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(54) **Vocal reporting device for pointer type timers with direct timing transformation.**

(57) A vocal reporting device for pointer type timers comprising a printed circuit board on which three separate circular circuits are printed, respectively representing a hour signal, a higher order digit minute signal and a lower order digit minute signal. Three signal picking up devices are synchronously rotatable with the pointer shafts of the timer to provide rotation of the signal picking up devices through the circuits to pick up hour and minute signals. These signals are then processed by a central processing unit and a vocal processing unit and broadcasted in a synthetic voice via a speaker.

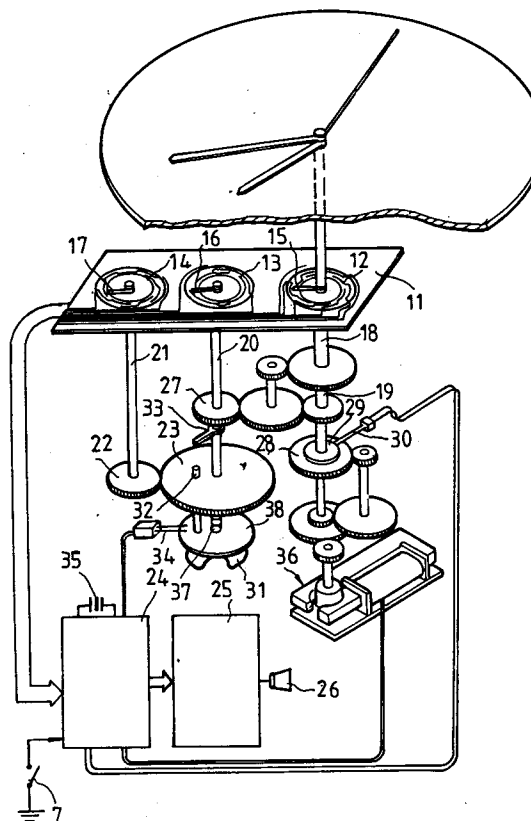


FIG. 1

FIELD OF THE INVENTION

The invention relates generally to a time reporting system and in particular to a vocal reporting device for pointer type timers.

BACKGROUND OF THE INVENTION

Digital display type timers or electronic timers with a vocal system to report time in a synthetic voice is a recently-developed product. It suits for the necessity of reading time without visual contact with the timers. An example of such timers is disclosed in Taiwanese Patent Application Number 76,202,480 cited herein for reference. Such a timer is particularly suitable for the blind. It also good for people working or driving in a dark environment.

The prior art uses a quartz oscillator to generate pluses of a given frequency and uses the pluses to generate the desired electronic time signal. It is thus easy for the prior art to pick up the desired time signal and then using such a signal to control the voice stored in a memory. The voice is then amplified and broadcasted via a speaker.

The problem of incorporating a vocal reporting system in a pointer type timer is that the pointer type timer uses pointers to display time and no electronic signals exist. Conversion of the positions of the pointers into an electronic time signal associated therewith must be done before an electronic signal is transmitted to the memory of voice to control the broadcast of the time report.

Therefore, to convert the time indicated by the pointers into a suitable form of electronic time signal is a major problem for a vocal time reporting system of the pointer type timer to be overcome. It is therefore desirable to have a system which is capable to convert the positions of the pointers of a pointer type timer into an electronic time signal and broadcast the time associated with the electronic time signal with a speaker.

OBJECTS OF THE INVENTION

It is therefore an object of the present invention to provide a vocal time reporting device to be incorporated in a pointer type timer to convert a mechanical time signal (i.e. positions of the pointers) into an electronic time signal which is in turn used in a voice synthesis device to produce the desired vocal report of time.

It is another object of the present invention to provide a simple device to convert the positions of pointers of a timer into an electronic time signal.

To achieve the above-mentioned objects, there is provided a vocal reporting device for pointer type timers comprising a printed circuit board on which three separate circular circuits are printed,

respectively representing a hour signal, a higher order digit minute signal and a lower order digit minute signal. Three signal picking up devices are synchronously rotatable with the pointer shafts of the timer to provide rotation of the signal picking up devices through the circuits to pick up hour and minute signals. These signals are then processed by a central processing unit and a vocal processing unit and broadcasted in a synthetic voice via a speaker.

Other objects and advantages of the invention will be apparent from the following description of the preferred embodiments taken in connection with the accompanying drawings wherein:

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a perspective view of a vocal reporting device of the present invention showing the mechanical portion thereof and schematically showing the electronic portion thereof;

Fig. 2 is a top view of an encoding disk incorporated in the device shown in Fig. 1, together with a transformation table associated therewith; and

Fig. 3 is a partial cross-sectional view showing in detail the structure of the hour pointer driving shaft, minute pointer driving shaft and the second pointer driving shaft.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

With reference to the drawings and in particular to Fig. 1, a vocal reporting device for a pointer type timer in accordance with the present invention comprises a printed circuit board 11 on which three separate circular encoding circuits are printed, respectively corresponding to a hour signal 12, a first minute signal 13 and a second minute signal 14. Each encoding circuit 12, 13 or 14 has a signal picking up device 15, 16 or 17 associated therewith to pick up signals from the encoding circuits 12, 13 and 14.

Alternatively, the encoding circuits 12, 13 and 14 may be respectively printed on three separate disk-like circuit boards, which may also be referred as encoding disks hereinafter.

Also with reference to Fig. 3, the signal picking up device 15 is coaxial and rotatable with a rotation shaft 18 of the hour pointer, on which other members, such as a hour gear, not explicitly designated in the drawings, may be secured and is capable to pick up the hour signal from the hour encoding circuit 12 which is radially and equally spaced into twelve indices, for example 1 o'clock, 2 o'clock, ..., 12 o'clock.

The signal picking up device 16 is secured on a first auxiliary shaft 20 which is mechanically connected to a rotation shaft 19 of the minute pointer to be synchronously rotatable therewith and thus picking up the higher order digit of the minute signal from the first minute encoding circuit 13 which is radially and equally spaced into six indices respectively representing every decade of minutes, such as 10 minutes past a whole hour, 20 minutes past a whole hour, ..., 60 minutes past a whole hour.

The signal picking up device 17 secured on a second auxiliary shaft 21 which is mechanically connected to the first auxiliary shaft 19 to be rotatable therewith with a speed six times thereof, such as by a gear train constituted by a ten tooth pinion 22 and a sixty tooth gear 23 of which the reduction ratio is 1:6, so that when the signal picking up device 16 rotates one sixth of a whole circle, the signal picking up device 17 rotates a whole circle. In the preferred embodiment, the second minute encoding circuit 14 is axially and equally spaced into ten divisions, each of which represent one minute so that when the signal picking up device 17 rotates through a whole circle, ten minutes pass and the corresponding angular displacement of the signal picking up device 16 is one sixth of the first minute encoding circuit 13.

With this arrangement, the hour signal picking up device 15, the first minute signal picking up device 16 and the second minute signal picking up device 17 respectively pick up the encoded hour signal, first minute signal and second minute signal and then transmit these signals to a central processing unit 24 to be processed thereby. The processed time signals are then sent to a vocal processing unit 25 and then broadcasted with a synthetic voice via a speaker 26. The techniques regarding to the central processing unit 24 and the vocal processing unit 25 are well-known to those skilled in the art and no details will be given herein.

In order to reduce the wear and tear between the printed circuit board 11 or more precisely the encoding disks 12, 13 and 14 and the signal picking up devices 15, 16 and 17, the auxiliary shafts 20 and 21 do not rotate in a normal situation. This may be done by installing a connecting member, such as a gear 27 shown in Fig. 1, which is rotatable with respect to the first auxiliary shaft 20 between the auxiliary shafts 20, 21 and the pointer shafts 18, 19. With this arrangement, the auxiliary shafts 20 and 21 are not in rotation in a normal situation while the gear 27 is rotated by the pointer shafts 18 and 19 and thus reducing the wear between the encoding disks 13 and 14 and the signal picking up devices 16 and 17. In other words, only the hour signal is picked up from the hour encoding circuit 12 in such a normal situation. Under this

circumstance, the minute signal is generated by the central processing unit 24 rather than obtained from the first and second minute encoding circuits 13 and 14.

A clock signal generator 35 (namely an oscillating quartz) supplies a series of pluses to the central process unit 24 to generate therein a minute signal every minute. Besides, the series pluses are also supplied to a stepping motor 36 which provides rotation to the pointers of the timer to serve as a clock signal. The minute signal so generated is directly supplied to the central processing unit 24 so as to be broadcasted via the speaker 26.

To match and check the minute signal and the hour signal every hour, a calibration cam is disposed on a minute gear which is secured on the minute shaft 19 to trigger a first calibration switch 30 every sixty minutes. The first calibration switch 30, upon triggered, sends a calibration signal to the central processing unit 24 to calibrate the time signals so as to have the minute signal of sixty minutes past a whole hour match the hour signal.

In manually adjusting the positions of the timer pointers, an adjusting button 31 should be depressed first to have a driving pin 32 contact and drive a driven rod 33 secured on the underside of the gear 27 and thus having the auxiliary shafts 20 and 21 rotate with the pointer shafts 18 and 19. This also triggers a second calibration switch 34. The pointers can then be adjusted to the correct positions under this situation with the button 31 depressed. When the button 31 is released, the signal picking up devices 16 and 17 send the correct minute signal to the central processing unit 24 to calibrate the minute signal in the central processing unit 24. The second calibration switch 34 is then released to complete the adjustment.

The central processing unit 24 may be further provided with a "talk" switch 7 which, when triggered, immediately actuates the vocal processing unit 25 to broadcast the time via the speaker 26.

The hour encoding disk 12 and the hour signal picking up device 15 constitute the hour signal encoder. The first minute encoding disk 13 and the first minute signal picking up device 16 constitute the first minute signal encoder which generates the higher order digit of the minute signal. The second minute encoding disk 14 and the second minute signal picking up device 17 constitute the second minute signal encoder which generates the lower order digit of the minute signal.

In the above-described embodiments, the encoding circuits or disks are fixed while the signal picking up devices are rotatable with respect thereto. It is also possible to have the signal picking up devices fixed and the encoding circuits or disks rotatable with respect thereto. The encoding circuits or disks can also be attached to gears which

are rotatably secured on the pointer shafts.

The encoding of the hour and minute signal can be the well-known Gray code or BCD code or other known coding methods. (This, however, is not the feature of the present invention.) In the present invention, the encoding method is shown in Fig. 2. This encoding method of the present invention provides in an encoding circuit or an encoding disk, such as the hour encoding circuit 12, N encoding index strips (wherein N is six in the embodiment shown in Fig. 2) disposed on a circle of 2N divisions (the circular encoding circuit or the encoding disk), each of which comprises a first section a, a second section b, and a third section c, wherein the first section a and part of the second section b are along a first arc of radius R1 while the third section c and the remaining part of second section b are along a second arc of a larger radius R2 which is concentric with the first arc. The part of second section b in the first arc and the remaining part of second section b which is in the second arc are connected together with a segment extending substantially in an axial direction. The first section a of each of the encoding index strips is opposite to the third section c of the previous encoding index strip and spaced therefrom. The truth table resulted from such an arrangement is also shown in Fig. 2.

Although so far the construction of the actuation mechanical system of the timer is not described in detail, it is believed that those skilled in the art know well the construction of the timer. Since the conventional mechanical portion of the pointer timer is not regarded as the feature of the present invention, no further detail regarding there-to is necessary herein.

It is also conventional to provide a housing (not shown) to have the above-described members or elements disposed therein and a marked surface to indicate the time when the pointers are in corresponding positions.

To this point, it is understood that the present invention provides a vocal reporting system to a pointer type timer wherein only two encoding circuits or encoding disks are used to represent the sixty minutes without any error. The present invention also provide an alternative of reading the minute signal directly from the central processing unit rather than from the minute encoding circuits so as to reduce the wear between the encoding disks and the signal picking up devices. This makes the present invention more practical and more difficult to malfunction. Furthermore, a double checking function is provided to double check the matching mechanical time signals and the electronic time signal in every whole hour. The adjustment of the pointers with the corresponding calibration of the minute signal in the central processing

unit is also possible.

It is apparent that although the invention has been described in connection with the preferred embodiments, it is contemplated that those skilled in the art may make changes to certain features of the preferred embodiments without altering the overall basic function and concept of the invention and without departing from the spirit and scope of the invention as defined in the appended claims.

Claims

1. A vocal reporting device for pointer type timers, wherein said pointer type timers comprise (A) a hour shaft for driving a hour pointer with a hour gear secured thereon, (B) a minute shaft for driving a minute pointer with a minute gear secured thereon, (C) a housing inside which said hour shaft with the hour pointer and the hour gear and said minute shaft with the minute and the minute gear are disposed, and (D) a surface with time indices formed thereon for illustrating the time with said hour pointer and said minute pointer, and characterized in that said vocal reporting device comprises:

(a) a hour signal encoder which is disposed between the hour shaft/hour gear and the housing/surface, said hour signal encoder comprising an hour signal encoding circuit which is substantially in the form of a circle or a disk and an hour signal picking up device, both of which are relatively rotatable with respective to each other, said hour encoding disk being divided into twelve equal divisions, each of which has a different hour index formed thereon to represent twelve hours so that when the hour signal picking up device rotates with the hour shaft with respect to the hour encoding circuit to sweep through the hour encoding circuit, indications of the twelve hours are formed,

(b) a first minute signal encoder which is disposed between the minute shaft/minute gear and the housing/surface, said first minute signal encoder comprising a first minute signal encoding circuit which is substantially in the form of a circle or a disk and a first minute signal picking up device, both of which are relatively rotatable with respective to each other, said first minute encoding disk being divided into six equal divisions, each of which has a different first minute index formed thereon to represent a decade of minutes so that when the first minute signal picking up device rotates with the minute shaft with respect to the first minute encoding circuit to sweep through

the first minute encoding circuit, indications of six decades of minutes are formed, and (c) a second minute signal encoder which is disposed between the minute shaft/minute gear and the housing/surface, said second minute signal encoder comprising a second minute signal encoding circuit which is substantially in the form of a circle or a disk and a second minute signal picking up device, both of which are relatively rotatable with respect to each other with the relative rotational speed therebetween six times of that of the first minute signal encoder, said second minute encoding disk being divided into ten equal divisions, each of which has a different second minute index formed thereon to represent one minute of a decade of minutes represented by an index of said first minute signal encoder so that when the second minute signal picking up device rotates with respect to the second minute encoding circuit to sweep through the second minute encoding circuit, indication of each minute of the decade of the first minute signal encoder is formed.

2. A device as claimed in Claim 1 further comprising calibration means which sends out a calibration signal once the first minute signal picking up device sweeps through a full circle of the first minute signal encoding circuit.
3. A device as claimed in Claim 1 wherein each encoding circuit has a number of encoding index strips disposed around a circle of divisions constituted by the circular encoding circuit, the number of the divisions being twice of the index strips, each of said index strip comprising a first section, a second section, and a third section wherein the first section of one of the index strips and part of the second section of said one of the index strips are along a first arc of a first radius while the third section and the remaining part of the second section of said one of the index strips are along a second arc of a second radius which is different from the first radius, said first and second arcs being concentric, said part of the second section in the first arc and said remaining part of the second section which is in the second arc being connected together with a segment extending substantially in an axial direction, the first section of said one of the encoding index strips being opposite to the third section of a previous encoding index strip and spaced therefrom.

4. A device as claimed in Claim 1 further comprising a central processing unit and a vocal processing unit, said central processing unit generating a minute signal every minute and using said minute signal to control said vocal processing unit to generate a vocal report of said minute.
5. A device as claimed in Claim 1 wherein said first and second minute signal encoders are in operation only when an adjustment of the pointers is conducted so as to obtain the time indicated by the pointers.

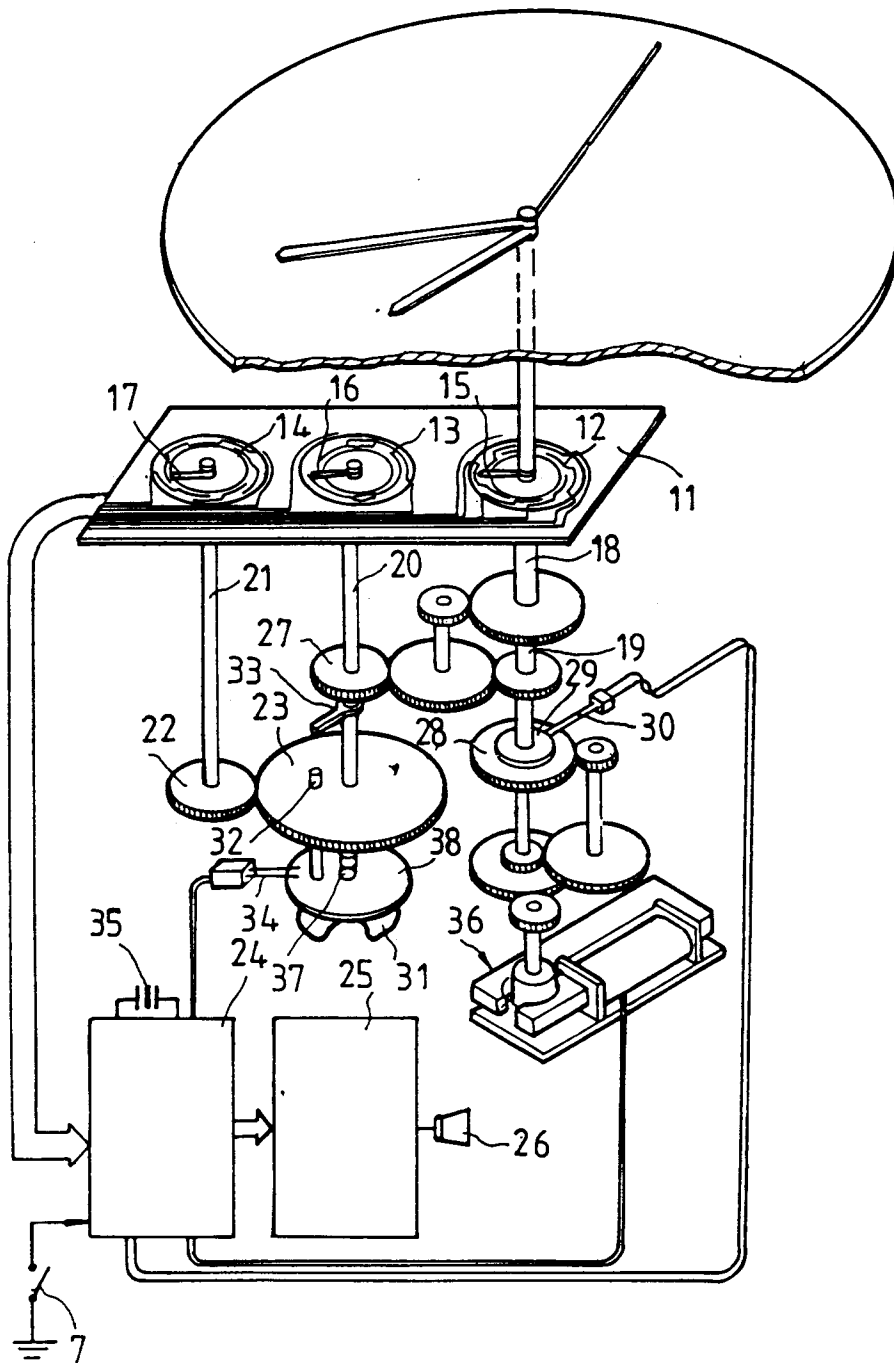


FIG. 1

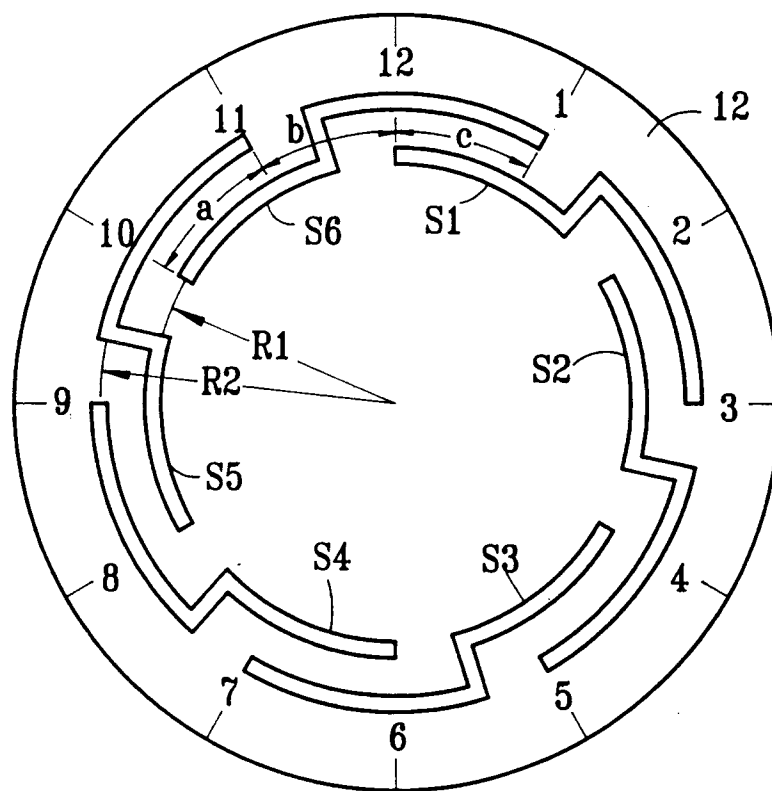


FIG. 2

	12-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12
S1	1	1	1	0	0	0	0	0	0	0	0	0
S2	0	0	1	1	1	0	0	0	0	0	0	0
S3	0	0	0	0	1	1	1	0	0	0	0	0
S4	0	0	0	0	0	0	1	1	1	0	0	0
S5	0	0	0	0	0	0	0	0	1	1	1	0
S6	1	0	0	0	0	0	0	0	0	0	1	1

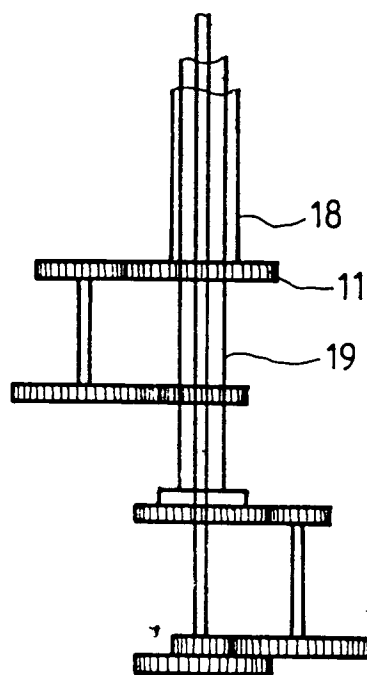


FIG. 3



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EUROPEAN SEARCH REPORT

Application Number

EP 92 10 1253

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	PATENT ABSTRACTS OF JAPAN vol. 005, no. 107 (P-070)11 July 1981 & JP-A-56 048 563 (CITIZEN WATCH CO LTD) 1 May 1981 * abstract *	1,3-5	G04G13/00
A	--- PATENT ABSTRACTS OF JAPAN vol. 005, no. 096 (P-067)23 June 1981 & JP-A-56 039 479 (CITIZEN) 15 April 1981 * abstract *	1,3	
A	--- FR-A-1 329 951 (BRYANS AEROEQUIPMENT LIMITED) * page 3, left column, line 27 - right column, line 14; figure 2 *	1,3	
A	--- US-A-4 148 181 (E. SCHEER) * column 10, line 5 - line 66; figure 16 *	1,3	

The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			G04G G04C
Place of search THE HAGUE		Date of completion of the search 29 SEPTEMBER 1992	Examiner BLAAS D.-L.A.J.
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