clock in accordance with the present invention. First, step 50 checks if a location signal has been received by local area detector 32. If received, step 55 performs a series of operations in order to adjust the time of day clock 36. First, the local time zone value is set to be equal to the time zone corresponding to the location signal just received. Then the clock time zone is set to be equal to the time zone corresponding to the time zone of the time of day clock. A new time is calculated by adding the clock time and the clock time zone while subtracting the local time zone. Table 60 shows a table of location signals and time zones which are stored in memory means 38. Then the time zone of the time of day clock is set to correspond to the location signal and finally an indicator indicative of the time zone of the location signal is displayed on display 30. The indicator is additionally shown in table 60.
Figure 3 shows an example of a display on a paging receiver operating in accordance with the present invention. The display 70 includes date information 72 which is shown to be "April 24", time of day information 74 which is shown to be "10:10 AM", and time zone information 76 which is shown to be "EST" representing Eastern Standard Time. Additionally, numeric message information display 78 is provided for displaying messages received by the pager. It should be appreciated that information display could additionally display alpha or graphic information, and that the information of 72, 74, and 76 could be displayed on 78 in the absence of message information thereby providing for the elimination of display segments dedicated to the functions of 72, 74 and 76, and thus providing for a smaller display.

One example of the operation of the present invention is a traveling business person traveling from Washington, D.C. to Los Angeles. While in Washington, D.C., the pager received a location signal indicating that Washington, D.C. was the location of the paging receiver, in response to which the pager displays the local time, date and "EST" indicating Eastern Standard Time. Upon arrival at Los Angeles the pager receives a new location signal indicating that Los Angeles is the location of the paging receiver. Assuming the first Los Angeles location signal was received at 10:10 AM EST, the following steps in accordance with step 55, would be taken. The pager would determine that the location of Los Angeles corresponds to a time zone of "+8" according to table 60. The pager would similarly determine the time of day clock was operating on EST which corresponds to a time zone of "+5" and the following calculation would be made:
CURRENT TIME  10:10 AM
CLOCK TIME ZONE  +5:00
LOCAL TIME ZONE  -(+8:00)

NEW TIME  7:10 AM

Additionally, the indication "PST" corresponding to Pacific Standard Time would be displayed in accordance with table 60. In can also be appreciated that a person traveling from Boca Raton, Florida to Washington, D.C. remains in the same time zone and the pager operating in accordance with the present invention would remain displaying the same time zone even though the location signal had changed while traveling.

It can be further appreciated that if the change in time zones cause the time of day to advance or retard to the next or previous day respectively, the date could be adjusted correspondingly. Furthermore, if time zones such as Caracas which according to table 60 cause the minutes to be adjusted, were eliminated, only the hours of the time of day clock need to be adjusted, thereby reducing the complexity of the adjusting means.

The advantage of using the location signal to set the time zone is that the location signal is already being transmitted and used for nation wide pagers in order that they may select a local channel, as described in Lucas et al. No additional time of day signal needs to be transmitted in order to adjust for travel between time zones. This resolves a number of queueing issues involved with paging transmitter systems as well as eliminating the air time required to transmit time of day signals. This additionally allows the time of day clock to be set to operate ahead of (or behind) the true time of day in a first location and preserving the setting as the as time zones are traversed.
It is obvious that numerous additional modifications and variations of the present invention are possible in light of the above teachings. It is therefore to be understood that within the scope of the appended claims, the invention may be practised otherwise than as specifically described herein.

What is claimed is:
Claims:

1. A portable receiver comprising:
   receiving means for receiving a location signal,
   time keeping means for keeping time of day; and
   adjusting means responsive to the location signal for
   adjusting said time keeping means.

2. The portable receiver of claim 1 further wherein;
   said time keeping means keeps the time of day in at
   least hours and minutes portions; and
   said adjusting means adjusts the hours portion of the
   time keeping means.

3. The portable receiver of claim 1 wherein said
   adjusting means further includes;
   means for determining a first time zone corresponding
   to the location signal;
   means for determining a second time zone corresponding
   to the time keeping means;
   means for determining the difference between the first
   and second time zones; and
   means for adjusting said time keeping means in
   response to said difference.

4. The portable receiver of claim 1 wherein said
   adjusting means includes;
   memory means having a plurality of predetermined
   locations with a time zone corresponding to each location
   wherein the time zone corresponding to the location signal
   is determined by selecting a time zone corresponding to a
   predetermined location matching the location signal; and
   wherein
   said adjusting means adjusts said time keeping means
   in response to the determined time zone.
5. The portable receiver of claim 4 further comprising a display means responsive said time keeping means for displaying the time of day.

6. The portable receiver of claim 5 wherein:
said memory means further includes an indication of the time zone corresponding to the location signal, and said display means further displays the indication.

7. The portable receiver of claim 5 wherein the location signal further includes a message for reception by a selective call receiver, the message including an address associated with the selective call receiver and information associated with the message, and said receiving means further includes:
address decoding means having a predetermined address.
said address decoding means for processing the location signal and determining if the address of the message matches the predetermined address and for generating a detect signal in response thereof; and
information decoding means responsive to the detect signal for processing the information of the message, wherein the information of the message is displayed on said display means.

8. The portable receiver of claim 1 further wherein said time keeping means additionally includes date information wherein said adjusting means additionally adjusts the date information in response to the location signal.

9. The portable receiver of claim 1 further including receiver frequency adjusting means additionally responsive to the location signal for adjusting the receive frequency of the portable receiver.
10. A method for adjusting the time zone of a portable receiver having a time of day clock, the method comprising the steps of:

5 receiving a signal indicative of the location of the portable receiver;

determining a time zone corresponding to the location;

and

adjusting the time of day clock in response to said determination.

11. The method of claim 10 wherein the step of determining includes the step of:

selecting from a memory means having a plurality of locations and corresponding time zones, a time zone corresponding to the signal indicative of the location.

12. The method of claim 10 wherein the step of adjusting further includes the steps of:

20 determining the time zone of the time of day clock;
comparing the time zone of the signal with the time zone of the time of day clock; and

adjusting the time of day clock in response to the comparison.
13. The method of claim 10 further including the step of:
   displaying the time of day on a display means.

14. The method of claim 13 wherein the signal further
    includes a message for reception by a selective call
    receiver, the message including an address associated with
    the selective call receiver and information associated with
    the message, and said method further including the step of:
    processing the signal and determining if the address
    of the message matches a predetermined address assigned to
    the portable receiver;
    generating a detect signal in response thereof; and
    processing the information of the message; and
    displaying the information of the message on the
    display means.

15. The method of claim 10 further wherein the portable
    receiver receives signals on one of a plurality of receive
    frequencies, said method further comprising the steps of:
    determining a new receive frequency corresponding to
    the location; and
    adjusting the receive frequency of the portable
    receiver in response to said determination.
16. A method of displaying the time zone of a portable receiver comprising the steps of:

receiving a signal indicative of the location of the portable receiver;

determining a time zone corresponding to the location;

and

displaying a signal indicative of the time zone of said determination.
FIG. 1
INTERNATIONAL SEARCH REPORT

PCT/US90/01801

I. CLASSIFICATION OF SUBJECT MATTER

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC (5); H04Q 7/00
U.S. CL 340/825.44

II. FIELDS SEARCHED

Classification System

U.S.
340/311.1 368/47 21, 22, 23 370/93

III. DOCUMENTS CONSIDERED TO BE RELEVANT

Category  Citation of Document, with indication, where appropriate, of the relevant passages

Y  US, A, 4,713,308 (GASKILL et al.) 15 DECEMBER 1987
See especially column 7, lines 33-41; column 16, lines 67-68; column 17, lines 1-4; column 31, lines 40-52, as well as entire document.

See the entire document.

Y  US, A, 4,313,186 (YOSHIDA) 26 JANUARY 1982
See the entire document.

A,P  US, A, 4,845,491 (FASCENDA et al.) 04 JULY 1989
See column 8, line 57 to column 9, line 19

A  US, A, 4,315,332 (SAKAMI et al.) 09 FEBRUARY 1982
See the entire document.

IV. CERTIFICATION

Date of the Actual Completion of the International Search: 07 JUNE 1990
Date of Mailing of this International Search Report: 28 AUG 1990

International Searching Authority

ISA/US

Signature of Authorized Officer

Peter Weissman