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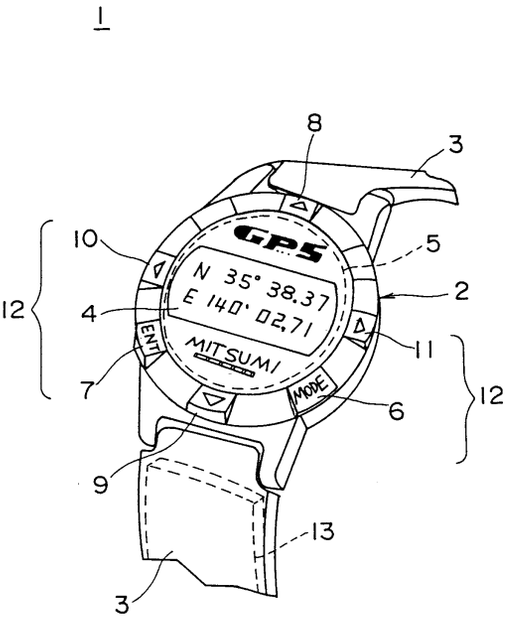
(54) Time display device

(57) A time display device (1) has location detecting means (5, 14, 15, 16) for detecting a location of the time display device (1), clocking means (21) for counting time and time adjusting means (17, 18, 19, 20) for adjusting the counted time of the clocking means (21) to match a local time of the location detected by the location detecting means (5, 14, 15, 16). The location detecting means (5, 14, 15, 16) acquires location information via a global positioning system (GPS) and the time adjusting means (17, 18, 19, 20) automatically computes the local time and adjusts the counted time of the time display device (1) to display the local time, so it is not necessary for the user to perform some operation to adjust the time of the time display device (1) to the local time.

FIG.1



EP 1 014 235 A2

Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates generally to a time display device, and more particularly, to a time display device adapted for movement between different time zones.

2. Description of the Related Art

[0002] Set time differs by country and by zone. That is, time is set by each country and region based on Greenwich Mean Time, which is universal standard time. Accordingly, there are time differences between countries and zones.

[0003] Portable time display devices such as wristwatches and other such devices that display the time move with the user. If the user moves from one time zone to a different time zone it is necessary for the user to set the wristwatch to the local time.

[0004] There are watches that display the time according to a country or city specified by the user. However, with such watches the user must specify the country or city in order to set the watch to the local time.

[0005] Accordingly, whenever the user moves from one time zone to a different time zone it is necessary for the user to set the watch to the local time or to specify the country or city in order to display the local time, that is, it is necessary for the user to engage in some operation in order to set the watch to the local time.

[0006] Moreover, if the user forgets to reset the time, or mistakes the time, or mistakes the specified country or city, the correct local time will not be obtained.

SUMMARY OF THE INVENTION

[0007] Accordingly, it is a general object of the present invention to provide an improved and useful time display device in which the disadvantages described above are eliminated. A more specific object of the present invention is to provide a time display device that sets the local time correctly without the need for the user to perform some operation.

[0008] The above-described objects of the present invention are achieved by a time display device having location detecting means for detecting a location of the time display device and clocking means for counting time, the time display device comprising:

time adjusting means for adjusting the counted time of the clocking means to match a local time of the location detected by the location detecting means.

[0009] According to the invention described above, the location detecting means detects the current location and the counted time of the clocking means is automatically adjusted to a time at the current location so detected, that is, the local time, so it is not necessary for the user to perform some operation to adjust the time of the time display device to the local time.

[0010] Additionally, the above-described objects of the present invention are also achieved by the time display unit as described above, wherein the time adjusting means comprises:

coordinated universal time (UTC) obtaining means for obtaining UTC;

local time difference obtaining means for obtaining a value of a time difference between the local time of the location obtained by the location detecting means and the UTC obtained by the UTC obtaining means; and

time computing means for computing the local time of the location obtained by the location detecting means from the value obtained by the local time difference obtaining means and the UTC obtained by the UTC obtaining means.

[0011] According to the invention described above, by adding to the time standard UTC the value of the time difference with respect to the UTC of the location detected by the location detecting means, it is possible to compute and display the current time of the detected location.

[0012] Additionally, the above-described objects of the present invention are also achieved by time display device as described above, wherein the location detecting means acquires location information via a global positioning system (GPS) and the UTC obtaining means obtains the UTC according to a GPS time obtained from the GPS.

[0013] According to the invention described above, obtaining the UTC is made easier by using the GPS time.

[0014] Additionally, the above-described objects of the present invention are also achieved by the time display device as described above, wherein the time adjusting means comprises:

area selecting means for selecting a desired area from among preset area information; and

area time difference obtaining means for obtaining a value of a time difference with respect to the UTC of the location information selected by the area selecting means,

wherein further the local time difference obtaining unit computes the local time of the area selected by the area selecting means based on the time difference value obtained by the area time difference obtaining unit.

[0015] According to the invention described above, a current time of a selected area can be computed and displayed.

[0016] Additionally, the above-described objects of

the present invention are also achieved by the time display device as described above, embodied as a portable time display device.

[0017] Additionally, the above-described objects of the present invention are also achieved by the time display device as described above, wherein the portable time display device comprises a wristwatch.

[0018] According to the invention described above, the counted time of the time display device is automatically adjusted to local time even as the user moves from one time zone to a different time zone.

[0019] Additionally, the above-described objects of the present invention are also achieved by the time display device as described above, wherein a battery cell is provided in a band portion of the wristwatch.

[0020] According to the invention described above, power sufficient for location detection and other operations can be supplied, making extended operation of the time display device feasible.

[0021] Other objects, features and advantages of the present invention will become more apparent from the following detailed description when read in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022]

FIG. 1 is a perspective view of an embodiment of the present invention;
FIG. 2 is a block diagram of an embodiment of the present invention;
FIG. 3 is a schematic table of local time values according to an embodiment of the present invention;
FIG. 4 is a diagram showing the distribution of local time values according to an embodiment of the present invention; and
FIG. 5 is a schematic conversion table for converting local time values into local time differences according to an embodiment of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0023] A description will now be given of an embodiment of the present invention with reference to the accompanying drawings.

[0024] FIG. 1 is a perspective view of an embodiment of the present invention.

[0025] In the present embodiment the time display device 1 of the present invention is embodied as a wristwatch. The wristwatch type time display device 1 of the present embodiment comprises a time display device main unit 2, hereinafter referred to as the main unit 2, and a band part 3.

[0026] A case of the main unit 2 contains a GPS location detector not shown in the diagram and a clocking part for counting time. On the front surface of the main unit 2, which is substantially circular in shape, a display unit 4 is formed. As will be explained later, the display unit 4 displays location information, such as the longitude and latitude, as well as the time of the current location according to the location information.

[0027] A GPS antenna 5 is arranged along an inner periphery of the display unit 4 of the main unit 2. In addition, input buttons 12 are arranged on a surface of the display unit 4. These input buttons 12 comprise a mode switching button 6, an enter button 7, an up button 8, a down button 9, a left button 10 and a right button 11.

[0028] The band part 3 is attached to a top and bottom of the main unit 2, and is used to hold the main unit 2 in place on the user's wrist. A battery cell 13 is built into the band part 3. The battery cell 13 is used to power the main unit 2.

[0029] A description will now be given of the interior structure of the main unit 2.

[0030] FIG. 2 is a block diagram of an embodiment of the present invention. A high-frequency unit 14, signal processing device 15, data processing unit 16, local time difference obtaining unit 17, a local time value table 18, a coordinated universal time (UTC) obtaining means 19, a time computing unit 20, a clocking unit 21, an area selection unit 22, an area time difference obtaining unit 23, an area time value table 24 and a display control unit 25 are built into the main unit 2 of the time display device 1, and are coupled to the display unit 4, the GPS antenna 5 and the input buttons 12.

[0031] The GPS antenna 5 is composed of a loop antenna arranged, as noted previously, along the inner periphery of the case. A signal received at the GPS antenna 5 is supplied to the high-frequency unit 14.

[0032] The high-frequency unit 14 amplifies and frequency-converts the signal from the GPS satellite from the signal received at the GPS antenna 5. The signal amplified and frequency-converted by the high-frequency unit 14 is supplied to the signal processing unit 15.

[0033] The signal processing unit 15 performs predetermined signal processing such as demodulation and AD conversion of the signal amplified and frequency-converted by the high-frequency unit 14, and obtains GPS data. The GPS data obtained by the signal processing unit 15 is supplied to the data processing unit 16.

[0034] Based on the GPS data supplied from the signal processing unit 15, the data processing unit 16 obtains GPS time as well as location information such as latitude, longitude and elevation. The location information obtained by the data processing unit 16 is supplied to the local time difference obtaining unit 17 as well as the display control unit 25. In addition, the GPS time obtained by the data processing unit 16 is supplied to the UTC obtaining means 19.

[0035] The local time difference obtaining unit 17 is connected to the local time value table 18. Local time values corresponding to location information are stored in the local time value table 18. The local time difference

obtaining unit 17 searches the local time value table 18 and extracts a local time value corresponding to the location information supplied from the data processing unit 16. Local time values al through ar, for example, denote time differences from UTC.

[0036] A description will now be given of the composition of the data of the local time value table 18.

[0037] FIG. 3 is a schematic table of local time values according to an embodiment of the present invention. As shown in the diagram, local time values al through ar corresponding to latitude and longitude are set in the local time value table 18.

[0038] If, for example, the local time difference obtaining unit 17 is supplied with location data from the data processing unit 16 corresponding to the longitude X1 and latitude Y1 of Honolulu, then the local time difference obtaining unit 17 searches the local time value table 18, extracts a local time value al and outputs that local time value al to the time computing unit 20. Or, if, for example, the local time difference obtaining unit 17 is supplied with location data from the data processing unit 16 corresponding to the longitude Xn and latitude Yn of Wellington, then the local time difference obtaining unit 17 searches the local time value table 18, extracts a local time value ar and outputs that local time value ar.

[0039] The values al through ar set in the local time value table 18 are preset for individual regions divided according to latitude and longitude and are also divided so that individual regions using the same time are grouped together.

[0040] FIG. 4 is a diagram showing the distribution of local time values according to an embodiment of the present invention. As shown in the diagram, local time values al through ar are set for individual regions divided according to latitude and longitude. The local time value table 18 is searched by the local time difference obtaining unit 17 according to the location information longitude and latitude of the data processing unit 16 and a given value al through ar is selected. That given value al through ar selected and output by the local time difference obtaining unit 17 is supplied to the time computing unit 20.

[0041] At the same time, based on the GPS time supplied from the data processing unit 16, the UTC obtaining means 19 obtains the UTC. UTC is the mean solar time at the Greenwich meridian. By obtaining the UTC by using the UTC obtaining means 19 a reference time is obtained. The UTC obtained by the UTC obtaining means 19 is supplied to the time computing unit 20.

[0042] At the same time as it is supplied with a value from the local time value table 18, the time computing unit 20 is also supplied with the UTC from the UTC obtaining means 19. The time computing unit 20 computes the local current time by adding the given value al through ar obtained by the local time difference obtaining unit 17, that is, the time difference from UTC, to the UTC supplied from the UTC obtaining means. The local current time computed by the time computing unit 20 is supplied to the clocking unit 21.

[0043] The clocking unit 21 takes the local current time computed by the time computing unit 20 and counts it. The counted time is then supplied to the supply control unit 25.

[0044] At the same time as it is supplied with location information from the data processing unit 16 and with counted time supplied from the clocking unit 21, the display control unit 25 is also supplied with a switching control signal from the input buttons 12. The display control unit 25 selectively outputs either location information from the data processing unit 16 or counted time from the clocking unit 21 in response to the switching control signal supplied from the input buttons 12. The location information or counted time selectively output by the display control unit 25 is supplied to the display unit 4. The display unit 4, which may be composed of an LCD or similar device, displays the location information or counted time supplied from the display control unit 25.

[0045] As mentioned previously, the input buttons 12 comprise a mode switching button 6, an enter button 7, an up button 8, a down button 9, a left button 10 and a right button 11. The mode switching button 6 is used when switching the display mode between location information and time and for switching to a selection mode for selecting an area.

[0046] The enter button 7 is used when inputting an area selected in the selection mode.

[0047] The up button 8, down button 9, left button 10 and right button 11 are used when selecting a counted time area.

[0048] When the selection mode is selected using the mode switching button 6, the area selection unit 22 is activated and supplies selected area information to the display control unit 25. The display control unit 25 displays an area name according to the selected area information supplied from the area selection unit 22 when the selection mode is selected.

[0049] The area selection unit 22 successively changes the selected area information supplied to the display control unit 25 when the up button 8, down button 9, left button 10 and right button 11 are pressed. The user presses the enter button 7 when the name of the area for which time display is sought is displayed. When the enter button 7 is pressed the area selection unit 22 supplies the displayed area information supplied to the display control unit 25 to the area time difference obtaining unit 23 as selected area information.

[0050] Based on the selected area information supplied from the area selection unit 22, the area time difference obtaining unit 23 references the area time value table 24 and extracts from the area time value table 24 an area time value corresponding to the selected area information supplied from the area selection unit 22. The area time values al through ar are the same as the local time values al through ar set in the local time value table 18, and represent the time difference from UTC.

[0051] FIG. 5 is a schematic conversion table for con-

verting local time values into local time differences according to an embodiment of the present invention. As shown in the diagram, in the area time value table 24 the values al through ar are set for each area name, for example, a country name or a city name. The area time difference obtaining unit 23 extracts an area time value corresponding to the country name or city name corresponding to the selected area information selected by the area selection unit 22 from the area time value table 24 shown in FIG. 5.

[0052] The time computing unit 20 computes the local current time by adding the given value al through ar obtained by the local time difference obtaining unit 17, that is, the time difference from UTC, to the UTC supplied from the UTC obtaining means. The local current time computed by the time computing unit 20 is supplied to the clocking unit 21.

[0053] The clocking unit 21 takes the local current time computed by the time computing unit 20 and counts it. The counted time is then supplied to the supply control unit 25.

[0054] The time computing unit 20 computes the current time of the selected area by adding the given value al through ar obtained by the area time difference obtaining unit 23, that is, the time difference from UTC, to the UTC supplied from the UTC obtaining means. The current time of the selected area computed by the time computing unit 20 is supplied to the clocking unit 21.

[0055] The clocking unit 21 takes the current time of the selected area computed by the time computing unit 20 and counts it. The counted time of the selected area is then supplied to the supply control unit 25. The control display unit 25 controls the display unit 4 so that a counted time corresponding to the counted time of the selected area supplied from the clocking unit 21 is displayed by the display unit 4.

[0056] The above description is provided in order to enable any person skilled in the art to make and use the invention and sets forth the best mode contemplated by the inventors of carrying out the invention.

[0057] The present invention is not limited to the specifically disclosed embodiment, and variations and modifications may be made without departing from the scope of the present invention.

[0058] The present application is based on Japanese priority application No. 10-365593 filed on December 22, 1998, the entire contents of which are hereby incorporated by reference.

Claims

1. A time display device (1) having location detecting means (5, 14, 15, 16) for detecting a location of the time display device (1) and clocking means (21) for counting time, characterized in that
   a time adjusting means (17, 18, 19, 20) adjusts the counted time of the clocking means (21) to match a local time of the location detected by the location detecting means (5, 14, 15, 16).

2. The time display device (1) as claimed in claim 1, characterized in that the time adjusting means (17, 18, 19, 20) has:
   coordinated universal time (UTC) obtaining means (19) for obtaining a UTC;
   local time difference obtaining means (17, 18) for obtaining a value of a time difference between the local time of the location obtained by the location detecting means (5, 14, 15, 16) and the UTC obtained by the UTC obtaining means (19); and
   time computing means (20) for computing the local time of the location obtained by the location detecting means (5, 14, 15, 16) from the value obtained by the local time difference obtaining means (17, 18) and the UTC obtained by the UTC obtaining means (19).

3. The time display device (1) as claimed in claim 2, characterized in that the location detecting means (5, 14, 15, 16) acquires location information via a global positioning system (GPS) and the UTC obtaining means (19) obtains the UTC according to a GPS time obtained from the GPS.

4. The time display device (1) as claimed in any of claims 1 to 3, characterized in that the time adjusting means (17, 18, 19, 20) has:
   area selecting means (22) for selecting a desired area from among preset area information; and
   area time difference obtaining means (23) for obtaining a value of a time difference with respect to the UTC of the area selected by the area selecting means (22),
   further characterized in that the area time difference obtaining means (23) computes the current time of the area selected by the area selecting means (22) based on the time difference value obtained by the area time difference obtaining means (23).

5. The time display device (1) as claimed in any of claims 1 to 4, embodied as a portable time display device.

6. The time display device (1) as claimed in claim 5, characterized in that the portable time display device comprises a wristwatch.

7. The portable time display device (1) as claimed in claim 6, characterized in that a battery cell 13 is provided in a band portion (3) of the wristwatch.

FIG.1

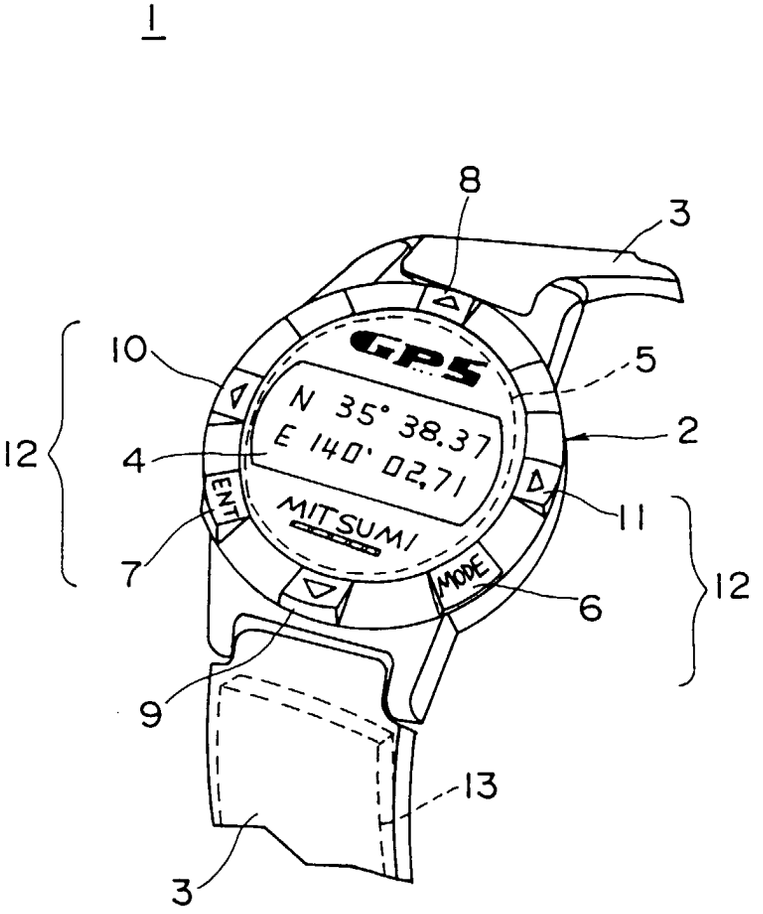

1
8
3
10
5
GPS
N 35° 38.37
E 140° 02.71
2
12
4
ENT
11
MITSUMI
7
MODE
6
12
9
13
3

FIG. 2

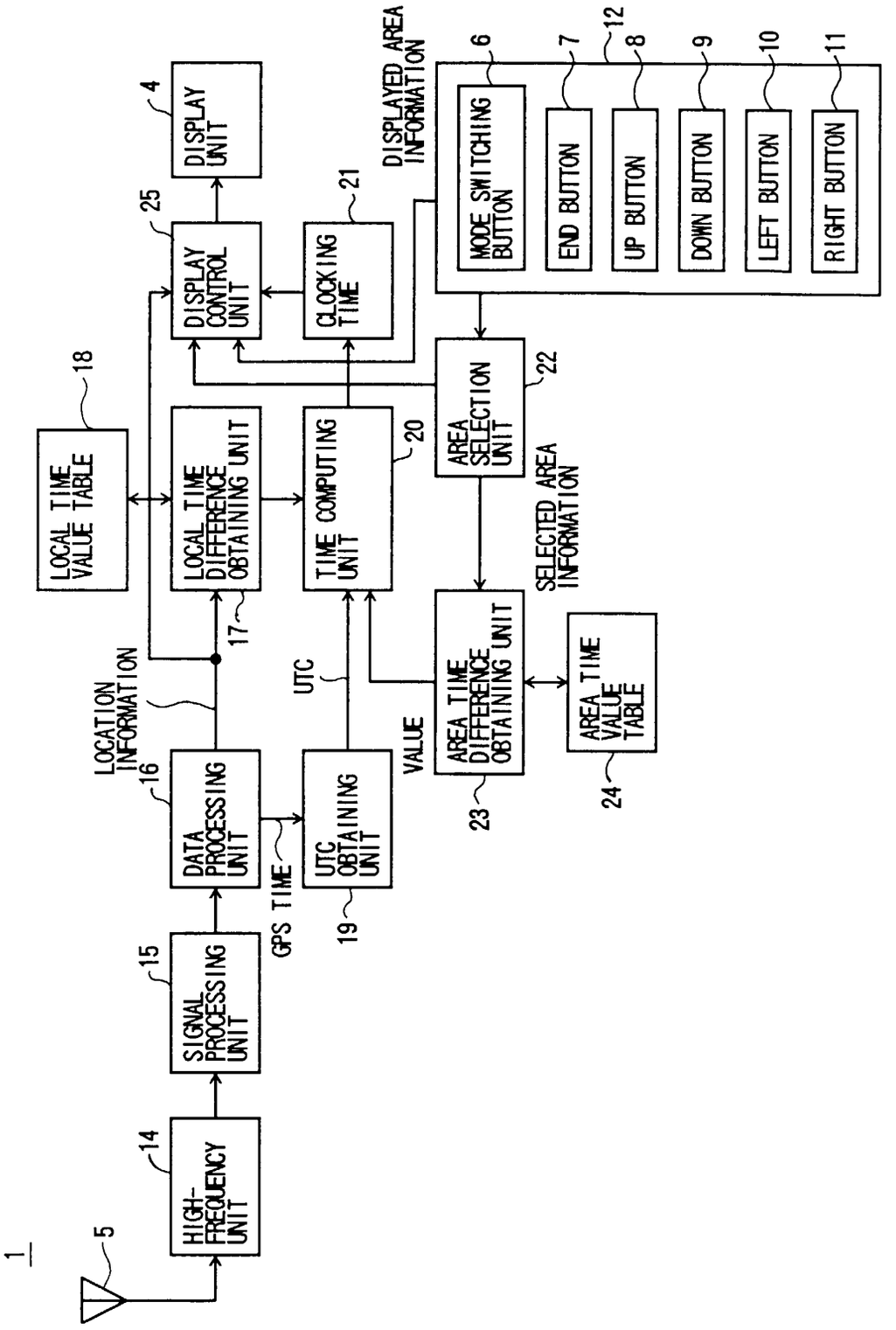

1
5
HIGH-FREQUENCY UNIT
14
SIGNAL PROCESSING UNIT
15
DATA PROCESSING UNIT
16
LOCATION INFORMATION
GPS TIME
UTC OBTAINING UNIT
19
UTC
TIME COMPUTING UNIT
20
VALUE
AREA TIME DIFFERENCE OBTAINING UNIT
23
AREA TIME VALUE TABLE
24
SELECTED AREA INFORMATION
AREA SELECTION UNIT
22
LOCAL TIME VALUE TABLE
18
LOCAL TIME DIFFERENCE OBTAINING UNIT
17
DISPLAY CONTROL UNIT
25
CLOCKING TIME
21
DISPLAY UNIT
4
DISPLAYED AREA INFORMATION
MODE SWITCHING BUTTON
6
END BUTTON
7
UP BUTTON
8
DOWN BUTTON
9
LEFT BUTTON
10
RIGHT BUTTON
11
12

FIG.3

18

		LONGITUDE		
		X1	·····	Xn
LATITUDE	Y_1	a 1	·····	a r
	⋮	⋮	⋱	⋮
	Y_{n1}	a 1	·····	a r

FIG.4

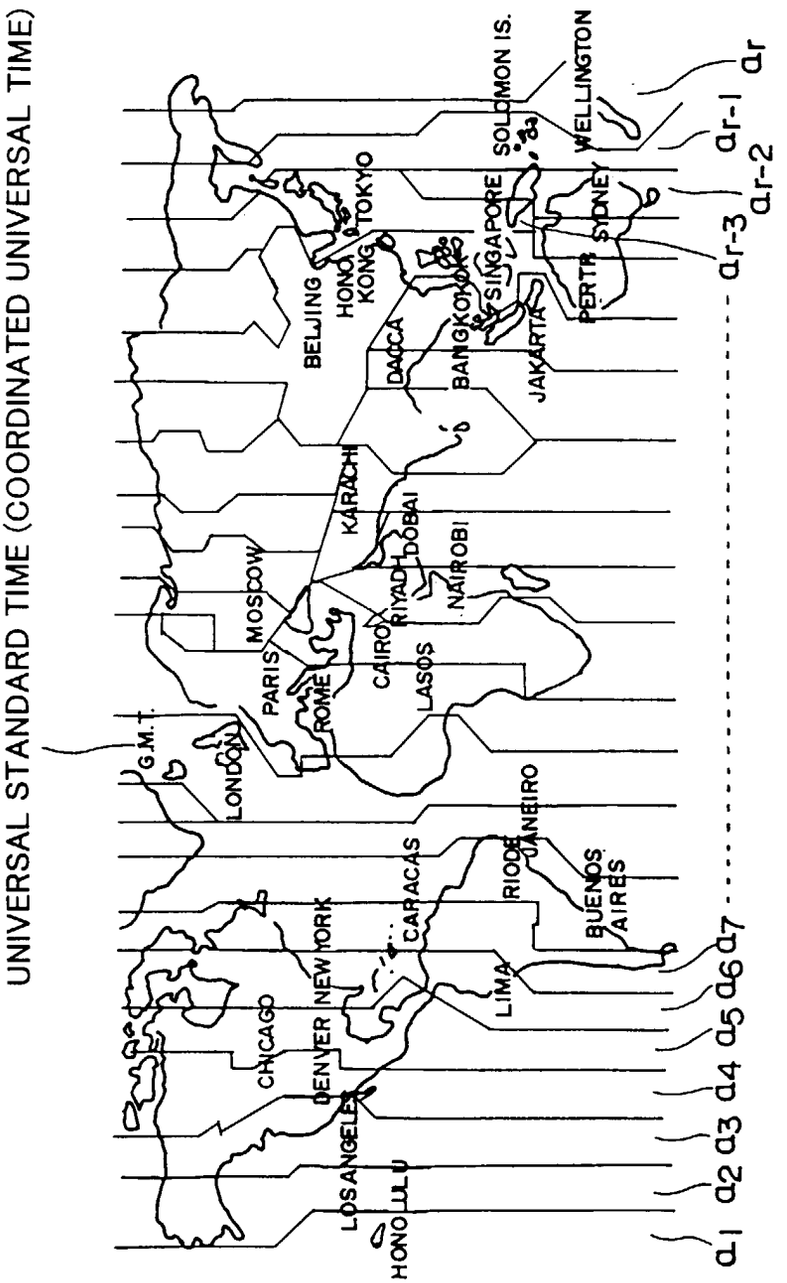

UNIVERSAL STANDARD TIME (COORDINATED UNIVERSAL TIME)
G.M.T.
LONDON
PARIS
ROME
MOSCOW
CAIRO
LAGOS
KARACHI
DUBAI
RIYADH
NAIROBI
DACCA
BANGKOK
SINGAPORE
JAKARTA
BEIJING
HONG KONG
TOKYO
SOLOMON IS.
WELLINGTON
PERTH
SYDNEY
RIO DE JANEIRO
BUENOS AIRES
CARACAS
LIMA
NEW YORK
CHICAGO
DENVER
LOS ANGELES
HONOLULU
a1
a2
a3
a4
a5
a6
a7
ar-3
ar-2
ar-1
ar

FIG. 5

24

COUNTRY/CITY	VALUE
A	a 1
B	a 2
C	a 3
D ⋮	