An electronic parking meter (10/50) comprising a display device (20/56), a timer (24, 31/62, 67, 64) and a control means (28/62) operable to set the timing device (24, 31/62, 67/64) in operation for a purchased parking time in response to insertion of coins into the meter. The display device (20/56) is arranged to give an initial display of purchased time, but for this display to be inhibited shortly afterwards so that a user of a previously vacant parking lot controlled by the meter cannot determine from the meter whether there is any unexpired parking time left for that lot by a preceding user. In one form, the meter is controlled by a central processing unit (62) and is arranged for storage in a memory (64) of user supplied data such as vehicle registration number and parking lot identification, as well as of purchased time. For controlling several parking lots by the meter, the meter is provided with a selector (22/52) enabling the user to select a desired parking lot.
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Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

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"TIME METERING DEVICES"

According to the invention there is provided an electronic time measuring device comprising a display device, a timing device, and control means operable to set the timing device in operation for a predetermined time period, the display device being arranged whereby to give a display corresponding to said predetermined time period, and for this display to be inhibited before the predetermined time period is expired.

Preferably the measuring device has a first up-down counter, said timing device including a second up-down counter, the first up-down counter being associated with a coin detector which in use generates a signal pursuant to passing by the user of a coin to the detector to upwardly increment the first counter in accordance with the denomination of said coin; coupling means being provided in use coupling said first counter to said display device.
whereby the said display is given by said display device in accordance with the count in the said first counter; said control means being selectively operable after said coin has been passed by a user to the detector to transfer said count to said second counter and to then downwardly increment said second counter over said predetermined time period. Said inhibiting of the display of said pre-determined period thus occurs in this instance by virtue of the coupling of the display means to display only the count in the first counter, which count, as described, counts down to for example to zero, immediately on transfer of the count to the second counter. A printer device may be provided connected, on operation of the control means to effect said transfer, to print a ticket indicating thereon said predetermined time period. Preferably, there are a number of said second counters each operable as above described and said control means is operable in conjunction with a selector to permit a user to selectively couple any desired one of these to receive the count from the said first counter.

In another embodiment, the display device is coupled for transfer of signal information thereto under control of a central processing unit incorporating a clock said central processing unit then comprising said control means. This unit may have or may be associated with a transitory information memory for storing transient information. The central processing unit provides a coupling between the display device and to a coin detector for detecting the denomination of coins in use provided by a user to the metering device. In this case,
the central processing unit operates to cause the display device, on detection of a coin by the detector, to effect said display as an indication of time corresponding to the said predetermined time period and in accordance with the said denomination of said coin. In the instance too, the control means may further include a user operable selector means for enabling the user, pursuant to setting up said display in said display device to access a particular memory location in said transitory information memory, and to store therein at that location, under control of the central processing unit, a time value corresponding to the said predetermined time period as then displayed by the display device. The central processing unit may be arranged to operate in conjunction with said clock to increment the stored time values in each said location downwardly to a zero count after respective times in accordance with the time values stored at each such location, so that the clock, together with the central processing unit and transitory information memory comprise the said timing device. In this case the central processing unit operates to inhibit display of the time periods stored in each location, at least after initial setting up of the said display following coin detection by said coin detector. This inhibition is effected by decoupling the transitory information memory from the display device. The time metering device may also be arranged for further access to said transitory information memory by a user to enable storage by the user of a user identification at the storage location corresponding that which the user selects by use of said selector. In any event, means may be provided
admitting key controlled access by an authorised person to the transitory information memory for interrogation of that memory to detect the particular time value stored in any particular location and to determine the identification information stored at that location.

The invention is further described with reference to the accompanying drawings in which:

Figure 1 is a perspective view of a parking lot having a time metering device constructed in accordance with the present invention;
Figure 2 is a block diagram of the electrical circuit of the time metering device of Figure 1;
Figure 3 is a front view of an alternative form of time metering device constructed in accordance with the invention;
Figure 4 is a simplified block diagram of the electrical circuit of the time metering device of Figure 3; and
Figure 5 is in two parts, 5A and 5B, which join on the line X-X to form a more detailed circuit diagram of the time metering device of Figure 3.

In Figure 1, a time metering device in the form of a parking meter 10 is shown adjacent a parking lot 40 having four parking bays indicated by the reference numerals "1", "2", "3" and "4". The meter is connected to meter allowed vehicle parking times in each of the bays 1 to 4. The arrangement is such that users wishing to park in one of the bays must insert coins into the meter whereupon they
are issued with a ticket indicating the amount of
time so bought. Means as described later is provided
for identifying on the ticket the particular bay for
which parking time has been so purchased and for
counting off of this time in the meter so that
parking infringements can be checked by interrogation
of the meter by a parking inspector.

The meter 10 includes a coin receiving chute
11 connected to a coin receiving receptacle (not
shown) inside the casing 10a of the meter. As
shown in Figure 2, switches 12 are positioned
adjacent the chute so as to be actuated by passage
of coins along the chute to the receptacle. In a
manner known per se the switches 12 are so arranged
that each is closed momentarily by passage therepast
of coins of only one unique denomination. Thus,
there may be one switch 12 sensitive to 5 cent
coins, one sensitive to 10 cent coins and one
sensitive to 20 cent coins. As a switch 12 is
operated, a coin detector 14 generates pulses the
number of which is proportional to the denomination
to the particular coin which has passed and operated
that switch 12.

Pulses from the coin detector are delivered to
an up-down counter 16 in such a fashion as to
increment the counter upwards on receipt of each
pulse. Incrementation occurs upwardly from a zero
count to which the detector has been previously
reset by a coin reset circuit 18. Insertion of a
coin or coins thus causes generation of a total
pulse count by coin detector 14 which is proportional
to the total denomination of all coins which pass
switches 12 and, at the end of such passage, the count in counter 16 will be proportional to this total denomination.

Up-down counter 16 is connected by a line 17 to a display device 20 having one part 20a for displaying the count in counter 16 and a second part 20b connected to a bay selector switch 22 positioned externally on the casing of the parking meter for access by a user. Once the user has inserted the desired number of coins, the first part 20a of the display device 20 will display the total count in up-down counter 16 and this count is arranged to be a time indication in, say minutes, proportional to the total coin denomination. This proportionality is selected by presetting switches (not shown) in the coin detector which govern the number of pulses generated by the coin detector per unit coin value.

Bay selector switch 22 permits a user, after having inserted coins into the meter 10, to set up in the selector switch an electrical circuit combination uniquely corresponding to a parking bay which he desires to make use of. As shown, the selector switch may thus have an external knob 22a which is calibrated to enable, in the present case, positioning of the switch at any of the positions 1, 2, 3, 4, marked on the meter body and which correspond to the four parking bays 1, 2, 3 and 4. On such a selection, the second part 20b of the display 20 will give a visual indication of the correspondingly selected parking bay.
A number of second up-down counters 24 are provided, the number of these corresponding to the number of parking bays. These are associated with bay selector switch 22 and, after selection of a particular bay by a user operating bay selector 22, the user presses an enter button 26 which is connected to a control circuit 28 in such a fashion that pressing the button 26 causes the up-down counter 16 to count down and to correspondingly increment one of the up-down counters 24 up. The particular counter 24 which is thus incremented up is that selected by the bay selector 22. The selected counter 24 has its contents quickly upwardly incremented from zero, the zero setting prevailing by automatic resetting immediately the button 26 is pressed. During down counting of the up-down counter 16 under these conditions, a zero condition is eventually reached which is detected by circuit 28 whereupon the circuit 28 is conditioned to stop down-counting in counter 16 and upcounting in the selected counter 24. Then, under control of the control circuit 28, the selected up-down counter 24 is conditioned to be incremented downwardly at a constant time rate until a zero condition is reached after a time interval corresponding to the time which was initially displayed in display device 20. Control circuit 28 is coupled to a clock 31 for generating signals for downward incrementation of counters 24.

At the same time as button 26 is pressed, control circuit 28 causes a printer controller 30 to be operated to actuate a ticket printer 32 which then operates to issue a ticket to the user of the meter. Such ticket may for example include the following information:
the responsible authority controlling the parking bays;
the bay number;
the meter number;
the time of day;
the date;
the amount of time purchased.

By the above arrangements, a user is not easily able to ascertain from the meter 10 which of the bays associated with the meter 10 has free time. Thus, although he can visually see whether a vehicle is parked in any particular bay or not, he has no means of ascertaining from the meter whether a previous occupier of the bay has left under a condition where the time for occupation for the bay as initially purchased by the previous user has expired. In this regard, the up-down counter 16, after being incremented initially to cause a corresponding display in display 20 is, as mentioned, counted down to zero immediately on pressing of the button 26 by a user to obtain his printed parking authorization ticket. Thus, after such down-counting of the down-counter 16, the display 20 is not accessed at any further time to the contents of the counter 16 nor does it display the contents on any of the counters 24. That is to say, there is no direct means of resetting up again in the display device the amounts of time (as represented by the counts in the various counters 24) which are left by previous users of the different parking bays. By this means, a double usage by
persons of purchased parking time is avoided. In fact, the user himself knows the expiration of his parking time since this is on his parking ticket, but this is the only information which is given to users.

The described meter is particularly adapted to control large numbers of parking bays, conveniently between ten and twenty. It may be operated from a suitable power supply circuit which might be charged from solar cells positioned on the top of a long pole above the meter or the meter could be directly operated from an alternating current mains supply.

Provision may be made for examination of the contents of the up-down counters 24 by a parking inspector. As shown, a key actuated interrogation circuit 38 may be provided so that the parking inspector may, by insertion of a key into a key slot 36 on the exterior of the meter, selectively set up in the display device 20 a number corresponding to any selected bay together with the count in the corresponding counter 24.

Figures 3 to 5 illustrate an alternative form of meter 50 constructed in accordance with the invention. The exterior casing of this meter 50 has a key board 52 with a number of keys 54. A display device 56 is positioned also on the exterior, together with two coin slots 58, 60 for different denomination coins.
Referring now to generally Figure 4, the interior circuit of the meter 50 includes a central processing unit 62 which controls the display 56. The CPU 62 is coupled to key board 52 for inputting of information by a user to the CPU 62. CPU 62 has an internal memory for processing instructions and is associated with a random access memory 64 for transitory information. CPU 62 is in turn associated with a switch matrix 66 operable to set up fixed information for use by the meter. The CPU has an associated crystal 67 so as to provide a high frequency clock signal for operation of the circuit.

Two switches 68, 70 are associated with respective coin chutes leading from the coin slots 58, 60 for momentary operation of these switches by coins as these pass the switches. Two further switches 72, 74 are provided to enable interrogation of information held in the circuit. The whole circuit is operated from a battery 75 via a regulator 81.

Broadly speaking, a person wishing to use the meter 50 first of all inserts coin or coins of number and nomination sufficient to buy an amount of parking time in accordance with displayed information in the vicinity of the meter. Either or both the switches 68, 70 are thus operated once or more than once in accordance with passage of the coins therepast. The CPU 62 then operates to set up, in a first part 56a of the display 56, the amount of time which has thus been bought. The amount of time is determined by a proportional relationship between
time and coin value, which proportional relationship is established by matrix 66. Immediately upon such setting up of this display, the CPU 62 causes a second part 56b of display 56 to be conditioned to give a display indicating that action is required now by the user of the meter. In this regard, part 56b comprises three indicators 76, 78, 80 which can be selectively lit up under control of CPU 62. Adjacent to each of these indicators is printed information 83 (Figure 3) indicating the significance of lighting up particular ones of these. Normally, indicator 80 is lit to indicate that "time" is being displayed by display device 56. However, on the setting up of the initial "bought time" display in part 56a, as described, CPU 62 causes indicator 78 to be flashed and adjacent this is written the instruction "Enter bay No ". Then, the user presses the selected ones of the keys 54 which correspond to a desired empty parking bay the user wishes to use, followed by an "enter" button "E" of keyboard 52. On pressing the enter button, the entry of the bay number is effected by the CPU 62 in the following manner. Firstly, CPU 62 first controls a third part 56c of the display 56 to display an indication corresponding to the selected bay number. Secondly, the random access memory 64 is accessed and, at a storage location corresponding to the selected bay number, the bought time previously set up in display 56a is entered.

Upon completion of entry of a bay number, the CPU 62 causes indicator 78 to be flashed, this being adjacent a direction on the meter reading "Enter Car Number". Then, the user may enter into the
memory 64, under control of the CPU 62, three digits corresponding to digits of the users' vehicle registration number. This entry is effected by pressing appropriate ones of the keys 54 of keyboard 52 followed by the enter key of the keyboard. After this entry, the user transactions are completed and the meter display reverts to the normal condition. This may be a blank state of display device 56 or may, for example, be a state at which the time of day is displayed.

Like the meter 10, the meter 50 is, as will be appreciated from the above, organized so that once a user has purchased his time and entered the bay number and registration details, the display no longer displays the amount of time purchased. Indeed, the amounts of time purchased are stored only in the corresponding locations in memory 64 and are not henceforth normally displayed by the display device 56.

Once entry of bought time, bay number and registration number has been effected by a user, the clock incorporated into CPU 62 is operated in such a fashion as to downwardly increment the initially stored bought time value in each storage location. This downward increment is effected to a zero condition at a constant rate such that the zero condition is reached in each storage location at the end of the bought time value stored therein.

A purchaser of time by use of the meter 50 can at any time access the meter in order to determine how much time is left at the particular parking
bay which he occupies. This is done by the following procedure:-

(a) pushing the enter button of keyboard 52, whereupon the display device 56 
operates to cause flashing of indicator 78 (i.e. to instruct subsequent entry 
of the abbreviated car registration number); and 

(b) by entry of the abbreviated car 
registration number by pressing 
appropriate keys 54 followed by the enter 
key. Then, the display will show the 
bay number (in display part 56c) and the 
time remaining (in display part 56a). 
These displays are arranged to disappear 
after a pre-determined time, such as one 
minute.

By the above procedure, no other user of the meter 
50, without a knowledge of the registration number 
of a car occupying a parking bay, can determine 
readily the amount of time remaining of the total 
time purchased by that user. Thus, once an initial 
user has left a parking bay, a subsequent user 
cannot readily access the meter 50 in a fashion which 
will enable him to, for example, select a parking bay 
for which there is still some parking time left as 
purchased by a preceding user.

Infringement detection by a parking inspector 
may be readily effected with the meter 50. Thus, 
the meter 50 has on its exterior a key lock 59 
into which a key may be inserted operable to effect
closure of switches 72, 74 selectively in a fashion such as to ready the CPU for interrogation of the memory 64. This interrogation is effected firstly by the parking inspector entering a preselected number code via the keyboard 52 whereupon the meter operates to display in sequence, on display 56, the numbers of all parking bays for which the purchased time has expired. This readout may be effected in the following format, such as sequentially:

(a) bay number;
(b) car number;
(c) time after expiration;

Removal of the parking inspector's key from keylock 59 restores the meter to normal operation. In a similar fashion, money collection may be effected by a parking inspector or other authorized person inserting a key into a two-position key lock 71 on the exterior of meter 50. When the key is inserted and is positioned at a first position thereof, CPU 62 is conditioned to permit the authorized person to input a particular code number to the CPU 62 via keyboard 54, which code number when correctly validated by the CPU 62 is answered by a readout on display device 56 of the number of coins of each of the two denominations which have been collected. The second position of the key permits the authorized person to open up the meter in the conventional fashion for money removal. Removal of the key cancels stored totals of coins of each denomination held in the meter and returns the meter to its normal mode of operation. The totals themselves are accumulated under control of CPU 62 in memory 64 as coins are inserted to operate switches 68, 70.
The circuit for the meter 50 is shown in more detail in Figure 5. Here, the CPU 62, with its crystal 67 and associated memory 64 (in this case in the form of two memory parts 64a, 64b) is shown. Also shown are two portions 66a, 66b of the switch matrix 66, the keyboard 52, display device 56 and switches 68, 70, 72, 74. The keyboard 52 is interfaced with the CPU 62 via a main data bus 84 and a port "A" of the CPU. The display device 56 is driven by four segment drivers 86, 88, 90, 92 which interconnect the display device with the data bus 84 and a CPU port "B". The memory parts 64a, 64b are accessed from the data bus 84 with the aid of an address latch 95 which is connected directly to the memory parts 64a, 64b and indirectly to the switch sections 66a, 66b by gates 94, 96.

Each switch portion 66a comprises a matrix of three switches each of which has ten different positions and indicator means to indicate which of the positions at which each switch is set. These two switch portions 66a, 66b provide for presetting the proportionality between time and coin denominations for the respective two coin denominations which can be accepted by the meter.

Although as described, the CPU 62 operates to effect storage of the integrated total of coin denominations applied to the meter over a period, the meter includes a separate electro-mechanical counter arrangement which permits maintenance of long-term records of total coin collection. Thus, one of the digit drivers, namely digit driver 86, is coupled via a monostable 98 and buffer 100 to operate two
counters (C1, C2), the coils 97, 99 of which are shown, whenever a switch 68 or 70 is operated to detect a coin. The pulses provided by driver 86 are such that one pulse is delivered for every coin. It will be observed that the buffer 100 is also coupled to receive information from one segment driver 90, which information includes information as to the coin denomination. The buffer 100 is thus operated from the monostable 98 in such a fashion to cause application of a pulse to whichever of the coils 97, 99 corresponds to a particularly detected coin denomination. The counters associated with coins 97, 99 thus accumulate long-term coin totals, and are not reset on each retrieval of money from the meter.

As in the meter 10, meter 50 is arranged so that, whenever a user inserts coins into the meter and subsequently correctly operates keyboard 52 to indicate a bay number and registration number for storage, the particular memory location selected for storage of this data together with the time value of purchased time has the time value previously stored therein replaced by the new value even if the previously bought time had not expired. In this way, dual usage by different persons of time purchased by one person is avoided.
CLAIMS:

1. An electronic time measuring device (10/50) comprising a display device (20/56), a timing device (24,31/62,67,64), control means (28/62), operable to set the timing device (24,31/62,67,64) in operation for pre-determined time period, the display device (20/56) being arranged whereby to give a display corresponding to said predetermined time period, and for this display to be inhibited before the predetermined time period is expired.

2. An electronic time measuring device (10) as claimed in claim 1 having a first up-down counter (16), said timing device (24,31) including a second (24) up-down counter the first up-down counter (16) being associated with a coin detector (14) which in use generates a signal pursuant to passing by the user of a coin to the detector (14) to upwardly increment the first counter (16) in accordance with the denomination of said coin; coupling means (17) being provided in use coupling said first counter (16) to said display device (20) whereby the said display is given by said display device (20) in accordance with the count in the said first counter; said control means (28) being selectively operable after said coin has been passed by a user to the detector (14) to transfer said count to said second counter (24) and to then downwardly increment said second counter (24) over said predetermined time period.

3. An electronic time measuring device (10) as claimed in claim 2 wherein a printer device (30) is
provided connected, on operation of the control means (28) to effect said transfer, to print a ticket indicating thereon said predetermined time period.

4. An electronic time measuring device (10) as claimed in claim 2 or claim 3 wherein there are a number of said second counters (24) and said control means (28) is operable in conjunction with a selector (22) to permit a user to selectively couple any desired one of these to receive the count from the said first counter (16).

5. An electronic time measuring device (10) as claimed in claim 1 wherein the display device (56) is coupled for transfer of signal information there-to under control of a central processing unit (62) incorporating a clock (67) said central processing unit (62) comprising said control means (62).

6. An electronic time measuring device (50), as claimed in claim 5 wherein said central processing unit (62) is at least associated with a transitory information memory (64) for storing transient information, the central processing unit (62) also providing a coupling between the display device (56) and a coin detector (68, 70), for detecting the denomination of coins in use provided by a user to the metering device.

7. An electronic time measuring device (50), as claimed in claim 6 wherein, in use, the central processing unit (62) operates to cause the display device (56), on detection of a coin by the detector (68, 70), to effect said display as an indication of time.
corresponding to the said predetermined time period and in accordance with the said denomination of said coin.

8. An electronic time measuring device (50) as claimed in claim 7 wherein said control means (62) further includes a user operable selector (52) for enabling the user, pursuant to setting up said display in said display device (56) to access a particular memory location in said transitory information memory (64), and to store therein at that location, under control of the central processing unit (62), a time value corresponding to the said predetermined time period as then displayed by the display device (56).

9. An electronic time measuring device (50) as claimed in claim 8 wherein the central processing unit (62) is arranged to operate in conjunction with said clock (67) to increment the stored time values in each said location downwardly to a zero count after respective times in accordance with the time values stored at each such location, so that the clock, together with the central processing unit (62) and transitory information memory (64) comprise the said timing device.

10. An electronic time measuring device (50) as claimed in claim 9 wherein said central processing unit (62) operates to inhibit display of the time periods stored in each location, at least after initial setting up of the said display following detection of a coin by said coin detector (68, 70).
11. An electronic time measuring device (50) as claimed in claim 10 wherein said inhibition is effected by decoupling the transitory information memory (64) from the display device (56).

12. An electronic time measuring device (50) as claimed in claim 10 arranged for further access to said transitory information memory (64) by a user to enable storage by the user of a user identification at the storage location corresponding that which the user selects by use of said selector (52).

13. An electronic time measuring device (50) as claimed in claim 11 or claim 12 wherein means (72, 74, 59) is provided admitting key controlled access by an authorised person to the transitory information memory (64) for interrogation of that memory (64) to detect the particular time value stored in any particular location and to determine the identification information stored at that location.

14. An electronic time measuring device (50) as claimed in any one of claims 8 to 13 wherein said control processing unit (62) operates to replace a previously stored time value at each said storage location in said memory (64) when said storage of a said time value at that location occurs.

15. An electronic time measuring device (10) as claimed in claim 4 arranged for resetting of each second counter (24) prior to entry therein of a count from the first counter (16).
16. An electronic time measuring device (10/50) as claimed in claim 1 arranged whereby on setting the timing device (24,31/62,67,64) in operation, the timing device (24,31/62,67,64) operates for said predetermined period only regardless of whether any preceding predetermined period for operation of the timing device (24,31/62,67,64) was concluded.
INTERNATIONAL SEARCH REPORT

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all)

According to International Patent Classification (IPC) or to both National Classification and IPC

Int. Cl\(^3\), G07F 17/24, G07C 1/30, G04F 3/06

II. FIELDS SEARCHED

Minimum Documentation Searched \(^4\)

Classification System Classification Symbols

IPC G07F 17/24, G07C 1/30.

Documentation Searched other than Minimum Documentation to the extent that such Documents are Included in the Fields Searched \(^5\)

AU:IPC as above; Australian Classification 00.12, 55.716

III. DOCUMENTS CONSIDERED TO BE RELEVANT \(^4\)

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<td>P, A</td>
<td>AU, A, 35836/78 (513779), published 1979, November 8, Verhoeven.</td>
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* Special categories of cited documents: \(^1\)
  "A" document defining the general state of the art
  "E" earlier document but published on or after the international filing date
  "L" document cited for special reason other than those referred to in the other categories
  "O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but on or after the priority date claimed

"Y" later document published on or 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

IV. CERTIFICATION

Date of the Actual Completion of the International Search \(^3\)

17 November 1980 (17.11.80)

Date of Mailing of this International Search Report \(^3\)

19 November 1980 (19.11.80)

International Searching Authority \(^1\)

AUSTRALIAN PATENT OFFICE

Signature of Authorized Officer \(^10\)

A.A. Moore

A.S. Moore.