**PCT** WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

| (51) International Patent Classification 5 : | | (11) International Publication Number: |
|---|---|---|
| H04Q 7/00 | A1 | WO 90/13983 |
| | | (43) International Publication Date: 15 November 1990 (15.11.90) |

(21) International Application Number: PCT/US90/01801

(22) International Filing Date: 12 April 1990 (12.04.90)

(30) Priority data:
344,887 28 April 1989 (28.04.89) US

(71) Applicant: MOTOROLA, INC. [US/US]; 1303 East Algonquin Road, Schaumburg, IL 60196 (US).

(72) Inventors: DELUCA, Michael, J. ; DELUCA, Joan, Sabin ; 550 SW 6th Avenue, Boca Raton, FL 33486 (US).

(74) Agents: PARMELEE, Steven, G. et al.; Motorola, Inc., Intellectual Property Dept., 1303 East Algonquin Road, Schaumburg, IL 60196 (US).

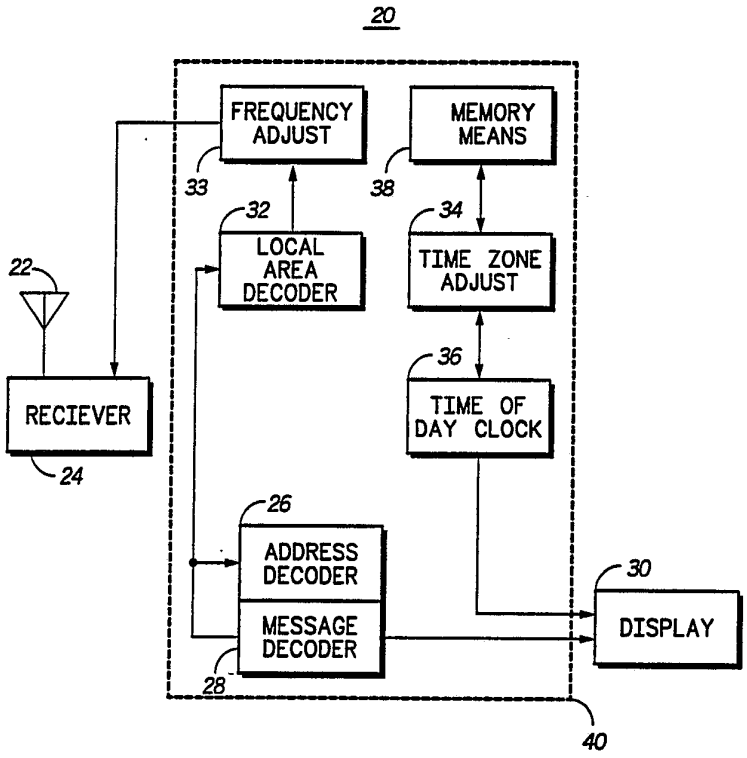
(81) Designated States: AT (European patent), BE (European patent), CH (European patent), DE (European patent), DK (European patent), ES (European patent), FI, FR (European patent), GB (European patent), IT (European patent), JP, KR, LU (European patent), NL (European patent), NO, SE (European patent).

**Published**
*With international search report.*

(54) Title: AUTOMATIC TIME ZONE ADJUSTMENT OF PORTABLE RECEIVER

(57) Abstract

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.




+ See back of page

## 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.

*FOR THE PURPOSES OF INFORMATION ONLY*

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

| | | | | | |
|---|---|---|---|---|---|
| **AT** | Austria | **ES** | Spain | **MC** | Monaco |
| **AU** | Australia | **FI** | Finland | **MG** | Madagascar |
| **BB** | Barbados | **FR** | France | **ML** | Mali |
| **BE** | Belgium | **GA** | Gabon | **MR** | Mauritania |
| **BF** | Burkina Faso | **GB** | United Kingdom | **MW** | Malawi |
| **BG** | Bulgaria | **GR** | Greece | **NL** | Netherlands |
| **BJ** | Benin | **HU** | Hungary | **NO** | Norway |
| **BR** | Brazil | **IT** | Italy | **RO** | Romania |
| **CA** | Canada | **JP** | Japan | **SD** | Sudan |
| **CF** | Central African Republic | **KP** | Democratic People's Republic of Korea | **SE** | Sweden |
| **CG** | Congo | | | **SN** | Senegal |
| **CH** | Switzerland | **KR** | Republic of Korea | **SU** | Soviet Union |
| **CM** | Cameroon | **LI** | Liechtenstein | **TD** | Chad |
| **DE** | Germany, Federal Republic of | **LK** | Sri Lanka | **TG** | Togo |
| **DK** | Denmark | **LU** | Luxembourg | **US** | United States of America |

# 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.

Summary of the Invention

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

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.

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.

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.

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.

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 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 Angles. 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 Angles the pager receives a new location signal indicating that Los Angles is the location of the paging receiver. Assuming the first Los Angles 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 Angles 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 indicative of a location;

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:

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:

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.

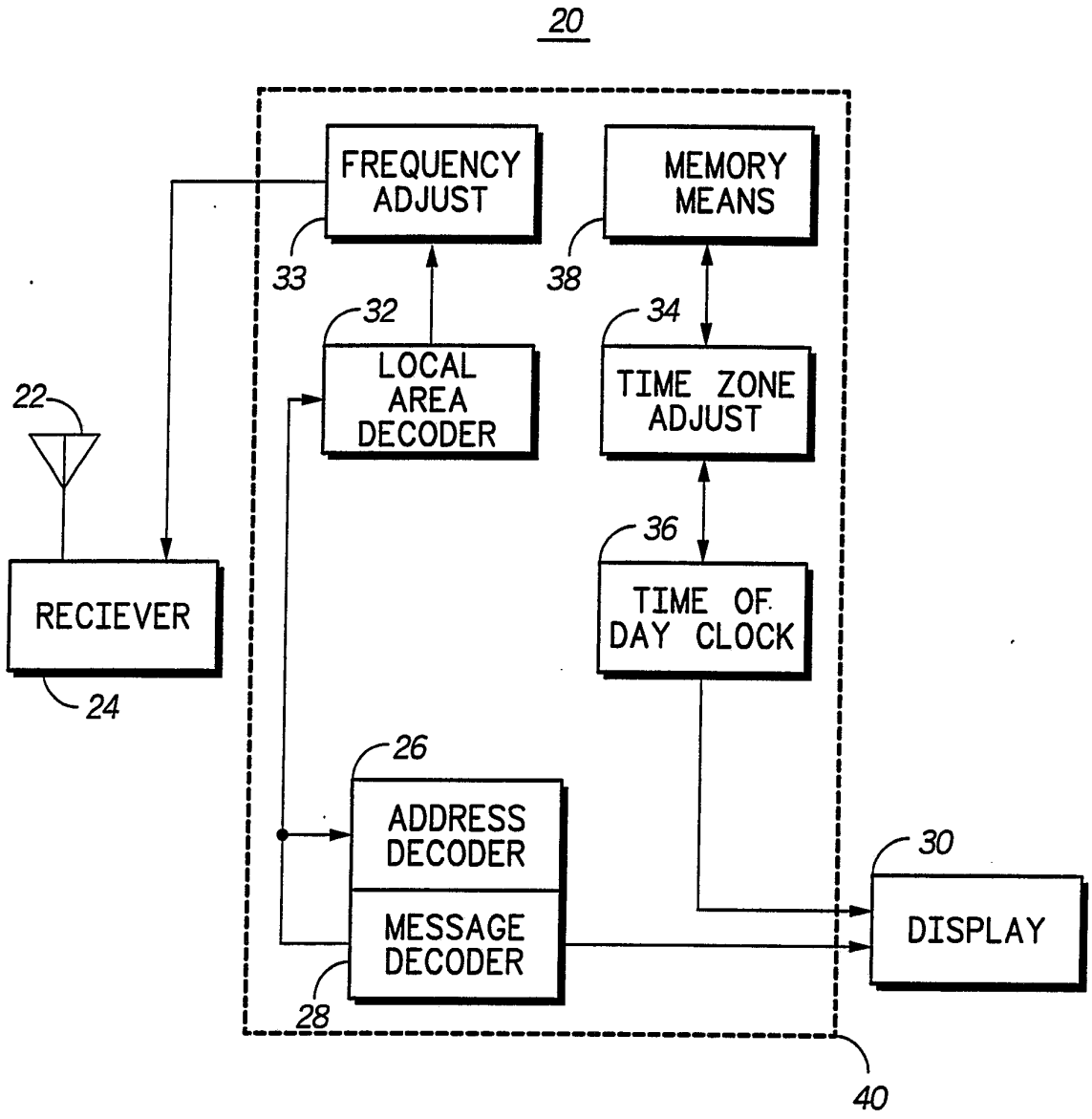

20
FREQUENCY ADJUST
33
MEMORY MEANS
38
32
LOCAL AREA DECODER
34
TIME ZONE ADJUST
22
36
TIME OF DAY CLOCK
RECIEVER
24
26
ADDRESS DECODER
30
MESSAGE DECODER
DISPLAY
28
40

FIG.1

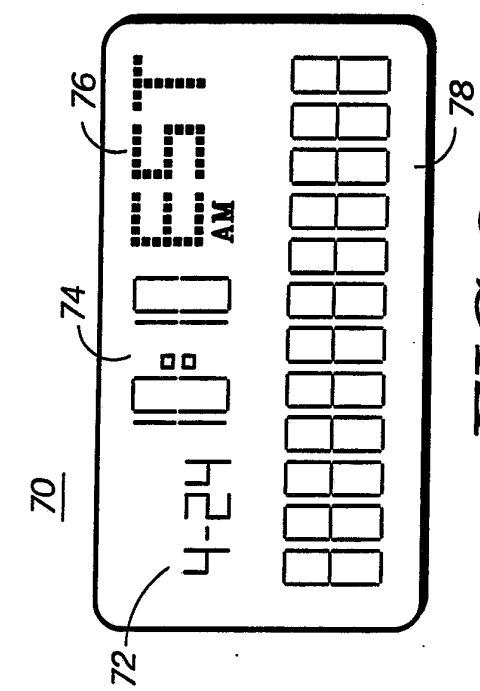
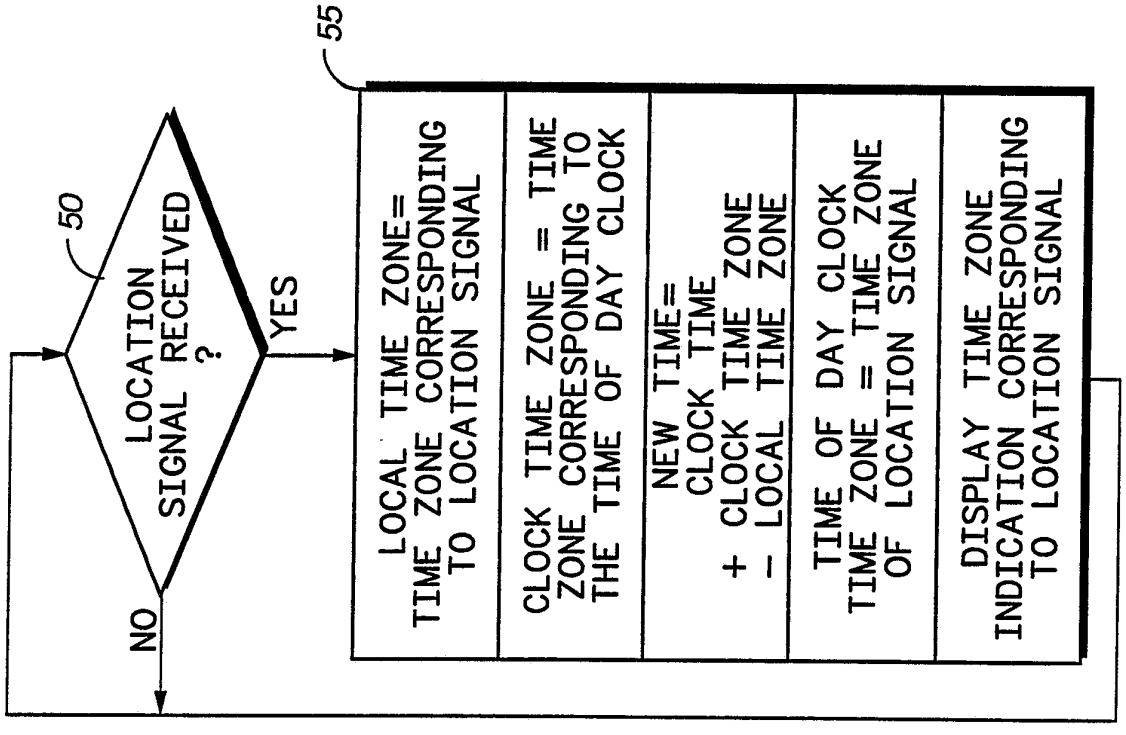



FIG.3

60

| LOCATION | TIME ZONE | INDICATION |
|---|---|---|
| BOCA RATON, FL. | +5:00 | EST |
| WASHINGTON, DC. | +5:00 | EST |
| SCHAUMBURG, IL. | +6:00 | CST |
| KEYSTONE, CO. | +7:00 | MST |
| PHOENIX, AZ. | +7:00 | MST |
| LOS ANGLES, CA. | +8:00 | PST |
| TOKYO, JAPAN | −9:00 | JAP |
| CARACAS, VENEZUELA | +3:30 | VEN |

FIG.2



# INTERNATIONAL SEARCH REPORT

International Application No. PCT/US90/01801

## I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [6]

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

Minimum Documentation Searched [7]

| Classification System | Classification Symbols |
|---|---|
| U.S. | 340/825.44, 825.45, 825.46, 825.47, 825.48, 825.26, 825.04 340/311.1 368/47 21, 22, 23 370/93 |

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [8]

## III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

| Category * | Citation of Document, [11] with indication, where appropriate, of the relevant passages [12] | Relevant to Claim No. [13] |
|---|---|---|
| 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. | 1-16 |
| Y | US, A, 4,644,347 (LUCAS et al.) 17 FEBRUARY 1989 See the entire document. | 1-16 |
| Y | US, A, 4,313,186 (YOSHIDA) 26 JANUARY 1982 See the entire document. | 3-7, 11-14, 16 |
| A,P | US, A, 4,845,491 (FASCENDA et al.) 04 JULY 1989 See column 8, line 57 to column 9, line 19 | 1-16 |
| A | US, A, 4,315,332 (SAKAMI et al.) 09 FEBARUARY 1982 See the entire document. | 1-16 |

* Special categories of cited documents: [10]

"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

"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

## 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