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(54) **World timepiece.**

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Description

The present invention relates to a world time-piece, which enables the user to know the times of the cities of the world.

One known world timepiece has time counting means for counting the time of a particular region, such as Japan, and given time counting means which, when a given initial time is set by the user for a given region, counts the time for the given region based thereon. Such timepieces usually display the time of the particular region and the time of the given region in response to a switching operation. For instance, if 10:00 am has been counted and displayed in a particular region, such as Japan, the function for counting on the basis of a given initial time may be called and 9:00 pm may be set as the given initial time, e.g. for New York. The counting of the given time then continues for the time in New York and this time can be displayed as required.

In the above conventional timepieces, however, no attention has been given to the date in the given regions. Even in the case when the given time counting function includes a date counting function, the user has to input the date as a part of the given initial time, posing a manipulation burden on the user. When the day is April 1 in Tokyo in the above mentioned case, the day is still March 31 in New York, and hence the user must input the date for New York taking this fact into consideration. Thus, the user must manipulate the device while thinking about the change of date, often resulting in the input of an incorrect date.

It is an object of the present invention to provide a world timepiece, in which, when a given initial time is input as the time in any given region in the world, the corresponding date for this time is automatically added.

According to the present invention, there is provided a world timepiece comprising: means for calculating a time inclusive of date information for a particular region, input means for designating a given initial time, means for calculating a given time based on the given initial time, display means operable to display the time for the particular region and the given time, and characterised by means for calculating an international date line time, comparison means for comparing the international date line time, the time for the particular region and the given initial time, and means responsive to an output from the comparison means for determining a date for the given initial time.

Thus, when said given initial time is changed, said international date line time is compared with said particular region time and said international date line time is compared with said given initial time thereby to determine the date for said given initial time.

In particular as described below, when a given initial time (DT) is changed according to the above mentioned arrangement, the time on the international

date line (HI) is first calculated from the time in a particular region (WT). Next, the international date line time is compared with the particular region time, and the international date line time is compared with the given initial time. There are four possible outcomes of such comparison, consisting of the case when $HI \geq WT$ and $HI > DT$, the case when $HI \geq WT$ and $HI \leq DT$, the case when $HI < WT$ and $HI > DT$, and the case when $HI < WT$ and $HI \leq DT$. These results of comparison correspond to the same day, to the previous day, to the next day and to the same day respectively, relative to the date in the particular region. Thus, the three times are compared with one another, i.e. the time on the international date line, the time in the particular region and the given initial time are compared with one another, and the date for the given initial time is determined from the results of comparison, i.e. determined to be the previous day, the same day or the next day based on the date in the particular region.

The invention is described further, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a block diagram showing the control system of a world timepiece according to the present invention;

Figure 2 is a functional block diagram of the world timepiece according to the present invention;

Figure 3 is a flow chart representing the operation of the world timepiece according to the present invention; and

Figure 4 is a diagram showing time differentials for different particular regions in the world.

Figure 1 is a block diagram showing the control system of a world timepiece according to the present invention. In this system, a frequency dividing circuit 2 divides the frequency of an output oscillation of an oscillation circuit 1. Timing control means 3 produces timing signals for various processing calculations and execution instructions in response to frequency divided output signals of the frequency dividing circuit 2. A RAM 4 stores time data for the world timepiece. The procedure for operating the system is programmed in a ROM 5. Display means 6 displays time data and the like of the world timepiece.

Calculation means 7 effects calculations, such as counting the time and comparing times. Key input means 8 constitute input means for inputting a given initial time for a given region.

Operation of the system shown in Figure 1 will now be described. An address of the ROM 5 is determined by an output signal from the timing control means 3. Programming data from this address is sent to the calculation means 7 over a bus line 9. The calculation means 7 decodes the programming data that it receives, processes data stored in the RAM 4, and supplies data for display by the display means 6. Further, any input through the key input means 8 is

sensed, and processing is carried out according to the operating procedure programmed in the ROM 5.

Figure 2 is a functional block diagram of the world timepiece of the present invention. Time counting means 7 counts a given time and the time in a particular region. When it becomes necessary to correct the time, the time is corrected using a timepiece function key 10. Upon receipt of inputs from a given time key 8 and a particular region designation key 9, display control means 11 displays the given time or the time of the particular region on display means 6. Particular region time differential storage means 14 stores the time differentials of major cities (such as Tokyo, London, New York, etc.) of the world with the international date line as a reference. When particular region select means 12 is controlled by an input from the particular region designation key 9, a particular region desired by the user is selected out of a plurality of available particular regions. When the desired region is selected, time differential calculation means 20 calculates the time of the desired region based on the time data currently stored in the particular region time storage means 13 and the time differential data stored in the particular region time differential storage means 14. The time of the particular region is calculated to include the date and is stored as data in the particular region time storage means 13. Further, the display means 6 displays the time of the desired region.

As an example, assume that the particular region time storage means 13 is now storing the time in Tokyo, and the user wants to know the time in New York. When the particular region designation key 9 is manipulated to designate New York, the time is first calculated on the international date line using the time in Tokyo and the time differential between Tokyo and the international date line. Then, the time in New York is calculated using the thus calculated time and the time differential between New York and the international date line. The calculated time in New York is stored in the particular region time storage means 13 and is displayed instead of the time in Tokyo. These functions are realised by the control system represented in Figure 1 and the program stored in the ROM 5.

A further function, described below, enables time counting on the basis of a set given initial time.

When the user feels the need of setting or changing the given time, he depresses the given time key, calls up the given time, and then sets the given time to a desired initial time using the time function key 10. Here, however, the date must be determined for the time that is set. In terms of the twenty four hour system, there exist only 0 to 24 hours on the earth. When the time in the current particular region is regarded to be the reference, therefore, the date for the given initial time will be only one of three possibilities: namely, the previous day, the same day or the next day rel-

tive to the date in the particular region. Therefore, the previous day, the same day or the next day to which the date corresponds must be judged and may then be stored in the given time storage means 15.

First, the international date line time is calculated by international date line time calculation means 16 based on two items of data consisting of the particular region time stored in the particular region time storage means 13 and the particular region time differential stored in the particular region time differential storage means 14, and the data is stored in international date line time storage means 17 (step 1).

Next, time comparator means 18 compares the particular region time with the international date line time (step 2). A judgement is thus made as to whether the particular region pertains to a zone A or a zone B represented in Figure 4. The particular region pertains to zone A when the particular region time (WT) and the international date line time (HI) have a relationship $HI \geq WT$, and pertains to the zone B when $HI < WT$. For instance, when the particular region is Tokyo where the time is 4:00, the time on the international date line is 8:00. Due to the condition $HI > WT$, therefore, Tokyo 4:00 pertains to the zone A.

A next step compares the international date line time with the desired given initial time (DT) (step 3). The method of discrimination, however, differs in the case of the zone A and the case of the zone B. In the case of the zone A, the condition $HI > DT$ represents the same day and the condition $HI \geq DT$ represents the previous day (step 3-a). In the case of the zone B, the condition $HI > DT$ represents the next day and the condition $HI \leq DT$ represents the same day (step 3-b). In the case of the zone A, for example, if $HI = 8:00$ when $WT = 4:00$, and $DT = 14:00$, the condition $HI < DT$ is fulfilled and, therefore, DT is the previous day relative to WT. Furthermore, in the case of the zone A, if $HI = 8:00$ when $WT = 4:00$, and $DT = 7:00$, from the condition $HI > DT$, therefore, it is established that DT is the same day as WT. That is, if DT and WT pertain to the same zone, DT is the same day as WT, and, if they pertain to different zones, DT is the previous day or the next day relative to WT. The next day, the same day or the previous day is discriminated depending upon the results of final comparison of HI and DT.

When DT is judged to be the previous day by date calculation means 19, the date -1 for the time in the particular region is regarded to be the date for the given initial time (step 4-a). Similarly, when DT is judged to be the same day, the date for the time in the particular region is regarded to be the date for the given initial time (step 4-b). When DT is judged to be the next day, the date +1 for the time in the particular region is regarded to be the date for the given time (step 4-c). The date for the given initial time is stored in the given time storage means 15.

As described above, the world timepiece of the

present invention compares the time in a particular region with the time on the international date line, and compares the time on the international date line with a given initial time, in order to discriminate the date for the given initial time.

The thus determined date can be changed by changing the date in the particular region or by providing changing means that can be manipulated independently from the outside of the timepiece.

The world timepiece of the present invention automatically imparts the date for a set given time that may hold anywhere on the earth. Further, the user only has to bear a reduced burden of operation, and the date that is automatically imparted eliminates erroneous setting of the date.

Claims

1. A world timepiece comprising means (7, 13) for calculating a time inclusive of date information for a particular region, input means (8, 10) for designating a given initial time, means (7, 15) for calculating a given time based on the given initial time, display means (6) operable to display the time for the particular region and the given time, and characterised by means (14, 16, 17) for calculating an international date line time, comparison means (18) for comparing the international date line time, the time for the particular region and the given initial time, and means (19) responsive to an output from the comparison means for determining a date for the given initial time.
2. A timepiece according to claim 1 characterised in that the means for calculating the international date line time is arranged to make the calculation on the basis of the time for the particular region and a time differential for the particular region with the international date line as a reference.
3. A timepiece according to claim 2, characterised by a first store (13) for the time for the particular region, and a second store (14) for storing the time differentials for a plurality of particular regions with the international date line as a reference.
4. A timepiece according to any of claims 1 to 3 characterised in that the comparison means comprises a first comparator for comparing the international date line time with the time for the particular region, and a second comparator for comparing the international date line time with the given initial time.
5. A timepiece according to any of claims 1 to 4 characterised in that the comparison means are ar-

ranged to compare the international date line time with the given initial time when the given initial time is altered.

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6. A timepiece according to any of claims 1 to 5 characterised by input means for changing the date information for the particular region.
- 10 7. A timepiece according to claim 1 characterised by a first store (13) for the time for the particular region, a second store (15) for the given initial time and the given time, and counting means (7) for counting the time for the particular region and the given time.
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- 20 8. A world timepiece comprising means (7, 13) for calculating a time inclusive of date information for a particular region, display means (6) for displaying the time of the particular region, and characterised by input means (9) for designating a selected particular region, means (14) for storing time differentials for a plurality of particular regions with respect to the international date line, and means (20) for calculating a time inclusive of date information for the selected particular region on the basis of a current output from the means for calculating the time for the particular region and outputs from the means for storing the time differentials.
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- 35 9. A world timepiece comprising input means (9) for designating a particular region, input means (8, 10) for designating a given initial time, means (13) for storing the time inclusive of date information of the particular region, means (14) for storing time differential of the particular region, means (15) for storing the given initial time, means (7) for counting the particular region time and the given initial time, display means (6) for displaying the time and the like, characterised by: means (16) for calculating the time on the international date line, means (17) for storing the time on the international date line, first comparator means (18) for comparing the time of the particular region with the time on the international date line, and second comparator means (18) for comparing the given initial time and the time on the international date line.
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Patentansprüche

1. Weltuhr mit Mitteln (7, 13) zur Berechnung einer Zeit einschließlich Datumsinformation für eine spezielle Zone, Eingangsmitteln (8, 10) zur Bestimmung einer gegebenen Anfangszeit, Mitteln (7, 15) zur Berechnung einer gegebenen Zeit auf der Basis der gegebenen Anfangszeit sowie zur

- Anzeige der Zeit für die spezielle Zone und der gegebenen Zeit betreibbaren Anzeigemitteln (6), **gekennzeichnet durch** Mittel (14, 16, 17) zur Berechnung einer internationalen Datumsgrenzenzeit, Vergleichsmittel (18) zum Vergleich der internationalen Datumsgrenzenzeit, der Zeit für die spezielle Zone und der gegebenen Anfangszeit und vom Ausgangssignal der Vergleichsmittel angesteuerte Mittel (19) zur Festlegung eines Datums für die gegebene Anfangszeit.
2. Uhr nach Anspruch 1, **dadurch gekennzeichnet**, daß die Mittel zur Berechnung der internationalen Datumsgrenzenzeit zur Durchführung der Berechnung auf der Basis der Zeit für die spezielle Zone und einer Zeitdifferenz für die spezielle Zone relativ zur internationalen Datumsgrenze als Referenz ausgebildet sind.
3. Uhr nach Anspruch 2, **gekennzeichnet durch** einen ersten Speicher (13) für die Zeit für die spezielle Zone und einen zweiten Speicher (14) zur Speicherung der Zeitdifferenzen für eine Vielzahl von speziellen Zonen relativ zur internationalen Datumsgrenze als Referenz.
4. Uhr nach den Ansprüchen 1 bis 3, **dadurch gekennzeichnet**, daß die Vergleichsmittel einen ersten Komparator zum Vergleich der internationalen Datumsgrenzenzeit mit der Zeit für die spezielle Zone und einen zweiten Komparator zum Vergleich der internationalen Datumsgrenzenzeit mit der gegebenen Anfangszeit umfassen.
5. Uhr nach den Ansprüchen 1 bis 4, **dadurch gekennzeichnet**, daß die Vergleichsmittel zum Vergleich der internationalen Datumsgrenzenzeit mit der gegebenen Anfangszeit bei Änderung der gegebenen Anfangszeit ausgebildet sind.
6. Uhr nach den Ansprüchen 1 bis 5, **gekennzeichnet durch** Eingangsmittel zur Änderung der Datumsinformation für die spezielle Zone.
7. Uhr nach Anspruch 1, **gekennzeichnet durch** einen ersten Speicher (13) für die Zeit für die spezielle Zone, einen zweiten Speicher (15) für die gegebene Anfangszeit und die gegebene Zeit und Zählermittel (7) zum Zählen der Zeit für die spezielle Zone und der gegebenen Zeit.
8. Weltuhr mit Mitteln (7, 13) zur Berechnung einer Zeit einschließlich Datumsinformation für eine spezielle Zone und Anzeigemitteln (6) zur Anzeige der Zeit für die spezielle Zone, **gekennzeichnet durch** Eingangsmittel (9) zur Bestimmung einer ausgewählten speziellen Zone, Mittel (14) zur Speicherung von Zeitdifferenzen für eine Vielzahl von speziellen Zonen in Bezug auf die internationale Datumsgrenze und Mittel (20) zur Berechnung einer Zeit einschließlich Datumsinformation für die ausgewählte spezielle Zone auf der Basis eines laufenden Ausgangssignals von den Mitteln zur Berechnung der Zeit für die spezielle Zone und Ausgangssignalen von den Mitteln zur Speicherung der Zeitdifferenzen.
9. Weltuhr mit Eingangsmitteln (9) zur Bestimmung einer speziellen Zone, Eingangsmitteln (8, 10) zur Bestimmung einer gegebenen Anfangszeit, Mitteln (13) zur Speicherung der Zeit einschließlich von Datumsinformation der speziellen Zone, Mitteln (14) zur Speicherung der Zeitdifferenz der speziellen Zone, Mitteln (15) zur Speicherung der gegebenen Anfangszeit, Mitteln (7) zum Zählen der Zeit der speziellen Zone und der gegebenen Anfangszeit und Anzeigemitteln (6) zur Anzeige der Zeit und ähnliches, **gekennzeichnet durch** Mittel (16) zur Berechnung der Zeit auf der internationalen Datumsgrenze, Mittel (17) zur Speicherung der Zeit auf der internationalen Datumsgrenze, erste Vergleichsmittel (18) zum Vergleich der Zeit der speziellen Zone mit der Zeit auf der internationalen Datumsgrenze und zweite Vergleichsmittel (18) zum Vergleich der gegebenen Anfangszeit und der Zeit auf der internationalen Datumsgrenze.

Revendications

1. Article d'horlogerie comprenant un moyen (7, 13) pour calculer une information concernant l'heure ainsi que la date pour une région particulière du globe, un moyen d'entrée (8, 10) pour désigner une heure initiale donnée, un moyen (7, 15) pour calculer une heure donnée sur la base de l'heure initiale donnée, un moyen de visualisation (6) conçu pour visualiser l'heure pour la région particulière et l'heure donnée, caractérisé par un moyen (14, 16, 17) pour calculer l'heure de la ligne de date internationale, un moyen de comparaison (18) pour comparer l'heure de la ligne de date internationale, l'heure pour la région particulière et l'heure initiale donnée, et un moyen (19) réagissant à une sortie du moyen de comparaison pour déterminer une date pour l'heure initiale donnée.
2. Article d'horlogerie selon la revendication 1, caractérisé en ce que le moyen pour calculer l'heure de la ligne de date internationale est conçu pour faire le calcul sur la base de l'heure pour la région particulière et du différentiel d'heure pour la région particulière, avec comme référence la ligne de date internationale.

3. Article d'horlogerie selon la revendication 2, caractérisé par une première mémoire (13) pour l'heure pour la région particulière et une seconde mémoire (14) pour enregistrer les différentiels d'heure pour une pluralité de régions particulières, avec la ligne de date internationale comme référence.
4. Article d'horlogerie selon l'une quelconque des revendications 1 à 3, caractérisé en ce que le moyen de comparaison comprend un premier comparateur pour comparer l'heure de la ligne de date internationale avec l'heure pour la région particulière et un second comparateur pour comparer l'heure de la ligne de date internationale avec l'heure initiale donnée.
5. Article d'horlogerie selon l'une quelconque des revendications 1 à 4, caractérisé en ce que le moyen de comparaison est conçu pour comparer l'heure de la ligne de date internationale avec l'heure initiale donnée lorsque l'heure initiale donnée est modifiée.
6. Article d'horlogerie selon l'une quelconque des revendications 1 à 5, caractérisé par un moyen d'entrée pour changer l'information de date pour la région particulière.
7. Article d'horlogerie selon la revendication 1, caractérisé par une première mémoire (13) pour l'heure pour la région particulière, une seconde mémoire (15) pour l'heure initiale donnée et l'heure donnée, un moyen de calcul (7) pour calculer l'heure pour la région particulière et l'heure donnée.
8. Article d'horlogerie comprenant un moyen (7, 13) pour calculer l'information concernant l'heure ainsi que la date pour une région particulière du globe, un moyen de visualisation (6) pour visualiser l'heure de la région particulière, caractérisé par un moyen d'entrée (9) pour désigner une région particulière choisie, un moyen (14) pour enregistrer les différentiels d'heure pour une pluralité de régions particulières par rapport à la ligne de date internationale et un moyen (20) pour calculer l'information concernant l'heure ainsi que la date pour la région particulière choisie sur la base d'une sortie du moyen de calcul de l'heure pour la région particulière et des sorties du moyen pour enregistrer les différentiels d'heure.
9. Article d'horlogerie comprenant un moyen d'entrée (9) pour désigner une région particulière du globe, un moyen d'entrée (8, 10) pour désigner une heure initiale donnée, un moyen (13) pour enregistrer l'information concernant l'heure ainsi que la date pour la région particulière, un moyen (14) pour enregistrer le différentiel d'heure de la région particulière, un moyen (15) pour enregistrer l'heure initiale donnée, un moyen (7) pour calculer l'heure de la région particulière et l'heure initiale donnée, un moyen de visualisation (6) pour visualiser l'heure et similaire, caractérisé par un moyen (16) pour calculer l'heure pour la ligne de date internationale, un moyen (17) pour enregistrer l'heure sur la ligne de date internationale, un premier moyen comparateur (18) pour comparer l'heure de la région particulière avec l'heure sur la ligne de date internationale, et un second moyen comparateur (18) pour comparer l'heure initiale donnée et l'heure sur la ligne de date internationale.
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FIG. 1

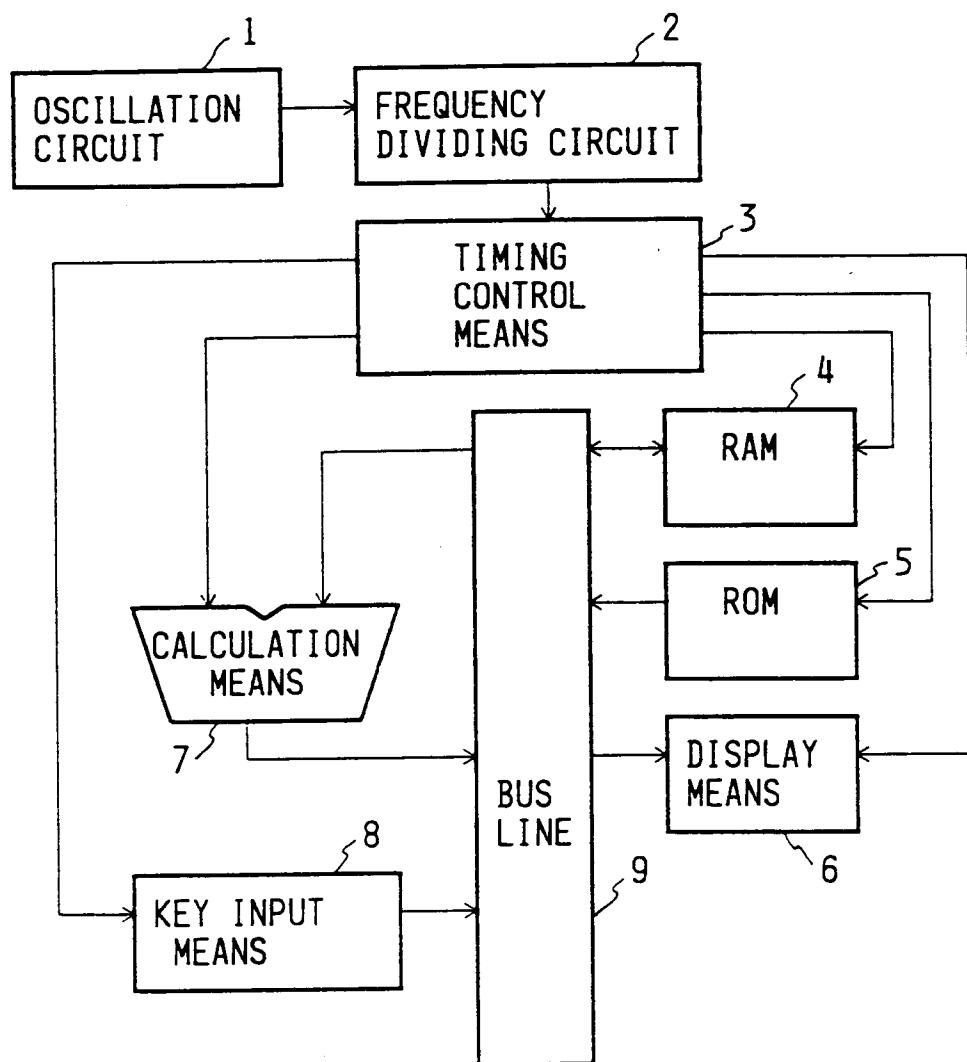


FIG. 2

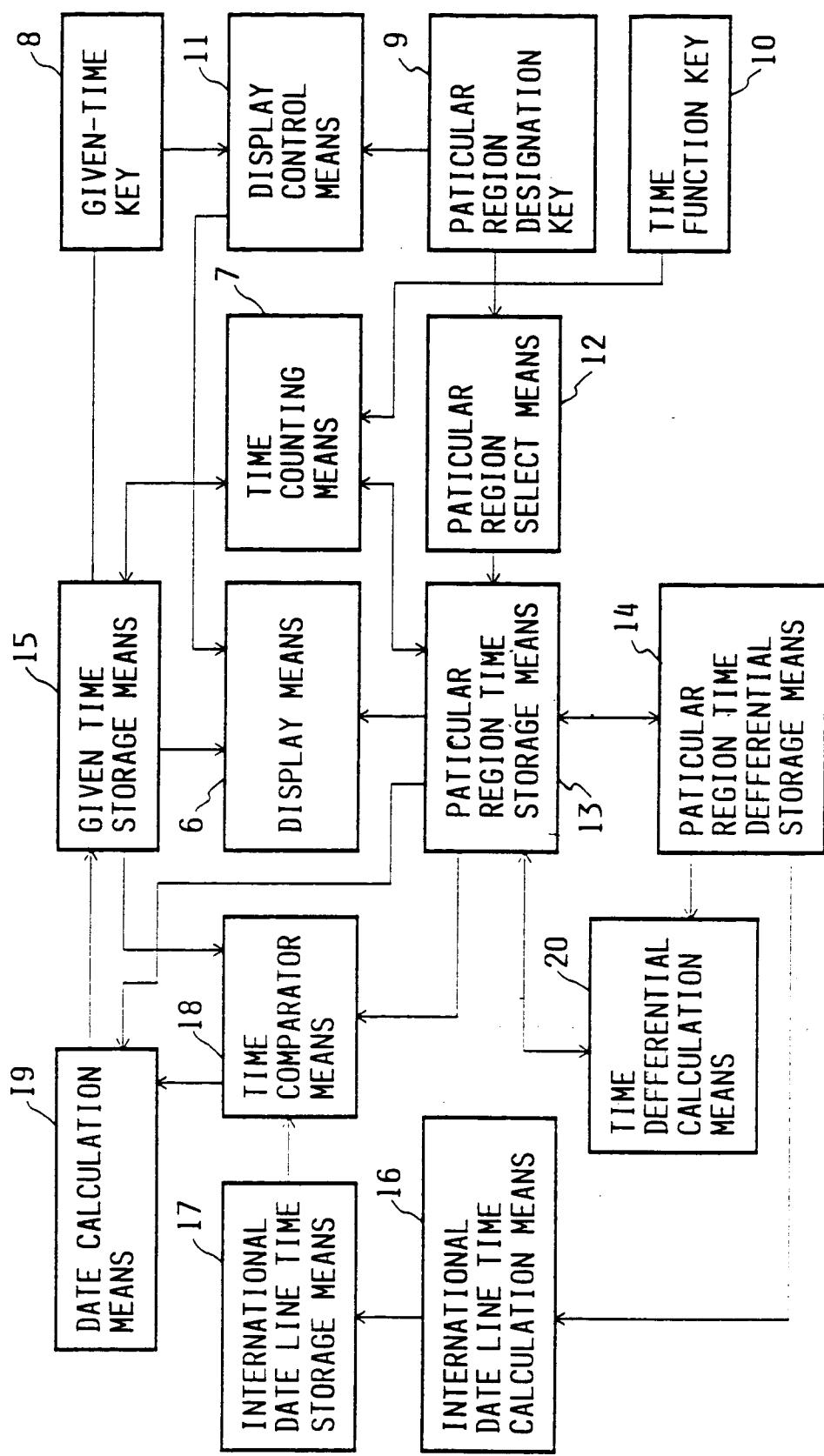


FIG. 3

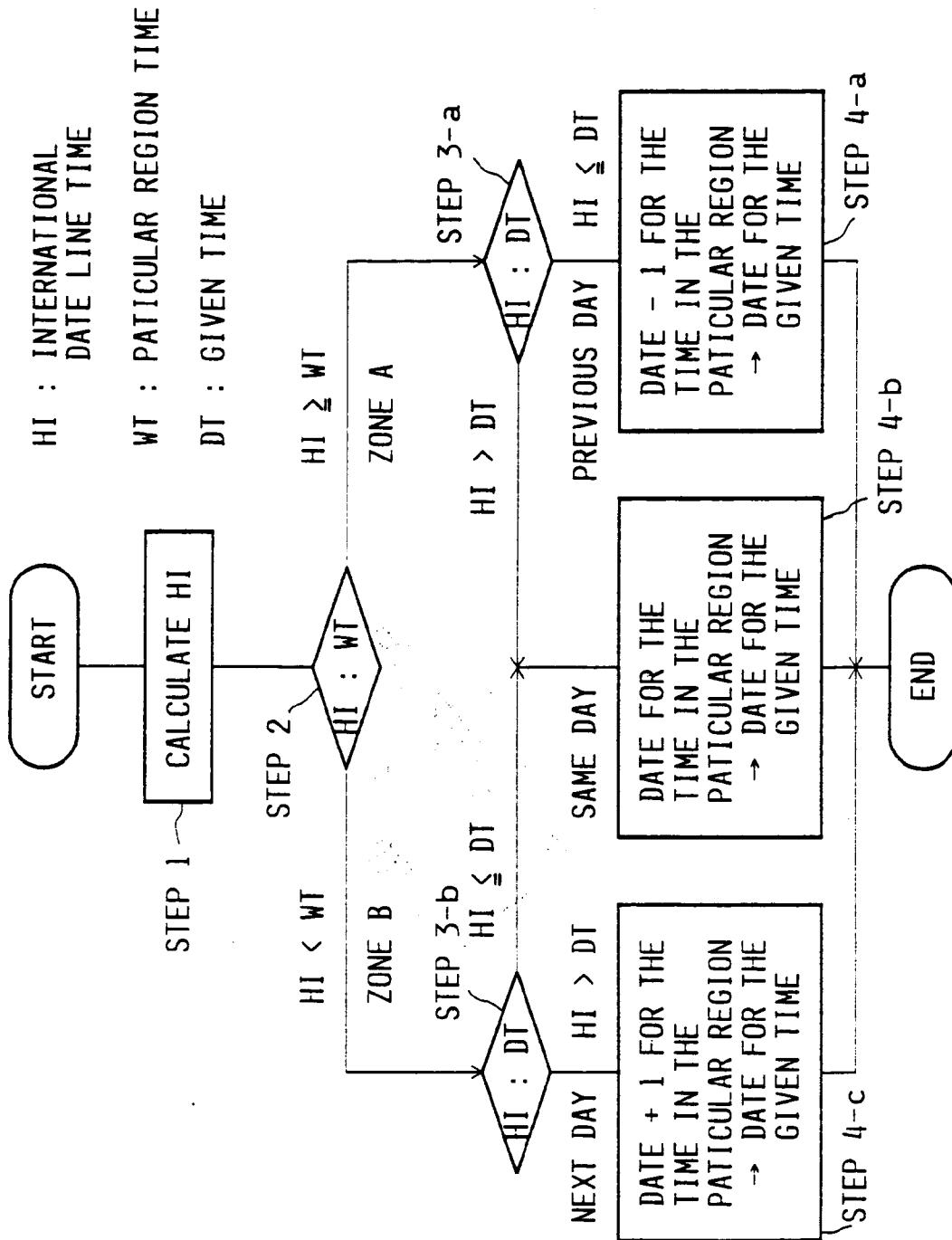


FIG. 4