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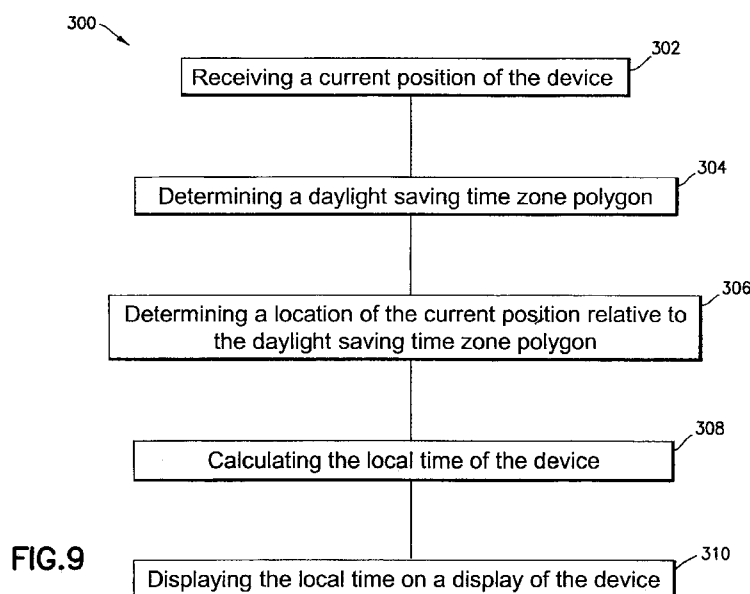


FIG.9

(57) Abstract: Disclosed herein is a method to determine a daylight saving time zone and local time in a device. A current position of the device is received. A daylight saving time zone polygon on a map corresponding to the current position is determined. A location of the current position relative to the daylight saving time zone polygon is determined. The local time of the device is calculated based on, at least partially, the determined location relative to the daylight saving time zone polygon. The local time is displayed on a display of the device.



METHOD AND APPARATUS TO DETERMINE DAYLIGHT SAVING TIME ZONE AND LOCAL TIME

FIELD OF THE INVENTION

The invention relates to an electronic device and, more particularly, to determining a daylight saving time zone and local time of the electronic device.

5 **BRIEF DESCRIPTION OF PRIOR DEVELOPMENTS**

The determination of the local time (where a device is located) in observance of time zones and/or daylight saving time has generally been provided by the usage of online network services or network operator services. For example, methods utilizing network identity and time zone (NITZ) provide for the update of the time zone with daylight saving time (DST) with a date
10 and time received from network operator broadcast signals. The broadcast information generally differs from operator to operator. The quality of the information is also dependent on operator, which may be prone to errors. Additionally, some devices may use using online network services to determine the local time in observance of time zones and/or daylight saving time. However, these daylight saving time zone (DSTZ) updates are generally received at the cost of internet
15 usage (such as data transfer rates, for example).

SUMMARY

The foregoing and other problems are overcome, and other advantages are realized, by the use of the exemplary embodiments of this invention.

20 In accordance with one aspect of the invention, a method to determine a daylight saving time zone and local time in a device is disclosed. A current position of the device is received. A daylight saving time zone polygon on a map corresponding to the current position is determined. A location of the current position relative to the daylight saving time zone polygon is determined. The local time of the device is calculated based on, at least partially, the determined location
25 relative to the daylight saving time zone polygon. The local time is displayed on a display of the device.

In accordance with another aspect of the invention, a method of setting a daylight saving time zone and local time in a device is disclosed. A current position of the device is received. A mobile country code corresponding to the current position is received. The daylight saving time
30 zone is set in response to the received current position and the received mobile country code. The local time is calculated based on, at least partially, the set daylight saving time zone. The local time is displayed on a display of the device.

In accordance with another aspect of the invention, an apparatus configurable to determine a daylight saving time zone and local time is disclosed. The apparatus includes a positioning system and a processor. The positioning system is configured to provide a current position of the apparatus. The processor is configured to form a daylight saving time zone region.

5 The processor is configured to calculate the local time. The daylight saving time zone region corresponds to the provided current position. The local time is calculated based on, at least partially, a positional relationship between the current position and the daylight saving time zone region.

In accordance with another aspect of the invention, a computer readable medium that
10 stores computer program instructions that when executed result in operations to set a daylight saving time zone and local time in a device is disclosed. A current position of the device is received. A daylight saving time zone polygon on a map corresponding to the current position is determined. A location of the current position relative to the daylight saving time zone polygon is determined. The local time of the device is calculated based on, at least partially, the determined
15 location relative to the daylight saving time zone polygon.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing aspects and other features of the invention are explained in the following description, taken in connection with the accompanying drawings, wherein:

20 Fig. 1 is a perspective view of an electronic device incorporating features of the invention;

Fig. 2 is a block diagram of an exemplary method of the device shown in Fig. 1;

Fig. 3 is a diagram illustrating daylight saving time zone polygons used in the device shown in Fig. 1;

25 Fig. 4 is a diagram illustrating daylight saving time zones used in the device shown in Fig. 1;

Fig. 5 is a diagram illustrating daylight saving time zone polygons and merged islands used in the device shown in Fig. 1;

30 Fig. 6 is a diagram illustrating daylight saving time zone polygons and a merged island used in the device shown in Fig. 1;

Fig. 7 is a diagram representation of an algorithm used in the device shown in Fig. 1;

Fig. 8 is a block diagram of another exemplary method of the device shown in Fig. 1;

Fig. 9 is a block diagram of another exemplary method of the device shown in Fig. 1;

Fig. 10 is a block diagram of another exemplary method of the device shown in Fig. 1;

35 and

Fig. 11 is a schematic drawing illustrating components of the electronic device shown in Fig. 1.

DETAILED DESCRIPTION

Referring to Fig. 1, there is shown a perspective view of an electronic device 10 incorporating features of the invention. Although the invention will be described with reference to the exemplary embodiments shown in the drawings, it should be understood that the invention can be embodied in many alternate forms of embodiments. In addition, any suitable size, shape or type of elements or materials could be used.

According to one example of the invention, the device 10 is a multi-function portable electronic device. However, in alternate embodiments, features of the various embodiments of the invention could be used in any suitable type of portable electronic device such as a mobile phone, a gaming device, a music player, a notebook computer, or a PDA, for example. In addition, as is known in the art, the device 10 can include multiple features or applications such as a camera, a music player, a game player, or an Internet browser, for example. The device 10 generally comprises a housing 12, a transceiver 14 connected to an antenna 16, electronic circuitry 18, such as a controller, a computer and/or a data processor, and a memory for example, within the housing 12, a user input region 20 and a display 22. The display 22 could also form a user input section, such as a touch screen. It should be noted that in alternate embodiments, the device 10 can have any suitable type of features as known in the art.

The electronic device 10 further comprises a positioning interface 24. The positioning interface 24 may be a global positioning system (GPS) for example. However, any suitable positioning/navigation system may be provided.

Various exemplary embodiments of the invention provide an improved method to determine the daylight saving time zone (DSTZ) and local time (LT) using the country code and the current position of an electronic device. According to some examples of the invention, configurations for calculating the daylight saving time zone in which the positioning receiver is located may be provided. The electronic device may be used for receiving signals of positioning system from satellites, and in some examples of the invention, the day light saving time zone and local time is determined for the electronic device. Additionally, various exemplary embodiments of the invention may provide for determining the local time in observance of the time zone and/or the daylight saving time (DST) with no further auxiliary data through any communication network and/or network operator/service.

In general, various examples of the invention may provide for the current position to be obtained through a GPS or other navigational system, and for countries with multiple time zones, one or more daylight saving time zones polygons may be constructed. The daylight saving time zones polygons may be determined/constructed (with reference to a map of the particular country/region) within a memory or controller of the device. The daylight saving time zones polygons may be determined without the borders of the countries, to reduce the memory consumption and to decrease the calculation time. On identifying the current position in one of

these polygons, the daylight saving time zone of the current position is found as same as that of the corresponding polygon. This may allow for the calculated daylight saving time zone to be set in the positioning electronic device. Once the daylight saving time zone is determined, the local time may be calculated.

5 According to various exemplary embodiments of the invention, some possible test cases for which daylight saving time zone are calculated optimally may be, for example, a single time zone country with/without DST, a country with multiple time zones with/without DST, a single or multiple time zone island(s) with/without DST, or a current position on a time zone border. It should be noted that these cases are merely provided as non-limiting examples and various other
10 cases may be provided.

Referring now also to Fig. 2, there is shown an abstract implementation of a method 100 according to one example of the invention. The method 100 includes the following steps. The method starts at step 102. A timer is created/started and the previous mobile country code (MCC) and previous position are set equal to "none" (step 104). The apparatus is configured to get the
15 current position of the device and the Greenwich Mean Time (GMT) (step 106). Next determine if the current position is not equal to previous position (step 108). If "NO", then proceed to step 110 and step 112. If "YES", then proceed to step 114, wherein the timer is started. The apparatus is configured to get the mobile country code (step 116). Next determine if the current MCC is not equal to the previous MCC (step 118). If "NO", then proceed to step 120 wherein stored
20 polygons are used. If "YES", then proceed to step 122 wherein the DSTZ polygons are formed for all time zone identities mapped from the current MCC. Next, the polygons for the current and the next iterations are stored (step 124). Next determine if the current position is in a polygon (step 126). If "YES", then proceed to step 128 wherein the apparatus is configured to get the time zone identity from the circumscribing polygon. If "NO", then determine if the current position is
25 in more than one polygon (step 130). If "NO", then return to step 106, if "YES", then proceed to step 132 wherein, if the location of the current position is narrowed to a polygon using the MCC with optional mobile network code (MNC) and/or cell identity (cellid) successfully, then proceed to step 128. If not narrowed successfully, then return to step 106.

Following step 128, the daylight saving time zone (DSTZ) and local time are calculated.
30 Additionally, the previous position, the previous MCC, and the timer are updated (step 134). The DSTZ is calculated by summing an offset of the calculated TZID and a DST offset. The local time is calculated by summing the GMT, the DSTZ, and the timer value. The previous position is updated by setting the previous position as the current position. The previous MCC is updated by setting the previous MCC as the current MCC. In addition, the timer is reset. If there is a next
35 iteration (step 136), then return to step 106, otherwise proceed to step 140 wherein the timer is stopped/destroyed, and device resources are freed. At step 140, the method ends. It should be

noted that any of the above steps may be performed alone or in combination with one or more of the steps.

Fig. 2 as described above presents a reduced flow chart of a principle of identifying the DSTZ using the current position. A more detailed implementation may be provided as described below.

With reference to steps 106, 108, and 114, when the current position from the positioning receiver (or positioning interface) and GMT is received, the local timer is started in order to calculate the delay to be added later.

With reference to steps 116-124, once the country code is received, the device is configured to get the time zone (TZ) unique identity (ID) mapped to that country code. If more than one TZ ID is received, then the corresponding country may have several time zones. The device is configured to get the shape points of all the possible TZ polygons from the database using their corresponding TZ identity. It should be noted that according to some embodiments of the invention, the database resides within a memory of the device. However, in alternate embodiments, the database may be provided in any suitable locations, such as a removable memory, or on a server, for example.

The device is configured to create the TZ polygons 26, 28, 30, 32, 34, 36 with the shape points 38 (as shown in Fig. 3). The polygons 26, 28, 30, 32, 34, 36 are created between the time zone partition lines 40 (see also Fig. 4), adjacent longitudes 42 and adjacent latitudes 44 of the polygons. Borders of the country are not included in time zone polygons to reduce the memory consumption and to reduce the time taken for calculation. The country code may be used to identify the country (not using the borders).

In reference to Fig. 4, it should be noted that in addition to any offset from GMT due to the various time zones, additional time offsets corresponding to daylight saving time may be required. Many countries such as the United States and Canada observe daylight savings time. In addition, various locations in Australia and Antarctica, as well as, various countries throughout South America, Europe, Asia, and Africa also observe daylight savings time.

According to some embodiments of the invention, islands with same the country code and the same TZ as that of the nearest matching TZ polygon can be joined with the nearest matching TZ polygon with a bidirectional line traversing in both directions. For example, Fig. 5 illustrates a country with two time zones and islands. The country comprises polygons 46, 48 separated by the time zone line 50. The merging of the islands 52 with the polygon 48 (with bidirectional lines 54) in turn reduces the iterations in the calculation.

Similarly, Fig. 6 illustrates the country of Australia with multiple time zones and the island of Tasmania. The country comprises polygons 56, 58, 60, 62, 64, 66. The merging of the island of Tasmania 68 with the polygon 66 (with bidirectional line 70) reduces the iterations in the calculation.

With reference to steps 126-132, the device 10 is configured to identify whether the current position is inside or outside of all the time zone polygons. It should be noted that many algorithms are available to determine whether the point is inside or outside the TZ polygon. Any suitable method may be used to determine a location of the current position relative to the polygon (such as a determination of whether the point is inside or outside of the polygon, for example).

According to one example of the invention, a ray casting algorithm is provided. However, any suitable algorithm may be provided. Referring now also to Fig. 8, points 80, 81, 82, 83 and 84 represent the positions of the device 10. As per the ray casting algorithm, a horizontal ray 85, 86, 87, 88, 89 is drawn to meet the polygon 72. If number of intersections is even, then the point lies outside the TZ polygon 72. For example, points 80, 82, and 84 lie outside of the polygon 72. If number of intersections is odd, then the point lies inside the TZ polygon 72. For example, points 81 and 83 lie inside the polygon 72. If the horizontal ray meets any shape point of the TZ polygon, then considering only horizontal ray should results in errors. In such cases, vertical ray may also need to be considered to find a location of a point relative to the polygon.

With reference to steps 128, 134, if the current position lies inside the time zone polygon, then the time zone of the current position is same as that of circumscribing TZ polygon. The correct value of GMT is calculated by adding the delay of the timer to the GMT. With the TZ of the current position, the GMT, and the DST rules, the daylight saving time zone may be calculated for the current position. The calculated DSTZ can be set in the electronic device for further use, such as calculating the local time of the current position.

It should be noted that the DSTZ of the current position in a single time zone country, as well as multiple time zone countries, can be calculated in accordance with various embodiments of the invention without any difference. Additionally, the DSTZ of the current position may also be calculated if the current position of electronic device lies exactly on a country border and/or a DSTZ polygon border (see steps 126-132 of the method 100 shown in Fig. 2). For example, according to some embodiments of the invention, if the current position lies exactly on the country border (or the borders of many countries), then the MCC is sufficient to resolve. In another example, according to some embodiments of the invention, if the current position lies exactly on the border of a DSTZ polygon, or lies exactly on the border of many DSTZ polygons of the same country, then the MCC with optional MNC and/or cellid may resolve. However, if not resolved, once the electronic device starts moving away from the time zone border, the DSTZ can be calculated.

The technical effects of any one or more of the exemplary embodiments of the invention provide for an advantageous method in countries with several time zones. In such countries, the country code alone may not give the daylight saving time zone in which the positioning receiver

is located. In such a case, the current position of the electronic device along with country code is used to identify the day light saving time zone. Additionally, in the calculation of daylight saving time zone, the borders of the countries are not included in the database, so as to reduce the memory consumption and time taken for the calculation. Thus, according to some embodiments of the invention, only the time zone partitions are included in database. However, it should be noted that this is not required.

For example, as illustrated in Fig. 8 there is shown a method 200 according to another example of the invention. The method 200 is similar to the method 100, and similar steps are similarly numbered. The steps 202-240 substantially correspond to the steps 102-140 of the method 100. However, one difference between the method 200 and the method 100 is that in the calculation of daylight saving time zone, the borders of the countries are included in the database. For example see steps 220–224. It should be noted that in some embodiments, the borders of the countries may be provided in some iterations of the method 200 and may not be provided in other iterations of the method 200. The use of the borders of the countries may correspond to a particular location, for example. However, any suitable method configuration may be provided.

Figure 9 illustrates a method 300. The method 300 includes the following steps. Receiving a current position of the device (step 302). Determining a daylight saving time zone polygon on a map corresponding to the current position (step 304). Determining a location of the current position relative to the daylight saving time zone polygon (step 306). Calculating the local time of the device based on, at least partially, the determined location relative to the daylight saving time zone polygon (step 308). Displaying the local time on a display of the device (step 310). It should be noted that any of the above steps may be performed alone or in combination with one or more of the steps.

Figure 10 illustrates a method 400. The method 400 includes the following steps. Receiving a current position of the device (step 402). Receiving a mobile country code corresponding to the current position (step 404). Setting the daylight saving time zone in response to the received current position and the received mobile country code (step 406). Calculating the local time based on, at least partially, the set daylight saving time zone (step 408). Displaying the local time on a display of the device (step 410). It should be noted that any of the above steps may be performed alone or in combination with one or more of the steps.

Referring now also to Fig. 11, the device 10 generally comprises a controller 500 such as a processor or microprocessor for example. The electronic circuitry includes a memory 502 coupled to the controller 500, such as on a printed circuit board for example. The memory 502 could include multiple memories including removable memory modules for example. The device has applications 504, such as software, which the user can use. The applications 504 can include, for example, a telephone application, an Internet browsing application, a game playing application, a digital camera application, etc. These are only some examples and should not be

considered as limiting. One or more user inputs 20 are coupled to the controller 500 and one or more displays 22 are coupled to the controller 500. The positioning interface 24 is also coupled to the controller 500. The device 10 may be programmed to automatically set a daylight saving time zone and local time in the device. However, in an alternate embodiment, this might not be automatic. The user might need to actively set the daylight saving time zone and local time.

Various exemplary embodiments of the invention relate to a method of setting daylight saving time zone and local time. In a typical positioning electronic device, the position is determined through Global Positioning System satellites or through navigation systems. In conventional methods, with the determined position, the time zone is calculated at the expense of additional costs for the usage of online network server or network operator services. Various examples of the invention provide for a method with no additional costs incurred to the user. The device 10 is intelligent enough to find the daylight saving time zone by itself rather than depending on the services from other sources like internet or network operator.

The technical effects of any one or more of the exemplary embodiments of the invention provide for improved methods over conventional configurations which may be prone to many DST errors. Additionally, various technical effects of the one or more embodiments of the invention provide relatively high accuracy and minimal time taken to complete the operation with less memory consumption of the database (when compared to conventional configurations). It should be noted that the resolution of GPS information received from satellites may also differ from satellite to satellite based on the settings and configuration of the satellite. According to various embodiments of the invention, the resolution of the GPS information may also be used in calculations to reduce errors.

According to one example of the invention, an apparatus configurable to determine a daylight saving time zone and local time is disclosed. The apparatus includes a positioning system and a processor. The positioning system is configured to provide a current position of the apparatus. The processor is configured to form a daylight saving time zone region. The processor is configured to calculate the local time. The daylight saving time zone region corresponds to the provided current position. The local time is calculated based on, at least partially, a positional relationship between the current position and the daylight saving time zone region.

According to another example of the invention, a computer readable medium that stores computer program instructions that when executed result in operations to set a daylight saving time zone and local time in a device is disclosed. A current position of the device is received. A daylight saving time zone polygon on a map corresponding to the current position is determined. A location of the current position relative to the daylight saving time zone polygon is determined. The local time of the device is calculated based on, at least partially, the determined location relative to the daylight saving time zone polygon.

The technical effects of any one or more of the exemplary embodiments of the invention provide for relatively error free time indications as opposed to conventional configurations, such as methods utilizing Network Identity and Time Zone (NITZ) which are prone to errors.

Additionally, some embodiments of the invention may be dependent on only current position,

5 whereas conventional configurations depend on a network operator or an online network server or user input or current position, etc. Further, some examples of the invention may provide for less memory consumption than conventional methods. Yet further, some embodiments of the invention are configured such that no additional costs are involved and no auxiliary data is needed. In addition exception DST cases can also be solved according to some examples of the
10 invention, whereas in the conventional methods, the exception DST cases result in errors.

It should be understood that components of the invention can be operationally coupled or connected and that any number or combination of intervening elements can exist (including no intervening elements). The connections can be direct or indirect and additionally there can merely be a functional relationship between components.

15 It should be understood that the foregoing description is only illustrative of the invention. Various alternatives and modifications can be devised by those skilled in the art without departing from the invention. Accordingly, the invention is intended to embrace all such alternatives, modifications and variances which fall within the scope of the appended claims.

CLAIMS

What is claimed is:

1. A method to determine a daylight saving time zone and local time in a device, comprising:

5 receiving a current position of the device;

determining a daylight saving time zone polygon on a map corresponding to the current position;

determining a location of the current position relative to the daylight saving time zone polygon;

10 calculating the local time of the device based on, at least partially, the determined location relative to the daylight saving time zone polygon; and

displaying the local time on a display of the device.

2. A method as in claim 1 wherein the determining of the location of the current position
15 relative to the daylight saving time zone polygon further comprises determining whether the location of the current position is inside or outside of the daylight saving time zone polygon.

3. A method as in claim 1 or claim 2 wherein the determining of the daylight saving time zone polygon further comprises determining shape points retrieved from a database.

20

4. A method as in any of claims 1-3 wherein the local time is calculated from a sum of a time zone offset, a daylight saving time offset, Greenwich Mean Time (GMT), and a timer value.

5. A method as in any of claims 1-4 further comprising receiving a mobile country code
25 corresponding to the current position, wherein the calculating of the local time of the device further comprises calculating the local time of the device based on, at least partially, the determined location relative to the daylight saving time zone polygon and the received mobile country code.

30 6. A method as in claim 5 wherein the determining of the daylight saving time zone polygon, the determining of the location of the current position, and the calculating of the local time are all performed by a processor of the device with no further auxiliary data from a communication network.

7. A method of setting a daylight saving time zone and local time in a device, comprising:
receiving a current position of the device;
receiving a mobile country code corresponding to the current position;
setting the daylight saving time zone in response to the received current position and the
5 received mobile country code;
calculating the local time based on, at least partially, the set daylight saving time zone;
and
displaying the local time on a display of the device.

10 8. A method as in claim 7 wherein the setting the daylight saving time zone and the
calculating the local time are all performed by a processor of the device with no further auxiliary
data from a communication network or network operator/service.

9. A method as in claim 7 or claim 8 wherein the setting of the daylight saving time zone
15 further comprises mapping a time zone identity corresponding to the mobile country code.

10. A method as in any of claims 7-9 wherein the received current position is received
from a global positioning system (GPS) and/or a navigation system.

20 11. A method as in any of claims 7-10 wherein the setting of the daylight saving time
zone further comprises determining a daylight saving time zone polygon based on the received
mobile country code.

12. A method as in claim 11 wherein the setting of the daylight saving time zone further
25 comprises identifying a location of the current position relative to the daylight saving time zone
polygon.

13. An apparatus configurable to determine a daylight saving time zone and local time,
comprising:
30 a positioning system configured to provide a current position of the apparatus; and
a processor configured to form a daylight saving time zone region and configured to
calculate the local time, wherein the daylight saving time zone region corresponds to the provided
current position, and wherein the local time is calculated based on, at least partially, a positional
relationship between the current position and the daylight saving time zone region.

14. An apparatus as in claim 13 wherein the apparatus is configured to receive a mobile country code corresponding to the current position of the apparatus, and wherein the daylight saving time zone region corresponds to the provided current position and the received mobile country code.

5

15. An apparatus as in claim 14 wherein processor is configured to calculate the local time with no further auxiliary data from a communication network or network operator/service.

16. An apparatus as in any of claims 13-15 wherein the processor is configured to form
10 the daylight saving time zone region from shaped points stored in a database.

17. An apparatus as in any of claims 13-16 wherein the processor is configured to determine whether the location of the current position is inside or outside of the daylight saving time zone region.

15

18. A computer readable medium that stores computer program instructions that when executed result in operations to set a daylight saving time zone and local time in a device, the operations comprising:

receiving a current position of the device;
20 determining a daylight saving time zone polygon on a map corresponding to the current position;
determining a location of the current position relative to the daylight saving time zone polygon; and
calculating the local time of the device based on, at least partially, the determined location
25 relative to the daylight saving time zone polygon.

19. A computer readable medium as in claim 18 further comprising receiving a mobile country code corresponding to the current position, wherein the calculating of the local time of the device further comprises calculating the local time of the device based on, at least partially, the
30 determined location relative to the daylight saving time zone polygon and the received mobile country code.

20. A computer readable medium as in claim 18 or claim 19 wherein the calculating of the local time further comprises calculating a daylight savings time offset, wherein the daylight
35 saving time offset is calculated with no further auxiliary data from a communication network.

1/11

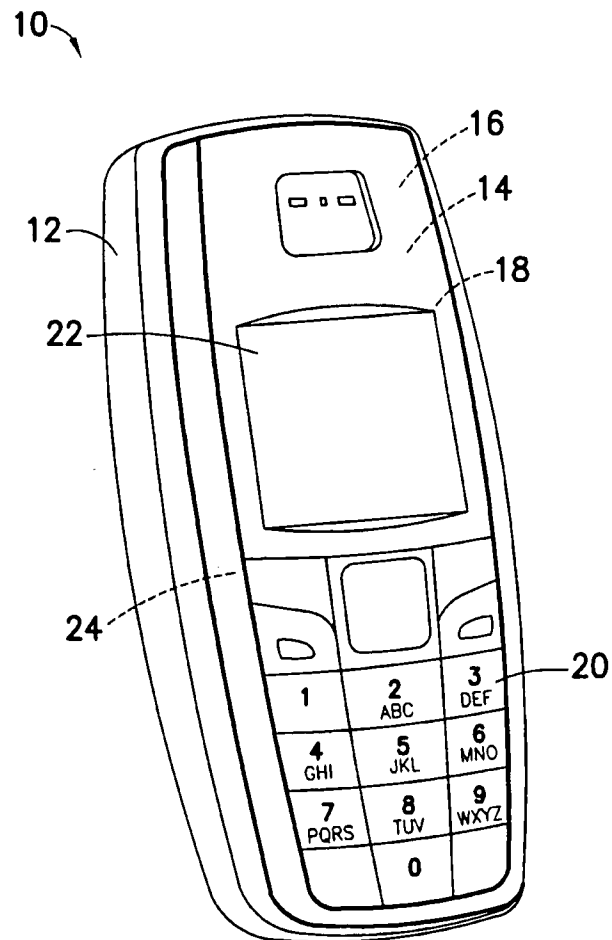


FIG. 1

2/11

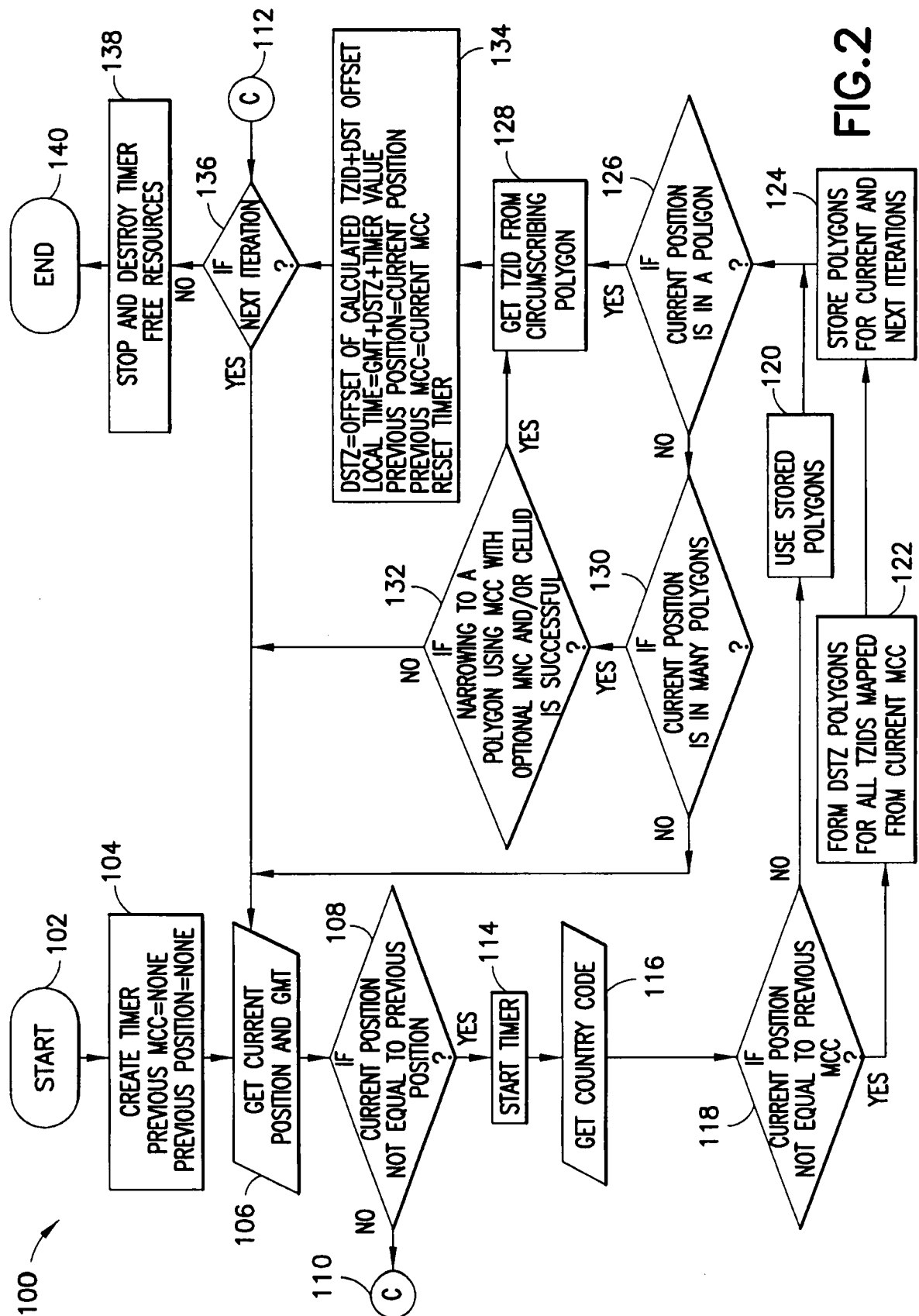
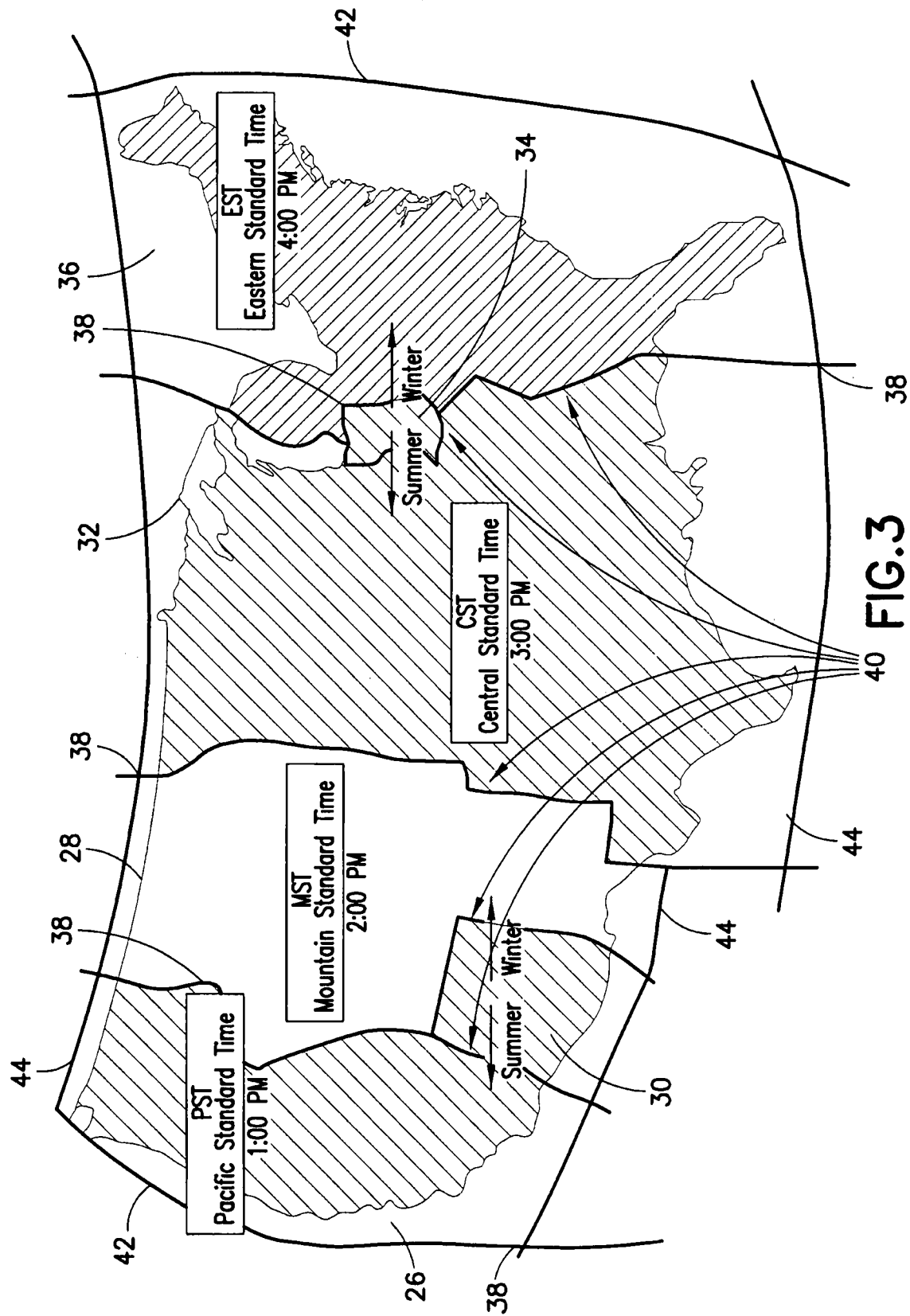


FIG. 2

3/11



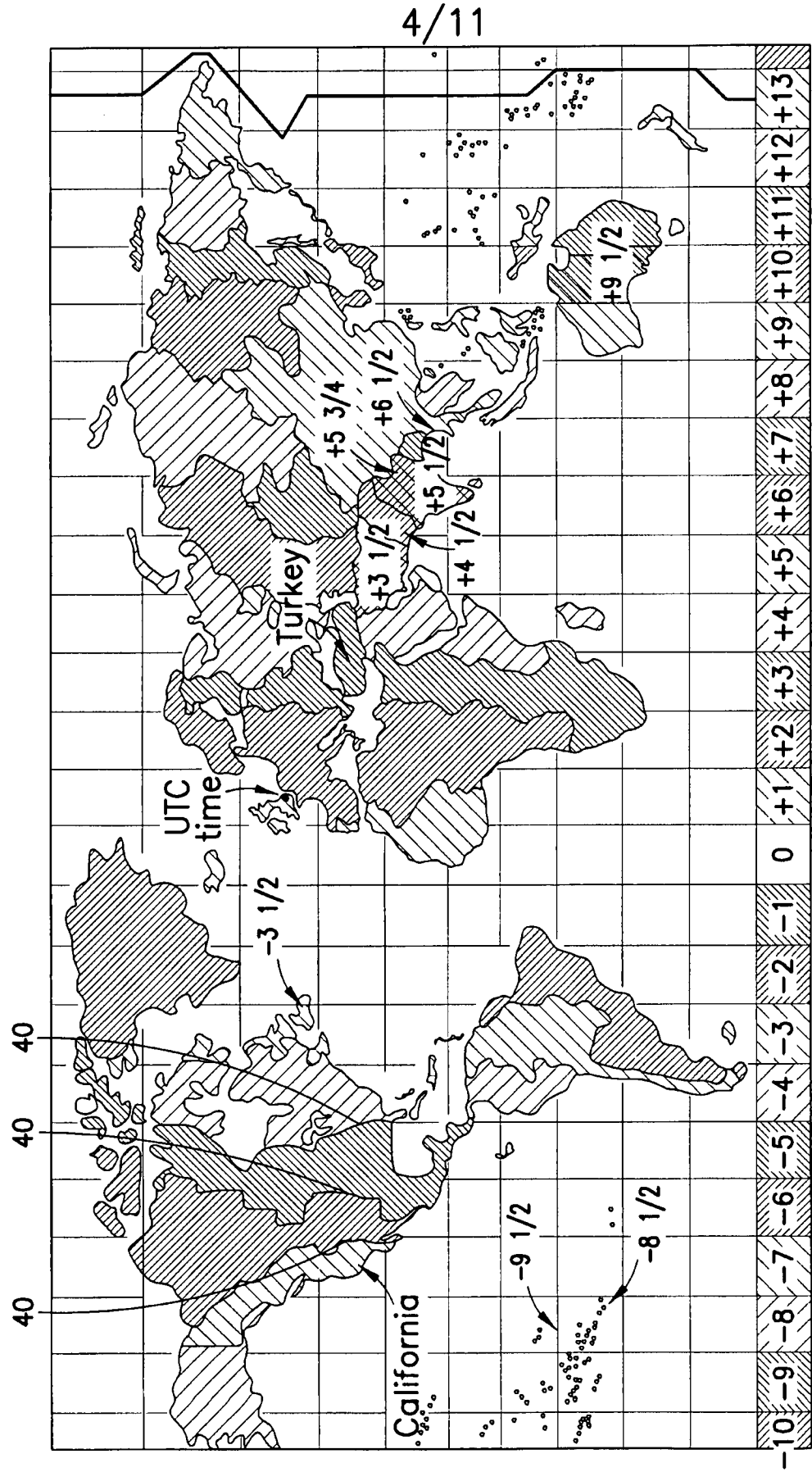


FIG.4

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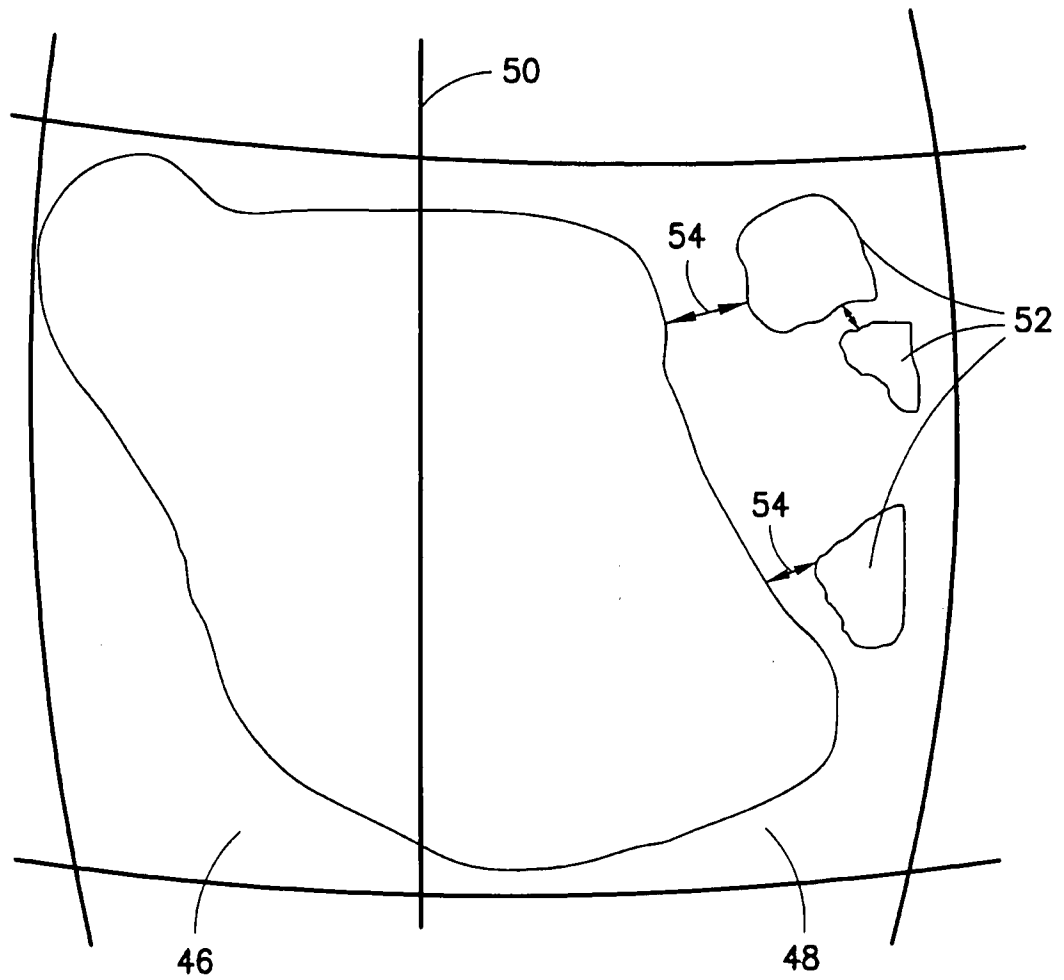


FIG.5

6/11

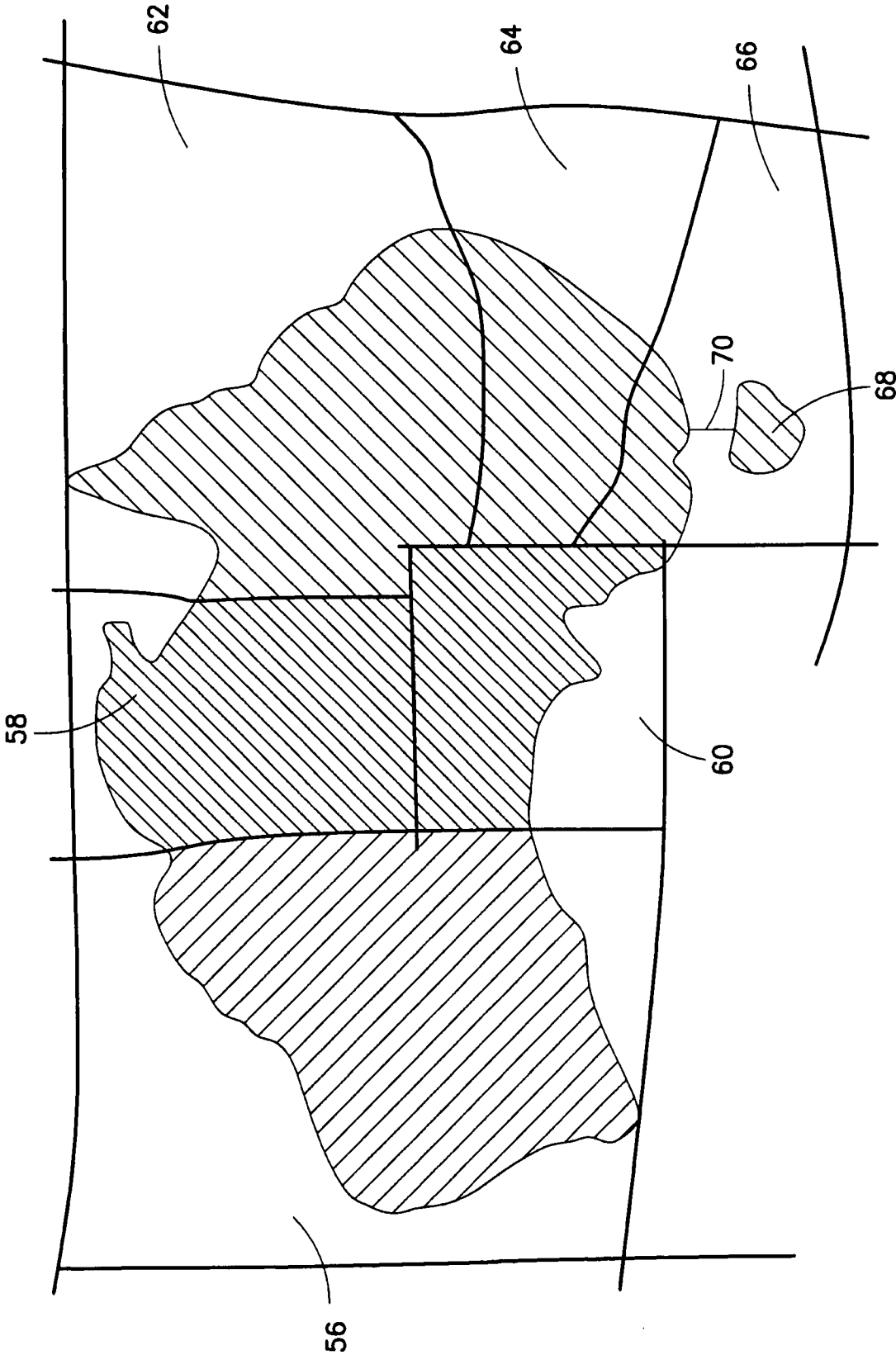


FIG. 6

7/11

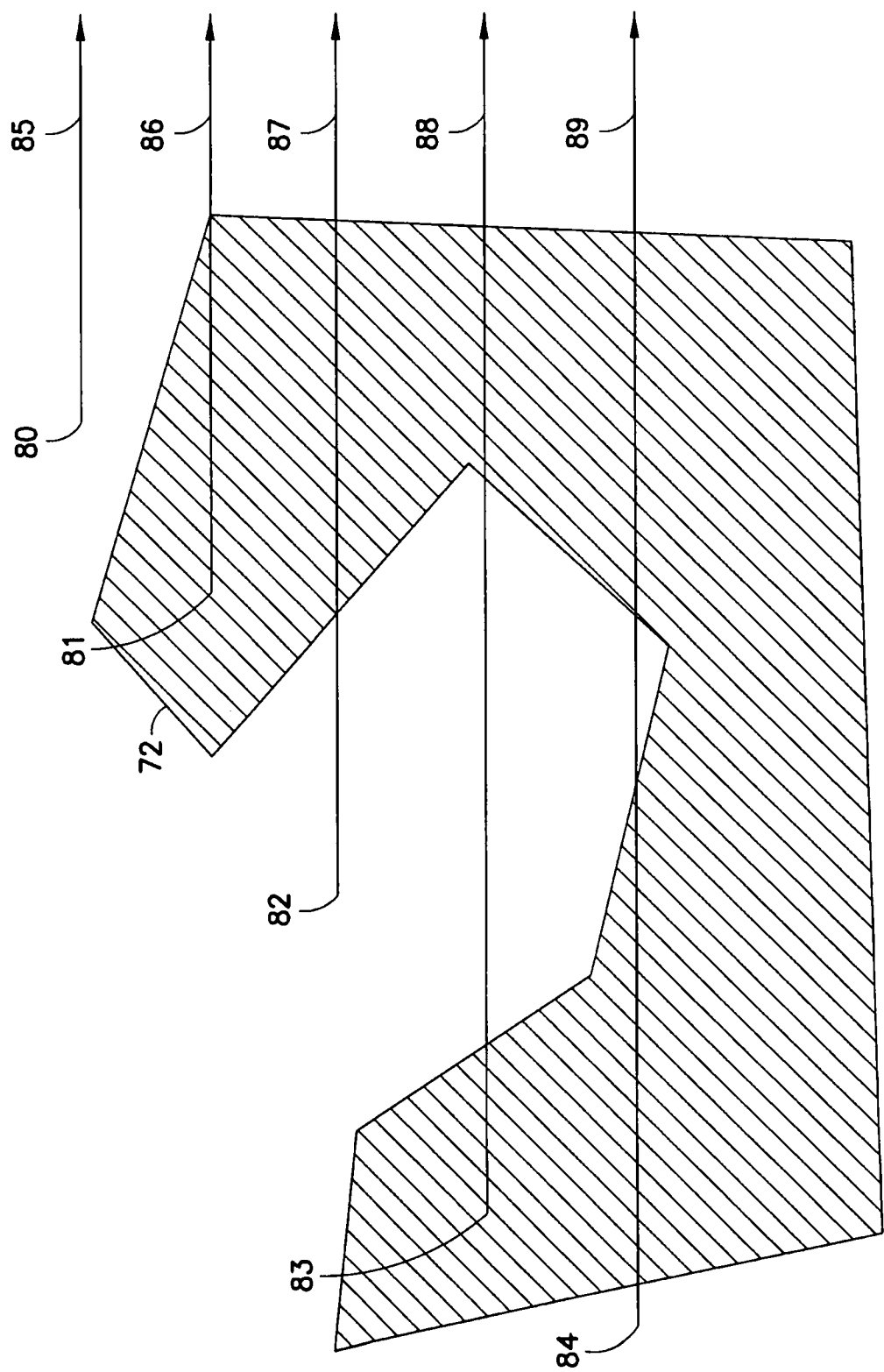
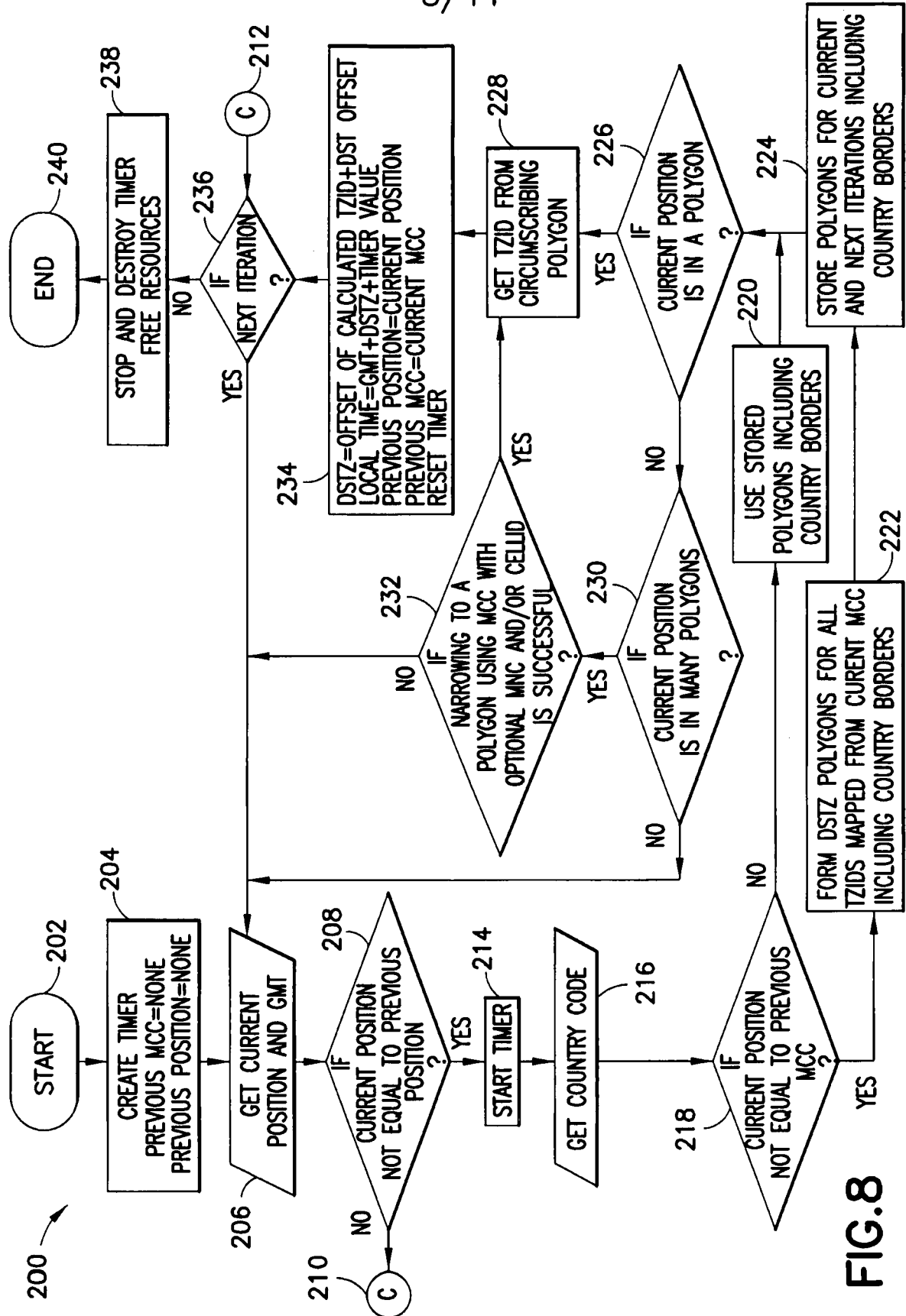


FIG. 7

8/11



9/11

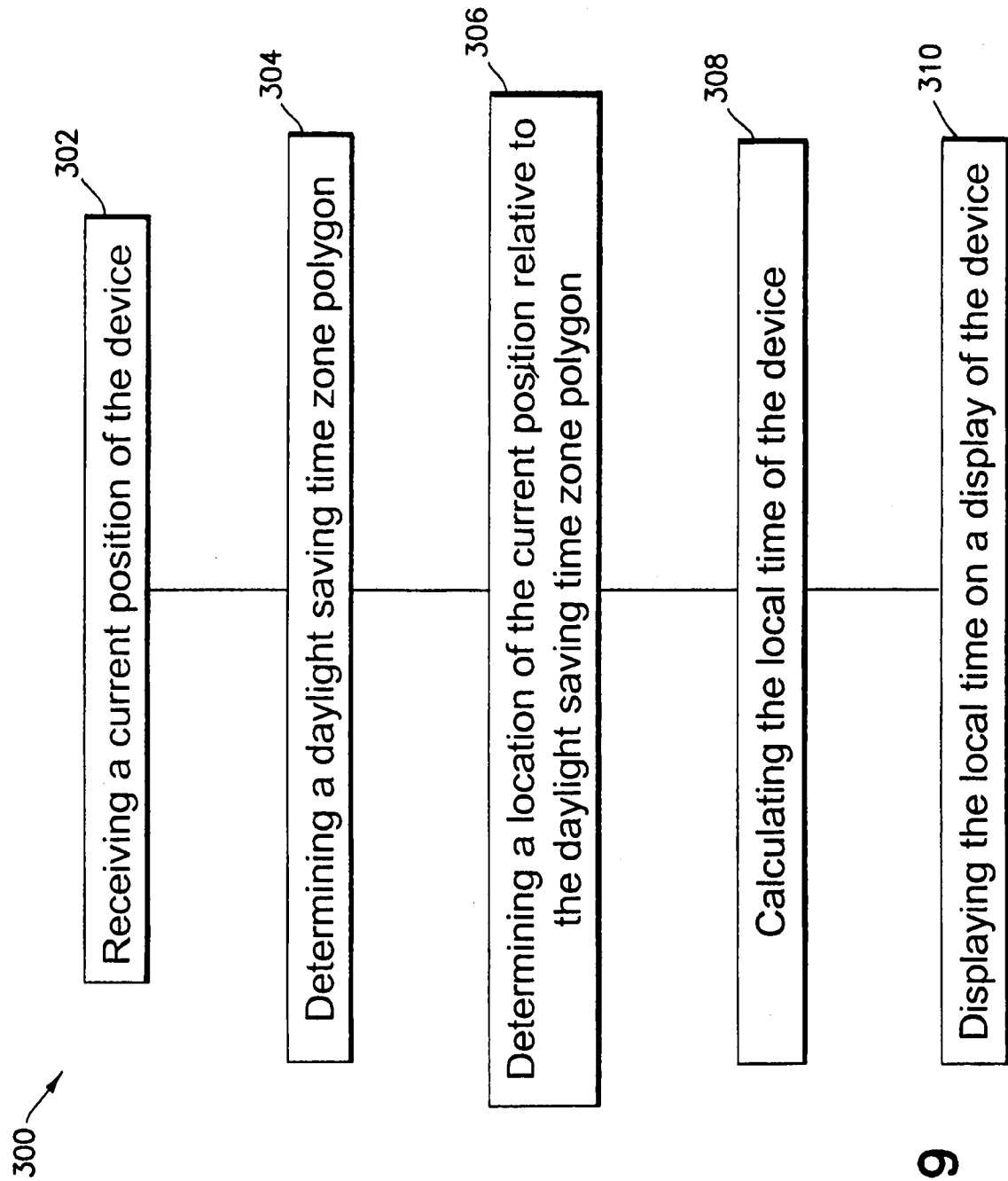


FIG. 9

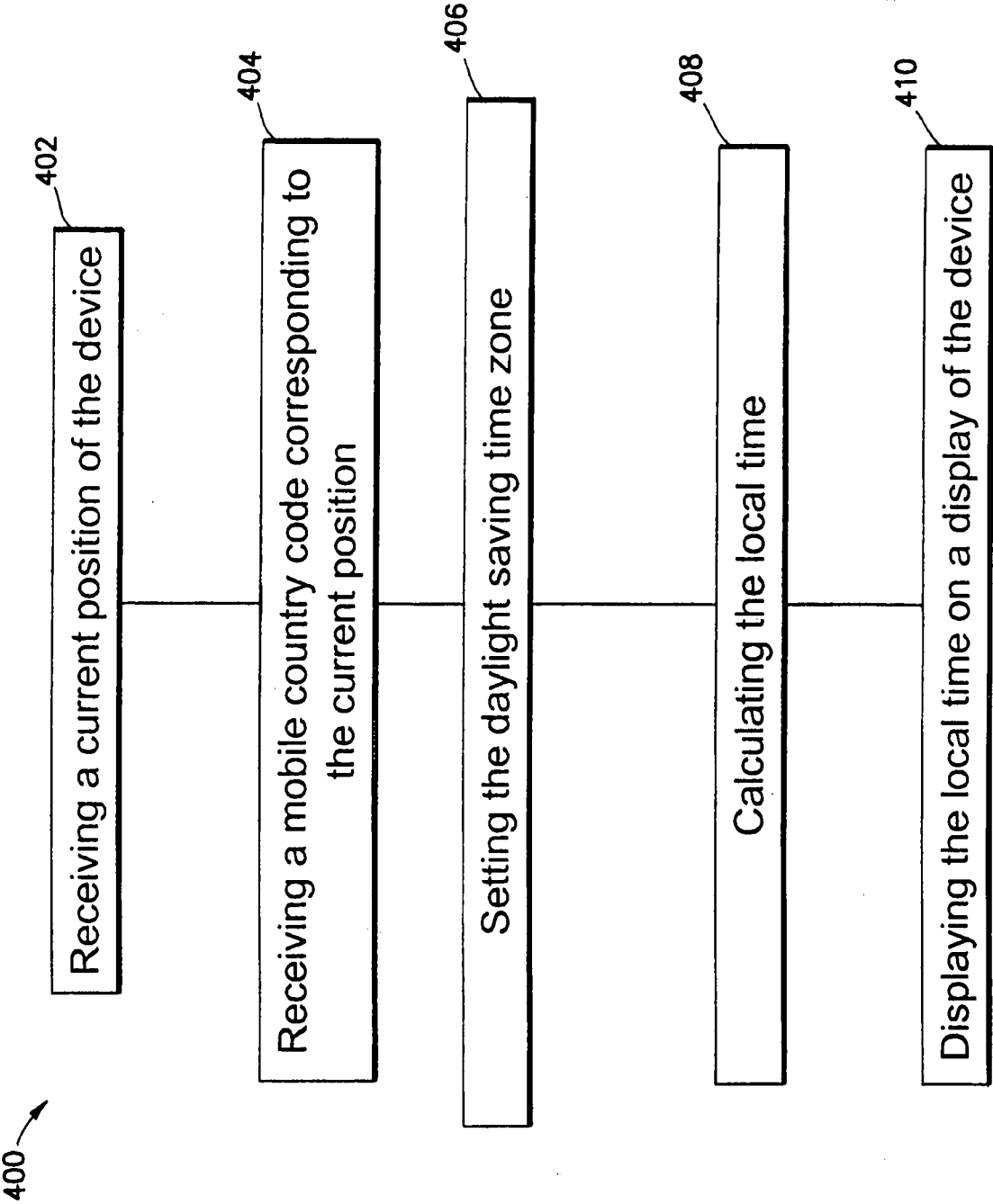


FIG.10

11/11

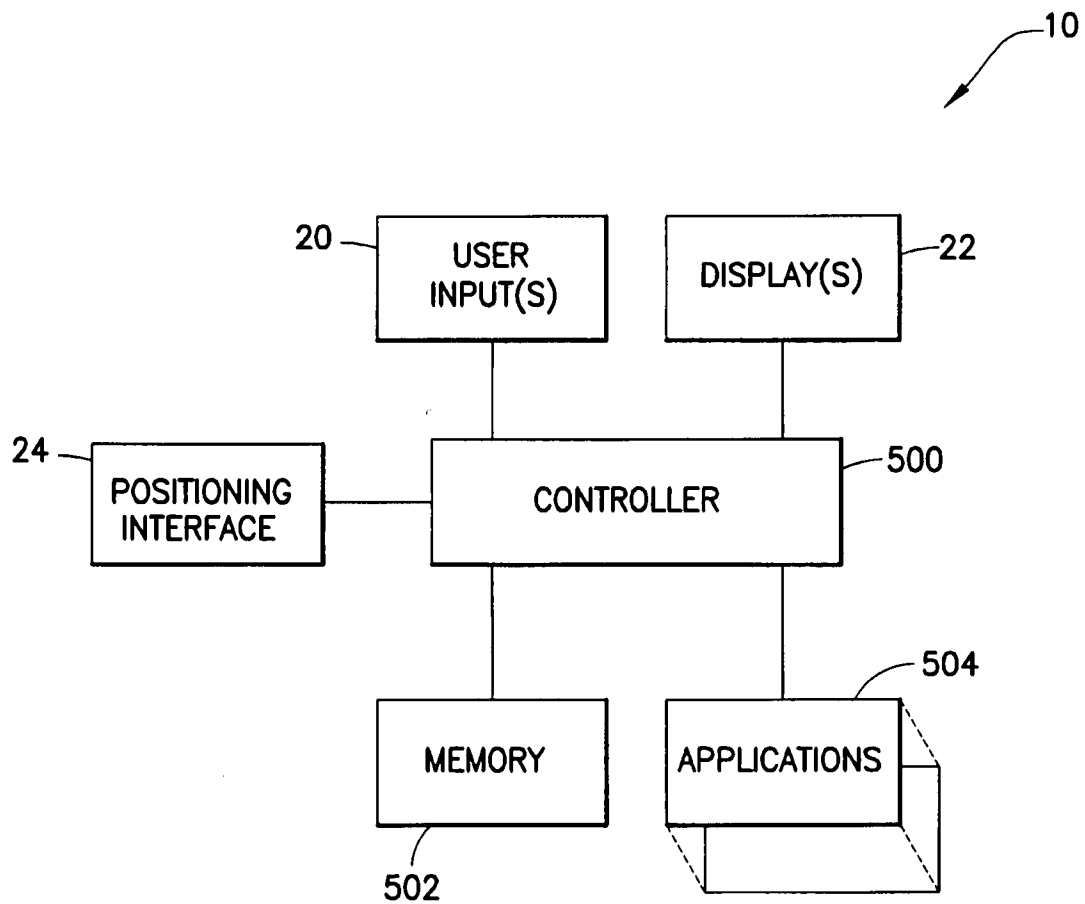


FIG. 11

INTERNATIONAL SEARCH REPORT

International application No.

PCT/IB2010/000660

A. CLASSIFICATION OF SUBJECT MATTER

IPC: see extra sheet

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: G04G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL, WPI DATA, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5724316 A (R.T. BRUNTS), 3 March 1998 (03.03.1998), column 4, line 33 - line 45; column 6, line 7 - line 37; column 10, line 62 - column 11, line 16, figure 9, abstract	1-4,13, 16-18,20
Y	--	5-12,14,15, 19
X	EP 0498199 A2 (MOTOROLA, INC.), 12 August 1992 (12.08.1992), column 1, line 43 - column 2, line 38, figures 1,2, abstract	1-4,13, 16-18,20
	--	

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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Date of the actual completion of the international search

9 June 2010

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INTERNATIONAL SEARCH REPORT

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 20060002236 A1 (V. PUNKKA), 5 January 2006 (05.01.2006), abstract, paragraphs (0011), (0015)-(0021) --	5-12,14,15, 19
A	JP 63250584 A, HITACHI LTD., 1988-10-18: (abstract) Retrieved from: PAJ database; Original document: Figures 1-4 --	1-20
A	WO 9527927 A1 (CELESTIAL TIME, INC.), 19 October 1995 (19.10.1995), page 3, line 4 - page 4, line 6, figure 3, abstract --	1-20
A	US 20050165543 A1 (T. YOKOTA), 28 July 2005 (28.07.2005), abstract, paragraphs (0021)-(0024) -- -----	1-20

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Information on patent family members

International application No.

PCT/IB2010/000660

US	5724316	A	03/03/1998	NONE			
EP	0498199	A2	12/08/1992	NONE			
US	20060002236	A1	05/01/2006	NONE			
WO	9527927	A1	19/10/1995	AU	2283695 A	30/10/1995	
US	20050165543	A1	28/07/2005	NONE			