

(19)



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11) Publication number:

0 676 679 A1

(12)

EUROPEAN PATENT APPLICATION
published in accordance with Art.
158(3) EPC

(21) Application number: **94925631.7**(51) Int. Cl.⁶: **G04B 19/23, G04B 19/28,
G04C 3/00, G04G 1/00**(22) Date of filing: **06.09.94**(86) International application number:
PCT/JP94/01466(87) International publication number:
WO 95/08140 (23.03.95 95/13)(30) Priority: **14.09.93 JP 252435/93**(43) Date of publication of application:
11.10.95 Bulletin 95/41(84) Designated Contracting States:
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London WC1R 5DJ (GB)(54) **DISPLAY STRUCTURE OF WORLD TIMEPIECE.**

(57) A device is provided for indicating the time of all areas in the world by a simple operation. "TOKYO" on an area ring (34) for which the time is displayed by a main timepiece (10) is set to a sub-timepiece (20). Sub-timepieces (22 to 30) display the times which are sequentially ahead of the time of the area of the sub-timepiece (20) by four hours, respectively. Accordingly, the times of a plurality of areas can be read on the spot by looking up the sub-timepieces (22 to 30) and the area ring (34). The sub-timepieces (24), (26), (28) and (30) represent the time at Denver, Rio de Janeiro, Paris or Rome and Karachi, respectively. Since the display of these sub-timepieces is made in the interlocking arrangement with the display of the main timepiece (10), any particular operation is not necessary whenever the time is read.

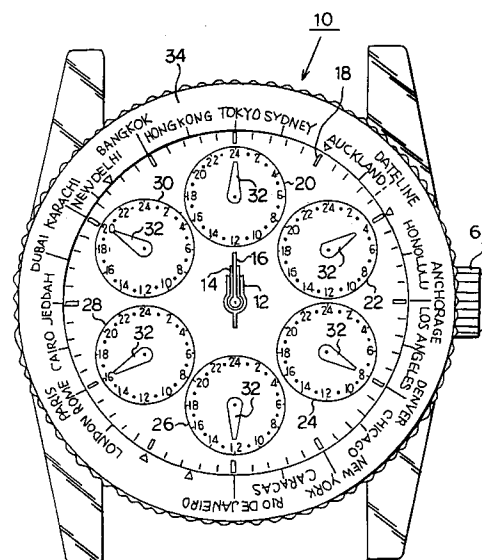


FIG. 1

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[Field of the Art]

The present invention relates to an improvement in the display structure of a timepiece capable of displaying the times of a plurality of parts of the world.

[Background Art]

A timepiece having the above capability, or world timepiece, may be implemented as a watch, as taught in Japanese Utility Model Laid -Open Publication No. 60-64286 by way of example. The watch has at the center a timepiece having an hour hand and a minute hand which make one turn for 12 hours and 60 minutes, respectively. This center timepiece is, therefore, identical with a conventional 12-hour display timepiece. The center timepiece is surrounded by a place name ring and a 24-hour ring which are rotatable. Particular place names are marked on the place name ring in consideration of time differences. Numerals 0 to 23 representative of hours are provided on the 24-hour ring at equally spaced positions.

For example, assume that the center timepiece indicates 9.05 which is the current time in Tokyo. When Tokyo is the reference place, a crown mounted on the timepiece is operated to rotate the place name ring until a mark representative of Tokyo aligns with the 12.00 position of the center timepiece. Subsequently, the 24-hour ring is turned until 9.00 coincides with the mark of Tokyo of the place name ring. In this condition, the user of the timepiece can read a desired place name and time thereof, looking at the place name ring and 24-hour ring.

However, the conventional timepiece described above has some problems yet to be solved, as follows.

(1) Because the place name ring and 24-hour ring are present and because the place name ring must be rotated via the crown, it is not always easy to read the time. Moreover, this kind of configuration makes the operation troublesome.

(2) To read the times of various places based on the time of the center timepiece, the user must turn the 24-hour ring and place name ring each time. For example, assume that the user has read the time of a desired place at 9.00 am by positioning " 9 " of the 24-hour ring at " Tokyo " of the place name ring. Then, to read the time of the same place 2 hours later, i.e., at 11.00 am, the user must again turn the 24 -hour ring to bring " 11 " into alignment with " Tokyo " of the place name ring.

In this manner, it is necessary for the user to correct the positional relation between the 24-hour

ring and the place name ring each time. This is undesirable from the convenience standpoint when, for example, the user desires to see the time of a given area continuously.

It is, therefore, an object of the present invention to provide a display structure of a world timepiece which allows the times of various parts of the world to be easily read thereon.

It is another object of the present invention to provide a display structure of a world timepiece which allows the times of some different places to be read on a real time basis without resorting to any special operation.

It is still another object of the present invention to provide a display structure of a world timepiece which is easy to operate.

It is a further object of the present invention to provide a display structure of a world timepiece in which the display of time changes every moment in an interesting way.

[Disclosure of the Invention]

In accordance with the present invention, a main timepiece for displaying the time of given part of the world is provided with a place name ring and a plurality of auxiliary timepieces. The place name ring is provided with place names thereon in consideration of time differences. The auxiliary timepieces each displays a time having a time difference corresponding to a position on the main timepiece. By turning the place name ring to a predetermined position relative to the auxiliary timepieces, it is possible to read the times of a plurality of places on a real time basis.

The above and other objects, features and advantages of the present invention will become apparent from the following detailed description taken with the accompanying drawings.

[Brief Description of the Drawings]

FIG. 1 is a plan view of a display structure of a world timepiece embodying the present invention as seen from a time display side;

FIG. 2 is a plan view of gear trains included in the embodiment;

FIG. 3 is a section of part of the embodiment extending from the center of the timepiece to a crown;

FIG. 4 is a fragmentary enlarged section of a gear train portion shown in FIG. 3;

FIG. 5 demonstrates how the hour hands of auxiliary timepieces, also included in the embodiment, move every moment; and

FIG. 6 is a fragmentary plan view of an alternative embodiment of the present invention.

[Preferred Embodiments of the Invention]

While the present invention is practicable in various ways, an adequate number of embodiments thereof will be described in detail hereinafter.

〈Outline of the Embodiment〉

Referring to FIG. 1 of the drawings, an embodiment of the present invention will be outlined. As shown, a main timepiece 10 has an hour hand 12 making one turn for 12 hours, a minute hand 14 making one turn for 60 minutes, a second hand 16 making one turn for 60 seconds, and a dial 18 surrounding the hands 12, 14 and 16 and graduated at equal intervals. In the figure, part of the hands 12, 14 and 16 is not shown. The main timepiece 10 operates in the same manner as a conventional 12-hour display timepiece.

Six auxiliary timepieces 20, 22, 24, 26, 28 and 30 are positioned radially inwardly of the main timepiece 10. The timepieces 20~30 each has an hour hand 32 and displays time on a 24-hour basis. The hour hand 32 of the timepiece 20 indicates a time identical with the time indicated by the hour hand 12 of the main timepiece 10.

The times indicated by the timepieces 20~30 are sequentially incremented by 4 hours in the clockwise direction (stated another way, they are sequentially decremented in the counterclockwise direction). For example, the timepiece 22 indicates a time 4 hours ahead of (or 20 hours past of) the time of the timepiece 20. Likewise, the timepiece 24 indicates a time 4 hours ahead of (or 20 hours past of) the time of the timepiece 22. Such a relation also holds between the other auxiliary timepieces.

A place name ring (or place name bezel) 34 is provided on the outer circumference of the main timepiece 10. The ring 34 has a circumference indicative of 24 hours and shows the names of major cities of the world thereon. The names of the cities, or place names, are positioned in consideration of time differences. Tokyo and Rio de Janeiro, for example, have a time difference of 12 hours and, therefore, positioned at radially opposite sides on the ring 34. Hong Kong, which is 1 hour later than Tokyo, is marked at a position 1 hour later than Tokyo. The other place names are indicated on the ring 34 in the same manner.

To see the times of the various parts of the world, the place name ring 13 is turned to bring the place name matching the time of the main timepiece 10 to the position where the auxiliary timepiece 20, identical in time with the timepiece 10, is located. In the specific condition shown in FIG. 1, the main timepiece 10 and auxiliary time

piece 20 indicate Tokyo time, so that "TOKYO" on the ring 34 is coincident with the 12.00 position of the timepiece 10. At this instant, the other auxiliary timepieces 22~30 each displays the time of one place ahead of the time of the place indicated by the main timepiece 10 by 4 hours or a multiple thereof.

Hence, by looking at the auxiliary timepieces 22~30 and place name ring 34, it is possible to read the times of a plurality of places on a real time basis. In the specific condition shown in FIG. 1, the timepieces 24, 26, 28 and 30 respectively display the times of Denver, Rio de Janeiro, Paris or Rome, and Karachi. Moreover, because the time indication by the auxiliary timepieces 22~30 is interlocked with the time indication by the main timepiece 10, it is not necessary for the user to perform a special operation every time the time should be read.

〈Construction of the Embodiment〉

A reference will be made to FIGS. 2~4 for describing the specific arrangements of the main timepiece 10, auxiliary timepieces 20~30, and place name ring 34. FIG. 2 shows gears as seen from the front or display side of the timepiece. FIG. 3 is a fragmentary section of a portion extending from the center of the timepiece to a crown. FIG. 4 is an enlarged view of a gear train for the auxiliary timepiece and shown in FIG. 3.

As shown, a barrel gear body 40 is located at the center of the timepiece and rotates the hour hand 12 of the main timepiece 10. A barrel gear 42 is included in the body 40 and held in mesh with three second intermediate wheels 44. As shown in FIG. 2, the intermediate wheels 44 are positioned symmetrically, and each is held in mesh with two 24-hour wheels 45. The 24-hour wheels 45 are also positioned symmetrically as shown in FIG. 2.

In the above configuration, when the barrel gear 42 rotates, the three intermediate wheels 44 and, therefore, the six 24-hour wheels 45 are rotated at the same time. The intermediate wheels 44 cause the 24-hour wheels 45 to rotate in the same direction as the barrel gear 42. The barrel gear 42 has a gear ratio of 1 : 2 to each 24-hour wheel 45. Hence, when the barrel gear 42 makes two rotations, each 24-hour gear makes one rotation. The hour hand 12 of the main timepiece 10 is mounted on the barrel wheel 42 and makes one turn for 12 hours, as stated earlier. On the other hand, each 24-hour wheel 45 makes one rotation for two rotations of the barrel gear 42, i.e., for 24 hours.

A back plate 50 is affixed to the time display side of a base plate 46 by screws 48. The screws 48 are so shaped and dimensioned as not to protrude from the back plate 50 at the time display

side. Three round holes 52 are formed in the back plate 50 at symmetrical positions which are spaced a predetermined distance from the center of the timepiece. Further, six round holes 54 are formed in the back plate 50 at symmetrical positions radially outwardly of the holes 52 and spaced a predetermined distance from the center of the timepiece. Each intermediate gear 44 has a shaft 44A rotatably received in the respective hole 52. Likewise, each 24-hour wheel 45 has a shaft 45A rotatably received in the respective hole 54.

A dial plate 56 is provided on the time display side of the intermediate wheels 44 and 24-hour wheels 45. Provided on the dial plate 56 are the previously mentioned 12-hour dial 18 of the main time piece 10 and the 24-hour dials and numerals of the auxiliary timepieces 20~30. The dial plate 56 is supported by a support ring 58.

A pin 45B is studded on the center of each 24-hour wheel 45 in such a manner as to protrude from the dial plate 56 at the time display side. As shown in FIG. 3, the hour hand 32 of each of the auxiliary wheels 20~30 is mounted on the tip of the respective pin 45B. Because the 24-hour wheels 45 rotate in the same direction as the barrel gear 42, as stated previously, the hour hand 12 of the main timepiece 10 and the hour hands 32 of the auxiliary timepieces 20~30 turn in the same direction as each other.

As shown in FIG. 3, a machine body 62, including a battery and a motor, is interposed between the base plate 46 and a rear cover 60 in order to drive the barrel wheel 42 as well as the other components. A crown 64 is located at the right-hand side, as viewed in FIG. 3. The place name ring 34 can be turned relative to a case 66 by hand. The dial plate 56 and a crystal 68 define a space therebetween. The hour hands 32 of the auxiliary timepieces 20~30 and the hour hand 12, minute hand 14 and second hand 16 of the main timepiece 10 are turnable in the space between the dial plate 56 and the crystal 68 at respective levels which sequentially increase in this order.

The auxiliary timepieces 20~30 will be described more specifically with reference also made to FIG. 1. The six timepieces 20 ~30 are respectively aligned with the 12.00, 2.00, 4.00, 6.00, 8.00 and 10.00 positions of the timepiece 10, as stated earlier. All the timepieces 20~30 display times on a 24-hour basis. Nearby ones of the hour hands 32 have a time difference of 4 hours. For example, the hour hand 32 of the timepiece 22 indicates a time 4 hours ahead of the hour hand 32 of the timepiece 20. Likewise, the hour hand 32 of the timepiece 24 indicates a time 4 hours ahead of the hour hand 32 of the timepiece 22.

On the other hand, the place name ring 34 has a circumference representative of 24 hours. The

hour hands 32 of the auxiliary timepieces 20~30 are conditioned such that, among the 24 hours on the ring 34, six different times sequentially incremented (or decremented) by each 4 hours are indicated by the timepiece 20~30.

〈Operation of the Embodiment〉

The operation of the embodiment having the above construction will be described hereinafter. The main timepiece 10 operates in the same manner as a conventional timepiece. Specifically, a driving force from the machine body 62 is transmitted to the hour hand 12, minute hand 14 and second hand 16, causing the timepiece 10 to display a time. The auxiliary timepieces 20~30 are interlocked with the main timepiece 10. Hence, only if the timepiece 10 is set, the timepieces 20 ~30 are automatically set to the times sequentially incremented by each 4 hours due to the operation of the barrel gear 42, second intermediate wheels 44, and 24-hour wheels 42.

How the times of various parts of the world are read is as follows. When the barrel gear 62 rotates, the second intermediate wheels 44 and, therefore, the 24-hour wheels 45 are rotated. Each 24-hour wheel 45 makes one rotation for 24 hours, as stated previously. It follows that the hour hand 32 mounted on the pin 45B makes one turn for 24 hours. The auxiliary timepieces 20~30 indicate times different from each other by 4 hours, and the timepiece 20 is coincident with the main timepiece 10 as to time. The timepieces 20~30, therefore, display times ahead of the time of the main timepiece 10 by each 4 hours.

To see the times of various places, the user of the timepiece turns the place name ring 34 until the place name associated with the time of the main timepiece 10 has been aligned with the auxiliary timepiece 20. In the illustrative condition shown in FIG. 1, because the timepiece 10 is assumed to indicate Tokyo time, the mark " TOKYO" on the ring 34 is aligned with the timepiece 20. By looking at the timepieces 22~30 and ring 34, the user can see the times of the places whose times are 4 hours, 8 hours, 12 hours, 16 hours and 20 hours ahead of Tokyo time (or 20 hours, 16 hours, 12 hours, 8 hours and 4 hours past of Tokyo time) on a real time basis. As to Paris time or Rome time, for example, the user should only read the time of the timepiece 28 with which the marks " PARIS" and " ROME" are aligned.

FIG. 5 shows how the hour hands of the main timepiece 10 and auxiliary timepieces 20~30 sequentially move. The hour hands each sequentially moves as shown in (A) , (B) , (C) , and (D) in this order. As shown, the six hour hands move in an extremely interesting way as the time elapses.

⟨Effects of the Embodiment⟩

The embodiment described above has the following advantages.

(1) Nearby auxiliary timepieces indicate times having a time difference of 4 hours with their hour hands, so that times at various parts of the world can be easily read at a glance.

(2) The hour hands of the auxiliary timepieces are interlocked with the hour hand of the main timepiece. It follows that the user can read the times on a real time basis only by turning the place name ring, i.e., without performing any additional operation.

In addition, because the auxiliary timepieces are interlocked with the main timepiece, they are automatically set to times each having a time difference of 4 hours when the main timepiece is set.

(3) The hour hands of the auxiliary timepieces move in an extremely interesting manner.

⟨Alternative Embodiments⟩

The present invention is not limited to the embodiment described above, but it also includes the following embodiments.

(1) In the previous embodiment, the auxiliary timepieces 20~30 are respectively located at positions corresponding to the even hours of the dial plate 56, i.e., 12.00, 2.00, 4.00, 6.00, 8.00 and 10.00, and the time of the timepiece 20 is coincident with the time of the main timepiece 10. FIG. 6 shows an alternative embodiment in which auxiliary timepieces 70~80 are respectively located at positions corresponding to the odd hours of the dial plate 56, i.e., 1.00, 3.00, 5.00, 7.00 and 11.00. In the alternative embodiment, the auxiliary timepiece 70 at the 1.00 position displays a time 2 hours ahead of the time of the main timepiece 10. The timepieces 70~80 indicate times which are sequentially incremented by each four hours in the clockwise direction, as in the previous embodiment.

With the alternative embodiment, it is possible to display seven different times in total by the main timepiece 10 and auxiliary timepieces 70~80.

(2) In the previous embodiment, the hour hand of each auxiliary timepiece makes one turn for 24 hours. Alternatively, the gear ratio between the barrel gear 42 and the second intermediate wheels 44 and the gear ratio between the wheels 44 and the 24-hour wheels 45 may be changed such that the wheels 45 turn out 12-hour wheels making one rotation for 12 hours. In addition, the main timepiece 10 may display a time on a 24-hour basis.

(3) While the embodiments shown and described include six auxiliary timepieces, the number of such timepieces may be increased or decreased, as desired. For example, if n auxiliary timepieces are provided, then the time difference between nearby timepieces is $24/n$.

[Industrial Applicability]

In summary, in accordance with the present invention, a plurality of auxiliary timepieces, each displaying the time of particular part of the world, are arranged in consideration of time differences. The names of places are provided on a place name ring also in consideration of time differences. Hence, the times of various parts of the world can be read with ease.

When the main timepiece is set, the auxiliary timepieces are automatically set. Once the place name ring is set, the times of various places can be read on a real time basis without resorting to any additional operation. The operation is, therefore, extremely easy.

Further, the hour hands of the auxiliary timepieces move every moment, implementing interesting time display.

Claims

1. A display structure of a world timepiece, comprising:
 - a main timepiece for displaying a time of given part of the world;
 - a place name ring provided with marks representative of names of various parts of the world in consideration of time differences;
 - a plurality of auxiliary timepieces for displaying times each having a difference corresponding to a position on said main timepiece; and
 - a gearing for operating said auxiliary timepieces in a same direction as and in interlocked relation to said main timepiece.
2. A display structure of a world timepiece as claimed in claim 1, wherein said main timepiece displays a time on a 12-hour basis.
3. A display structure of a world timepiece as claimed in claim 2, wherein said auxiliary timepieces display a time on a 24-hour basis.
4. A display structure of a world timepiece as claimed in claim 3, wherein one of said auxiliary timepieces is located at a 12.00 position of said main timepiece and indicative of a same time as said main timepiece.

5. A display structure of a world timepiece as claimed in claim 4, wherein said auxiliary timepieces are arranged at locations corresponding to even hours of said main timepiece, and display times sequentially ahead by each 4 hours in a clockwise direction. 5
6. A display structure of a world timepiece as claimed in claim 3, wherein said auxiliary timepieces are located at positions other than a 12.00 position of said main timepiece, and display times different from the time of said timepiece. 10
7. A display structure of a world timepiece as claimed in claim 6, wherein said auxiliary timepiece are arranged at locations corresponding to odd hours of said timepiece, and display times sequentially ahead by each 4 hours in a clockwise direction. 15 20

AMENDED CLAIMS

1. (Amended) A display structure of a world timepiece, comprising: 25
 - a main timepiece for displaying a time of given part of the world;
 - a place name ring provided with a circumference representative of 24 hours and marks representative of names of various parts of the world in consideration of time differences; 30
 - a plurality of auxiliary timepieces arranged on a circle corresponding to 24 hours, and each displaying a time having a time difference corresponding to a positional interval on said circle; and 35
 - a gearing for operating said auxiliary timepieces in a same direction as and in interlocked relation to said main timepiece. 40
2. A display structure of a world timepiece as claimed in claim 1, wherein said main timepiece displays a time on a 12-hour basis. 45
3. A display structure of a world timepiece as claimed in claim 2, wherein said auxiliary timepieces display a time on a 24-hour basis.
4. A display structure of a world timepiece as claimed in claim 3, wherein one of said auxiliary timepieces is located at a 12.00 position of said main timepiece and indicative of a same time as said main timepiece. 50
5. (Amended) A display structure of a world timepiece as claimed in claim 4, wherein said auxiliary timepieces are arranged at equally 55

spaced locations corresponding to even hours of said main timepiece, and display times sequentially ahead by each 4 hours in a clockwise direction.

6. (Amended) A display structure of a world timepiece as claimed in claim 3, wherein said all auxiliary timepieces are located at positions other than a 12.00 position of said main timepiece, and display times different from the time of said timepiece.
7. (Amended) A display structure of a world timepiece as claimed in claim 6, wherein said auxiliary timepiece are arranged at equally spaced locations corresponding to odd hours of said timepiece, and display times sequentially ahead by each 4 hours in a clockwise direction.

BRIEF STATEMENT UNDER PCT ARTICLE 19(1)

Reference 1 (JP, U, 1-129684) discloses a multiple display timepiece capable of displaying the times in a plurality of predetermined regions. Reference 2 (JP, U, 1-141485) teaches a world timepiece having a city name bezel and a time bezel. Further, Reference 3 (JP, A, 60-70390) proposes a timepiece having a plurality of auxiliary hands which are correctable independently of each other.

The timepiece of the present invention has a plurality of auxiliary timepieces arranged on a circle corresponding to 24 hours. The difference between the times being displayed by the nearby auxiliary timepieces corresponds to the distance between the timepieces on the circle. This is not described or even suggested in reference 1 or 2.

With the above configuration, the present invention allows the user of the timepiece to easily see the times in various parts of the world simply by looking at the auxiliary timepieces and a place name bezel. The present invention, therefore, eliminates the need for the time bezel of reference 2 and noticeably simplifies the user's operation for seeing the time of a desired city.

Moreover, because a main timepiece and the auxiliary timepieces in accordance with the present invention have a predetermined relation to each other, it is not necessary for the user to correct the auxiliary timepieces one by one. Specifically, only if the user sets the main timepiece, the auxiliary timepieces are automatically set. This even obviates the need for an auxiliary hand correction mechanism included in reference 3.

To clearly distinguish the present invention from the references cited, there are additionally recited in claim 1 that "the circumference of a

place name ring corresponds to 24 hours", and that "a plurality of auxiliary timepieces are arranged on a circle corresponding to 24 hours, and the difference between the times being displayed by the nearby auxiliary timepieces corresponds to the distance between the auxiliary timepieces on the circle".

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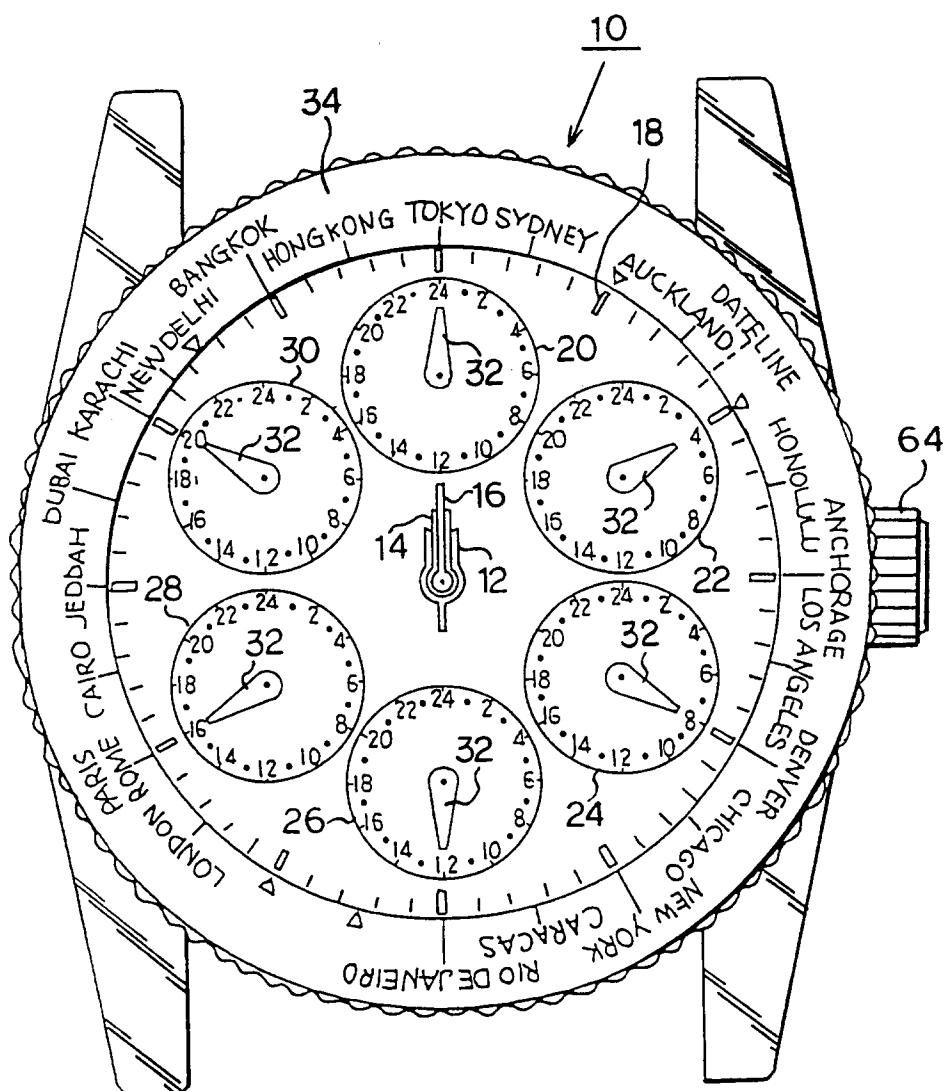


FIG. 1

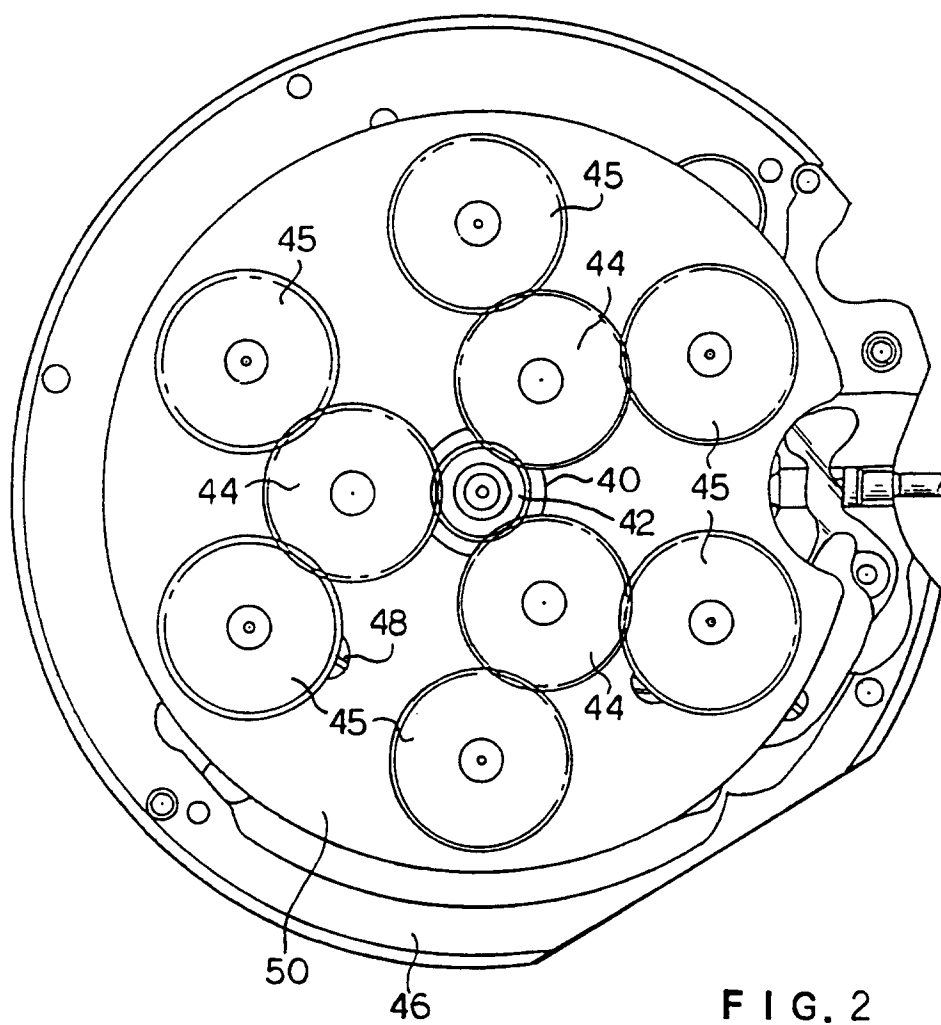


FIG. 2

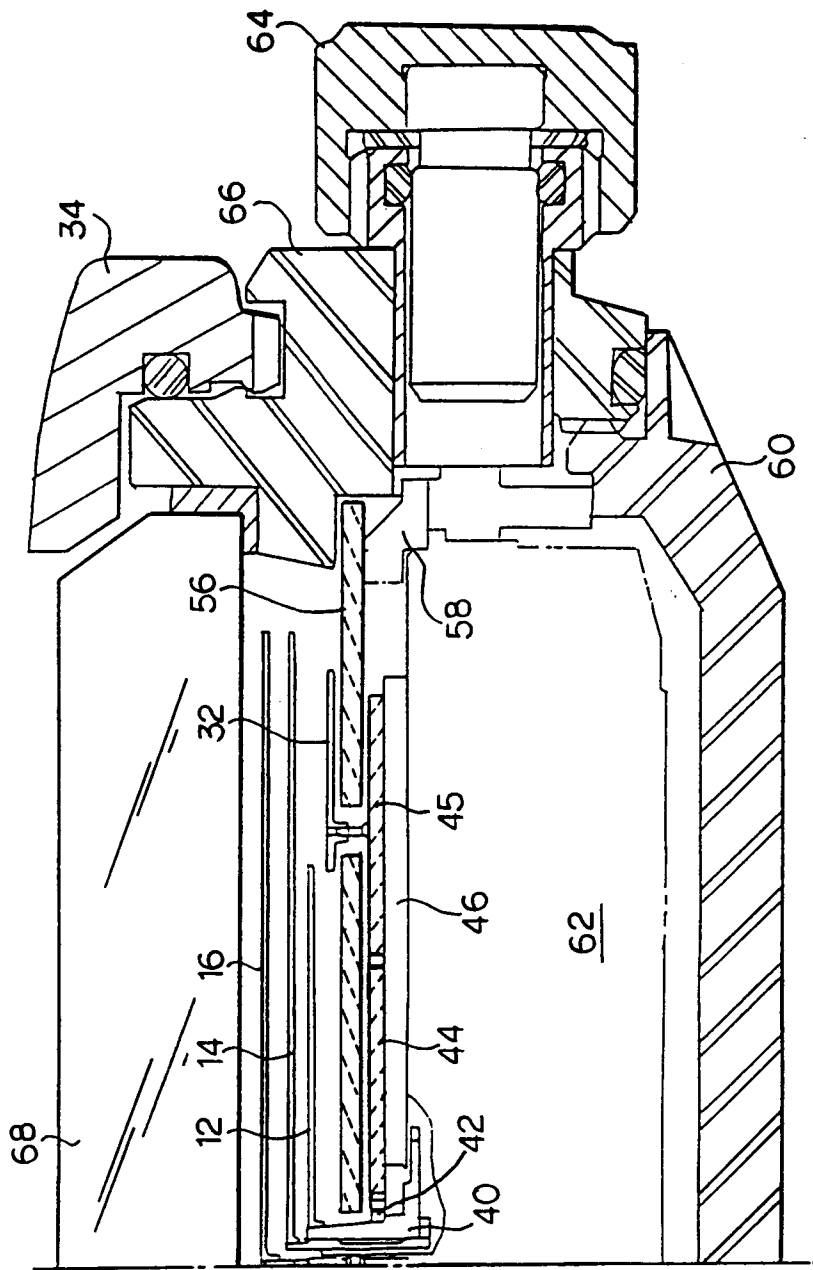


FIG. 3

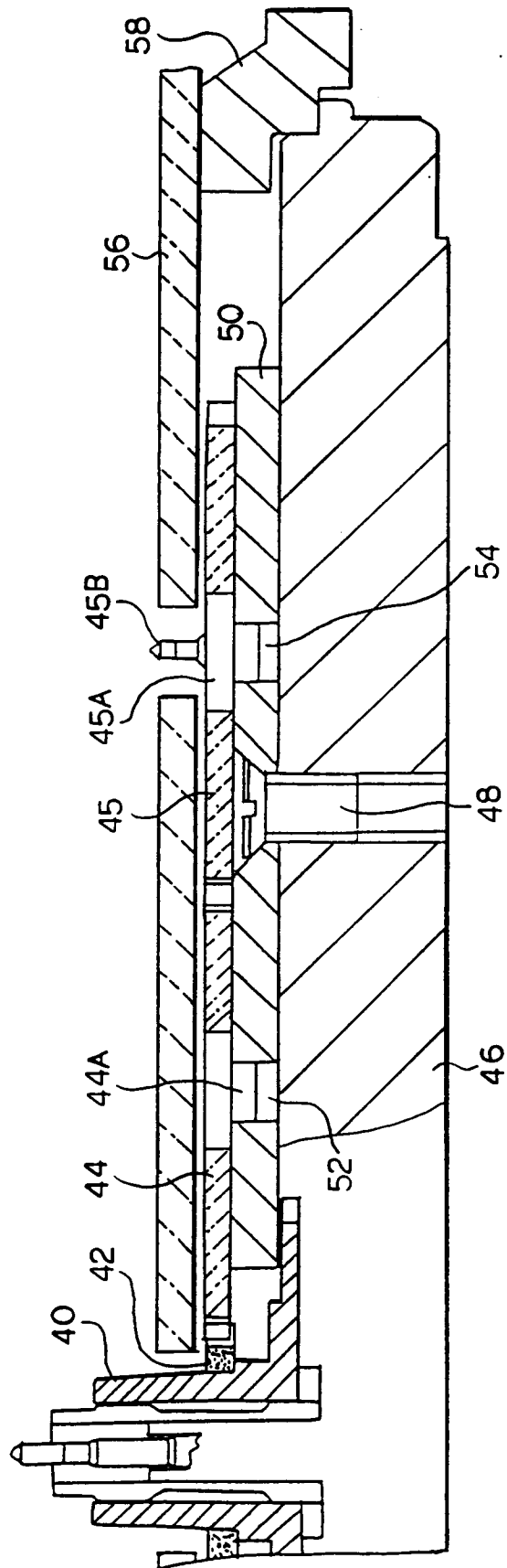


FIG. 4

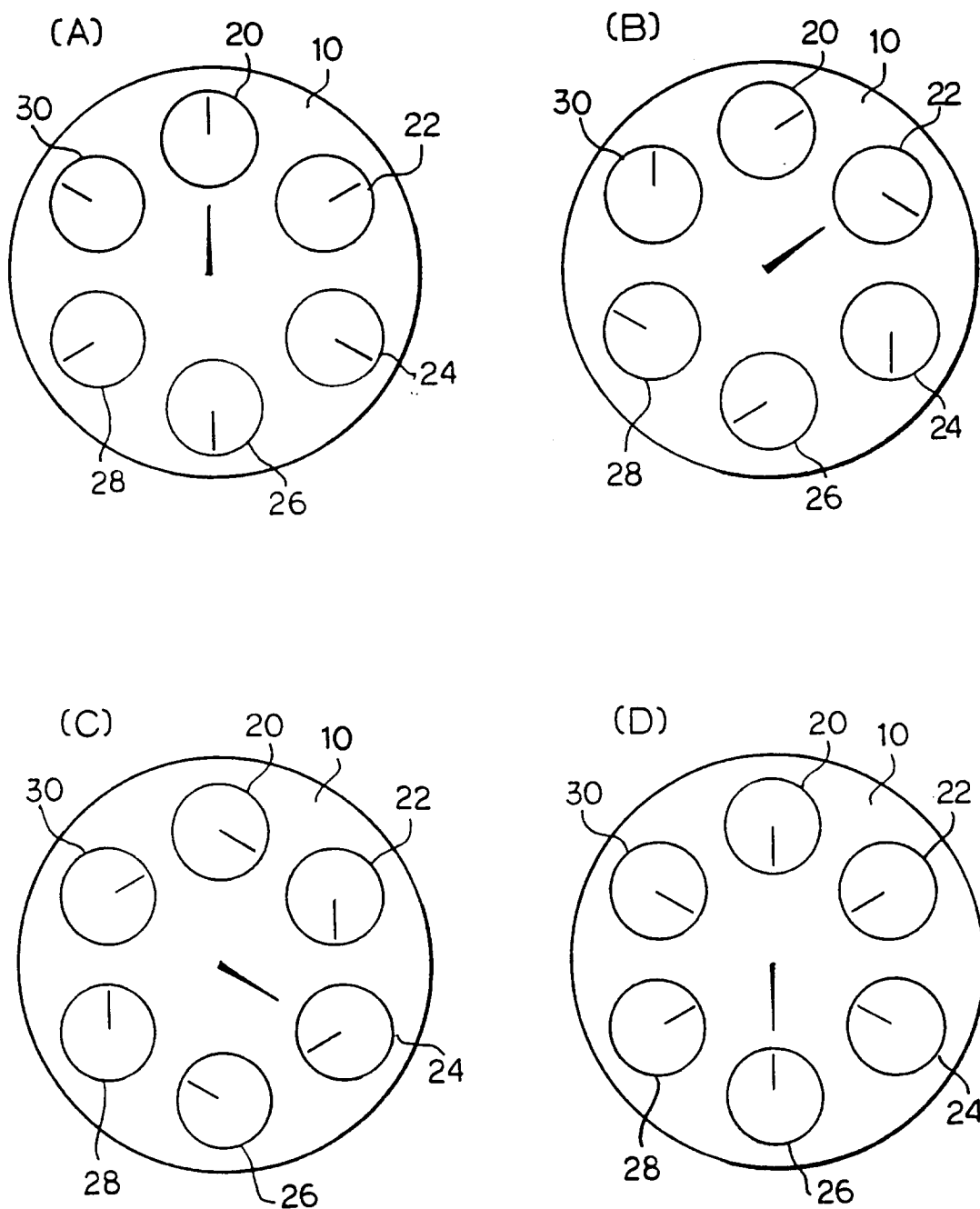


FIG. 5

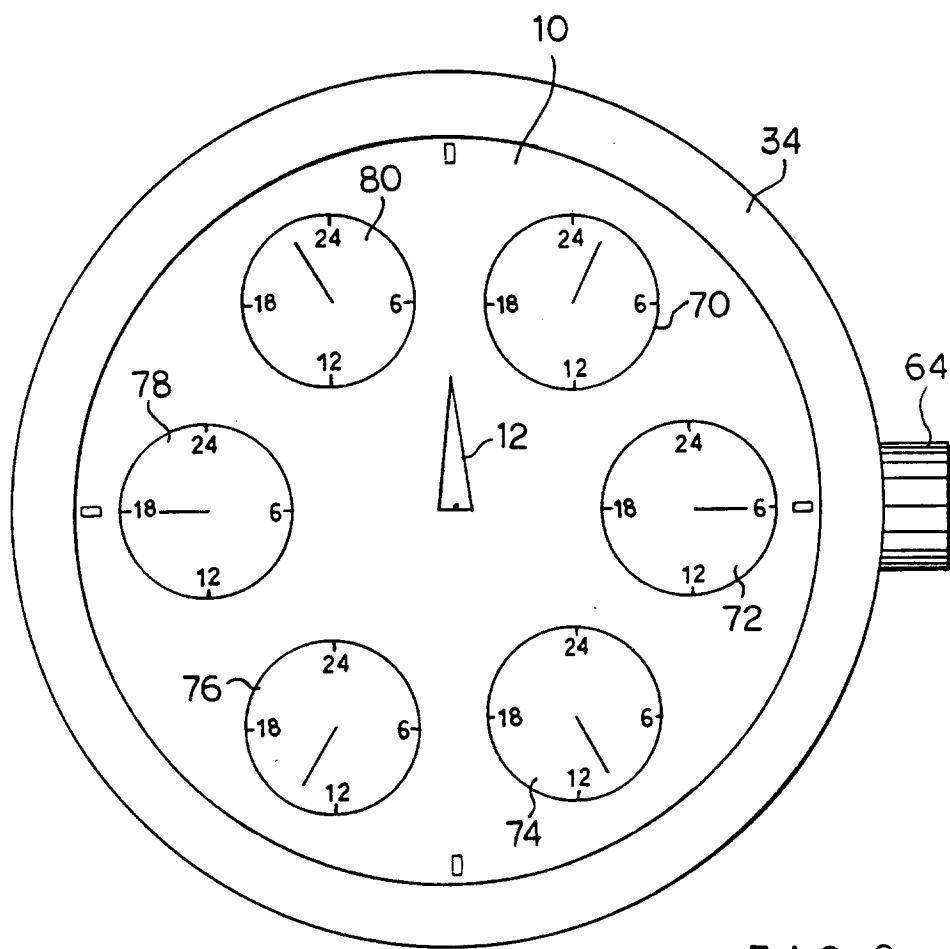


FIG. 6

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP94/01466

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl⁶ G04B19/23, G04B19/28, G04C3/00, G04G1/00

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)

Int. Cl⁵ G04B19/23, G04B19/22, G04B19/00, G04B19/28,
G04C3/00, G04G1/00

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

Jitsuyo Shinan Koho 1925 - 1994

Kokai Jitsuyo Shinan Koho 1971 - 1994

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP, U, 1-129684 (Seiko Epson Corp.), September 4, 1989 (04. 09. 89), (Family: none)	1-7
Y	JP, U, 1-141485 (Casio Computer Co., Ltd.), September 28, 1989 (28. 09. 89), (Family: none)	1-7
Y	JP, A, 60-70390 (Citizen Watch Co., Ltd.), April 22, 1985 (22. 04. 85), (Family: none)	2-7

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

* Special categories of cited documents:

"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

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"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 when the document is taken alone

"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

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Date of the actual completion of the international search

November 11, 1994 (11. 11. 94)

Date of mailing of the international search report

December 16, 1994 (06. 12. 94)

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