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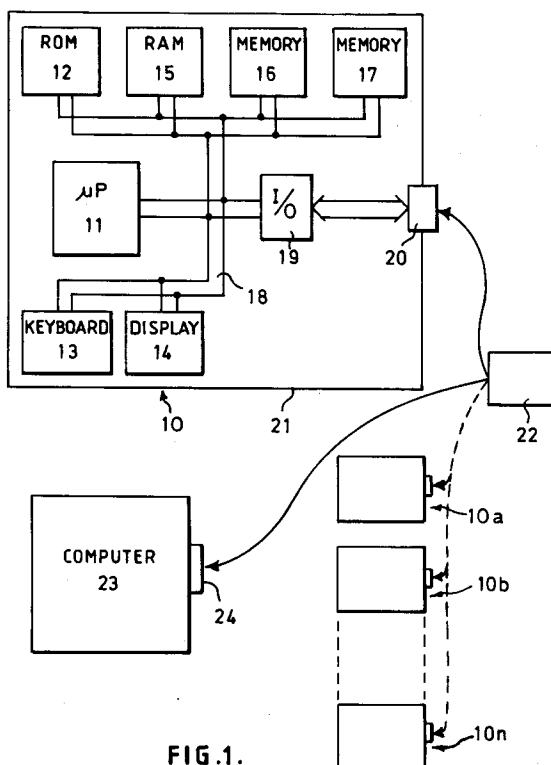
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London WC1B 5AA(GB)**(54) **Postage meter monitoring and control.**

(57) A method of monitoring use of postage meter (10) during a period of time is disclosed in which, at the start of the period, meter identification and accounting data is read from the meter and input to a control computer (24) and at the end of the period meter identification and updated accounting data is read from the meter and input to the control computer. A meter record relating to use of all meters monitored by the control computer is stored in the computer. Consecutive inputs to the computer of accounting data relating to the meter are compared and if the second of two inputs relates to accounting data at the end of a period, the second input is written to the meter record in the computer. Conveniently the data may be conveyed from the meter to the computer by means of portable memory device (22). The memory may carry a pseudo-random number from the computer which is compared with a pseudo-random number generated in the meter and if the comparison is successful permits operation of the meter for franking.

**FIG. 1.**

This invention relates to postage meters for franking mail items and in particular to the monitoring and control of the use of such meters at postal authority counters.

Franking meters for franking mail items with a value of postage are well known. Such meters are usually installed in those offices where a relatively large number of mail items need to be franked each day. The meters include electronic accounting circuits for maintaining records relating to usage of postage value in franking of mail items. The accounting records maintained by the accounting circuits are stored in non-volatile memories and provide an accounting basis for payment by the user to a postal authority of postage value used by the user in franking mail items.

For those users of the mail services who have relatively small numbers of mail items to be handled by the postal authority it is necessary for those users to purchase postage stamps and to stick them to the mail items.

It would be convenient for those users who have relatively small numbers of postal items and for the postal authority if the postal authority provided postage meters on counters at the offices of the postal authority for franking of mail items for members of the general public. This would reduce the need for printing of postage stamps and users of the service would merely need to insert mail items into the postage meter instead of having to purchase and stick stamps thereon. A further benefit would be provided to the postal authority in that the electronic accounting circuits of the postage meters would automatically provide records of sales of postage value and would alleviate the present requirement for manually keeping account of sales of postage stamps.

The use by members of the general public of postage meters provided at postal authority counters would be controlled by counter assistants. Payment for the postage value used would be made to the counter assistants and they would be responsible for the monetary value of postage amounts used in franking mail items. However in the normal course of operating the postal service counter any postage meter may be controlled at different times by a number of different assistants. For example an assistant may be responsible for use of a meter for a shift period and relinquish control of the meter during a break period. The meter may be out of use during the break period or may be controlled by another assistant. Accordingly since each assistant is responsible for the monetary value of sales of franked postage value, it is required that an accounting system is provided to record the value of sales attributable to each assistant.

According to one aspect of the invention a

method of monitoring use of a postage meter in carrying out franking operations during a period of time is characterised by the start of said period of time the steps of conveying meter identification data and first accounting data from registers in the meter and inputting said identification data and first accounting data to a computer; and writing said accounting data to a meter record identified by said meter identification data; and at the finish of said period of time the steps of conveying said identification data and second accounting data from registers in the meter and inputting said identification data and second accounting data to the computer; utilising said meter identification data to access said meter record identified by said meter data; comparing said second accounting data with said first accounting data to determine whether the second accounting data relates to the start or finish of a time period and if said second accounting data relates to the finish of the time period writing the second accounting data to the meter record.

According to a second aspect of the invention a method of carrying out franking operations during a period of time is characterised by the steps of providing a portable memory device carrying a pseudo-random number unique to the postage meter to be controlled; generating a pseudo-random number in said meter; coupling the portable memory device to said postage meter; for each franking operation comparing the pseudo-random number carried by the portable memory device with the pseudo-random number generated in said meter and only in response to said comparison indicating that the pseudo-random numbers have a predetermined relationship permitting a franking operation to be effected by said postage meter.

The invention will now be described with reference to the drawings in which:-

Figure 1 illustrates a postage meter for use on a postal authority counter and a computer for maintaining account records relating to usage of the meter, and

Figure 2 is a flow chart of a program routine for a computer monitoring usage of the postage meter.

Referring first to Figure 1, a postage meter 10 is disposed on a postal authority counter for use by members of the general public. The postage meter comprises a microprocessor 11 operating under program routines stored in a read only memory (ROM) 12 to carry out accounting and control functions in the meter. Data such as a desired postage amount is input to the microprocessor by means of a keyboard 13 and information for assisting the user of the meter is displayed by display device 14. A random access memory 15 is provided for use as a working store by the microprocessor and non-volatile memories 16, 17 are provided for stor-

ing accounting data. The keyboard, display, read only memory, random access memory and non-volatile memories are connected to the microprocessor by a bus 18. As is known in postage meters, the non-volatile memories 16, 17 include registers for storing accounting data. An ascending register stores an accumulated value of postage used in franking mail items, an items register stores the number of items franked and a high items register stores the number of items franked with a postage value above a predetermined value. In order to ensure integrity of the accounting data, each of the registers are replicated in the memory devices 16, 17 such that each device includes two of each register. A further register stores meter identification data.

An input/output interface 19 which includes a multi-way socket 20 is also connected to the microprocessor 11. The socket 20 extends through the secure housing 21 of the meter to receive a mating plug of a portable memory device 22.

While one postage meter 10 has been described, it is envisaged that a number of identical postage meters 10a, 10b ...10n will be provided at sales positions on a counter of a postal authority office.

A computer 23 for monitoring and accounting for use of the postage meters 10 is provided with an input output interface comprising a socket 24 identical to the socket 20 of the postage meters. Conveniently the computer may be a so-called personal computer.

The construction and operation of the portable memory device 22 and the input/output interface circuit 19 is described in our GB Patent Specification 2173738. However in that specification the portable memory device is utilised for conveying credit data from a postal authority equipment to a postage meter for the purpose of re-setting the credit register of the postage meter with additional credit funds.

In the system of monitoring and accounting for usage of the postage meters 10, 10a...10n to be described herein, the portable memory device is capable only of receiving data from the registers of the postage meters and of outputting this data to the computer. Such a portable memory device will be referred to herein as a read-only device. While the construction of a read-only device may be the same as described in our patent specification referred to hereinbefore, a flag is stored in a memory location thereof which prevents use of the device for credit resetting. The flag in the memory device is set by plugging the device into the socket 24 of the computer and operating the computer under a memory initialisation program routine to set the flag. The portable memory device is then ready for use in monitoring usage of the postage meters.

When a member of the counter staff starts a shift as an operator of one of the postage meters the operator inserts an initialised portable memory device into the socket of the postage meter to be monitored. The postage meter is operated under control of a program routine to read out the data contents of the account data registers in the memory devices and to write the data into the memory of the portable memory device. In addition the meter identification is read out and written into the portable memory device. The memory device is then unplugged from the postage meter and plugged into the socket 24 of the computer. The computer is operated under a register data input program routine to read out the data from the portable memory device and to check that the data read from the portable device is valid. The operator then removes the portable device from the computer and re-inserts the portable device into the socket 20 of the postage meter. The postage meter is then ready for operation under a franking program routine to carry out franking operations. In the course of carrying out franking operations the data in the registers is modified in accordance with the value of postage used in franking items and the number of items franked. At the finish of a shift when the operator ceases to monitor and control use of the postage meter, the postage meter is again operated under the program routine to read out the new data contents of the registers and to write the new data to the portable memory device. After read out of the registers, the portable device is removed from the postage meter and plugged into the socket 24 of the computer. The computer is then operated again under the read register data program routine to read the data from the portable memory device. Thus at the start of a shift when the portable memory device was inserted in the socket of the computer, the computer received the register data prior to the postage meter being used during the shift. When the portable device is next plugged into the socket of the computer, the computer receives the register data of the postage meter as at the finish of the shift. Accordingly the computer can compare the register data received in successive readings to determine the value of postage used during the course of the shift.

As a part of the register data input routine illustrated by the flow chart of Figure 2, the computer checks the data currently received from one of the postage meters with the data last received from that postage meter. If the data is unchanged it indicates that the current data relates to the register data at the start of a shift and that the previous data related to the end of a shift whereas if the current data differs from the previous data and the accumulated value in the ascending register and the number of items franked have been incre-

mented it indicates that the current data relates to the end of a shift and the previous data related to the start of a shift. The computer will display to the operator its determination of whether the current register data relates to the start or end of a shift. The operator will be prompted to confirm or deny the determination carried out by the computer. The computer will not accept data indicated by the operator to be shift start data if the previous register data received by the computer does not relate to shift end. Similarly the computer will not accept data indicated to be shift end data if the previously received data does not relate to shift start data. Thus each time the computer receives register data from the portable memory device, the data is compared with the data last received to determine whether it is start or end shift data and the computer will accept the data for meter records maintained by the computer only if the data received is determined to relate to the opposite end of the shift from the end to which the data received relates.

As hereinbefore described the portable memory device provides a means whereby register data is read from the postage meter and input to the computer at the start and finish of each shift. As part of this procedure it is required that a portable memory device which is assigned to a specific postage meter at any point in time can be used only with that specific meter and not with any other meter and that only the assigned portable memory device can be used with that specific postage meter. This is achieved by the use of a transaction identity code (TID) which is unique to each meter and to each shift in which that meter controlled. The transaction identity code is a pseudo-random number generated by a pseudo-random number generator in the computer and by a pseudo-random number generator in the postage meter. Each pseudo-random number generator is arranged to generate pseudo-random numbers in sequence and incrementing from one pseudo-random number to the next in the sequence is effected in such a manner that both generators are maintained in step with one another.

It will be appreciated that the computer is operable to generate a plurality of series of pseudo-random numbers corresponding respectively to the plurality of postage meters associated with the computer. At the start of a shift in respect of a specific one of the postage meters, the portable memory device is signed-on to the computer and has stored therein a current TID associated with that specific meter. When the meter is to be operated in conjunction with the portable memory device, the meter compares the TID stored in the portable memory device with the TID currently generated by the pseudo-random number generator in the meter. Operation of the meter is permit-

ted only if the comparison is successful. At the end of the shift, as described hereinbefore, the register data in the meter is read out and stored in the portable memory device and the device is then removed from the meter and plugged into the computer to enable input of the register data to the computer. The program routine for reading out the register data at the end of a shift includes incrementing the TIP to the next pseudo-random number of the series. Thus if the portable memory device is reconnected to the meter, the TID in the portable memory device will not compare with the TID generated by the meter and the meter will be inhibited from operation in conjunction with that device. When the portable memory device is connected to the computer, the computer carries out a comparison of the TID in the device and the TID currently generated by the pseudo-random number generator in the computer for the specific postage meter with which the device has been used. If the comparison is successful, the register data from the portable device is accepted by the computer and entered into the records for that specific meter. The pseudo-random number generator in the computer for the specific meter is then enabled to be incremented to generate the next TID of the series which will be used to control use of the portable memory device in the next shift in which that specific meter is controlled.

The writing of the current TID into the portable memory device at the start of a shift may be effected by the computer or by the meter which is to be controlled. Thus prior to reading the register data, the portable device may be connected to the computer to receive the current TID for a specific meter or the portable device may receive the TID as a part of the reading of the register data from the meter. It is envisaged that the TID will remain the current TID throughout the reading of register data at the start of a shift, control of the operation of the meter during the shift and reading of the register data at the end of the shift. However if desired the TID may be incremented more frequently and for example one TID may be used when the portable device is used to convey register data at the start of a shift, a second TID may be used during control of operation of the meter and a third TID may be used when the portable device is used to convey register data at the finish of the shift. It will be appreciated that incrementing of the TID at the meter and at the computer is effected in such a manner that, with correct use of the portable memory device for conveying data from the meter to the computer, the TID generated at the meter or computer to which the portable device is connected is identical or has a predetermined relationship with the TID carried by the portable device.

Access to the system is limited to authorised personnel and this may be achieved by a requirement in the program routines under which the computer is operated for the entry by the operator of a log-in name specific to that operator and of a password. A new operator may be authorised for access to the system by a procedure carried out by an authorised supervisor. The computer contains data relating to authorised supervisors and the log-in names and passwords to be used. Accordingly when an attempt is made to access the system for authorisation of a new operator, the computer operates in a program routine to check that a log-in name and password for an authorised supervisor has been received and only if this check is positive does the computer continue in the routine to receive authorisation data for the new operator.

Normally the start of a new shift cycle is not permitted by the computer until after the finish of the previous shift cycle has been confirmed and recorded by the computer. In the event that a portable memory device is lost, develops a fault or is inadvertently removed by an operator without recording the finish of a shift, a program routine is provided to enable a supervisor to complete the recording of the previous shift cycle to thereby enable the start of a new shift for a specific postage meter.

At the finish of a shift when the register data is read into the portable device and the device is removed from the meter, the portable device is no longer able to be used for control of operation of that meter or any other meter until it has been signed-on again for the start of a shift because the TID in the portable device no longer compares with the TID in the meters. While specific portable devices may be assigned to specific meters it will be appreciated that any one of a number of portable devices may be used with any meter provided that the chosen portable device has been signed-on for the specific meter with which it is to be used by writing the TID corresponding to that specific meter into the portable device. However at any instant of time only one portable device is able to carry the TID currently corresponding to any meter and hence at any instant of time only one portable device is enabled to be used with any one meter.

When a new postage meter is installed in the system, a record for that meter is set up by the computer. Installation of the meter is effected by plugging the portable memory device into the meter to read out register data from the meter as described hereinbefore. The portable memory device is then plugged into the computer and the computer is operated to perform a meter installation program routine in which a meter record for the new meter is set up and the register data in the

portable memory device is read in as initial meter data.

It will be understood that the meter identification data enables separate records to be maintained by the computer for each meter in the system. Accordingly each time meter register data is read out into the portable memory device, the meter identification data is read out so that when the portable memory device is plugged into the computer, the computer can determine from which meter the register data has been received. The computer is operated to provide facilities to store an audit trail for each meter which may be inspected to enable reconciliation of postage meter transactions over a period of time. The computer can be utilised to provide reports of shift account data and management reports.

The computer may be provided with printing means whereby reports relating to usage of the meters may be printed under control of the computer. A daily report may be printed showing the total value of postage franked by each postage meter in the system, each meter being identified by its identification data. The daily report preferably provides a summary of the total funds received in all completed shifts for all the meters in a day. A meter report may be printed showing the start and finish register data for a meter.

The franking program routine under which the postage meters are operated to frank mail items includes a sub-routine which checks that the portable memory device is plugged into the meter. Thus when the portable memory device is removed from the postage meter, the meter is inoperative to carry out franking operations.

The meter identification data and account data may be written to the portable memory device without encoding or other security measures since this takes place within the environs of the postal authority. However when it is desired to provide secure conveyance of the data, for example to prevent fraudulent tampering with the data, the data may be encoded. A further degree of security may be provided by the system requiring meter identification data and account data to be written under the control of a supervisor.

Claims

1. A method of monitoring use of a postage meter in carrying out franking operations during a period of time characterised by at the start of said period of time the steps of conveying meter identification data and first accounting data from registers (16, 17) in the meter (10) and inputting said identification data and first accounting data to a computer (24); and writing said accounting data to a meter record iden-

tified by said meter identification data; and at the finish of said period of time the steps of conveying said identification data and second accounting data from registers (16, 17) in the meter and inputting said identification data and second accounting data to the computer (24); utilising said meter identification data to access said meter record identified by said meter data; comparing said second accounting data with said first accounting data to determine whether the second accounting data relates to the start or finish of a time period and if said second accounting data relates to the finish of the time period writing the second accounting data to the meter record.

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2. A method as claimed in claim 1 further characterised in that the meter identification data and accounting data are conveyed from the meter (10) to the computer (24) by reading the data from registers (16, 17) in the meter and writing said data into a portable memory device (22) when the portable memory device is connected to the meter and then disconnecting the portable memory device from the meter and connecting it to the computer and while connected to the computer reading the data from the portable memory device and inputting said data to said computer.

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3. A method as claimed in claim 1 or 2 further characterised in that the meter (10) is operative to carry out franking of mail items only when the portable memory device (22) is connected to the meter (10).

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4. A method of controlling use of a postage meter in carrying out franking operations during a period of time characterised by the steps of providing a portable memory device (22) carrying a pseudo-random number unique to the postage meter (10) to be controlled; generating a pseudo-random number in said meter; coupling the portable memory device to said postage meter; for each franking operation comparing the pseudo-random number carried by the portable memory device with the pseudo-random number generated in said meter and only in response to said comparison indicating that the pseudo-random numbers have a predetermined relationship permitting a franking operation to be effected by said postage meter.

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5. A method as claimed in claim 4 further characterised by the steps of utilising the portable memory device (22) to convey data stored in registers (16, 17) of the postage meter (10) at the start and finish of the time period to a

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control computer (24).

6. A method as claimed in claim 5 further characterised by the step of generating in the control computer (24) the pseudo-random number generated in the postage meter (10).
7. A method as claimed in claim 6 further characterised in that the pseudo-random numbers generated in the postage meter (10) and the control computer (24) are incremented at least once for each time period for which the postage meter (10) is controlled.

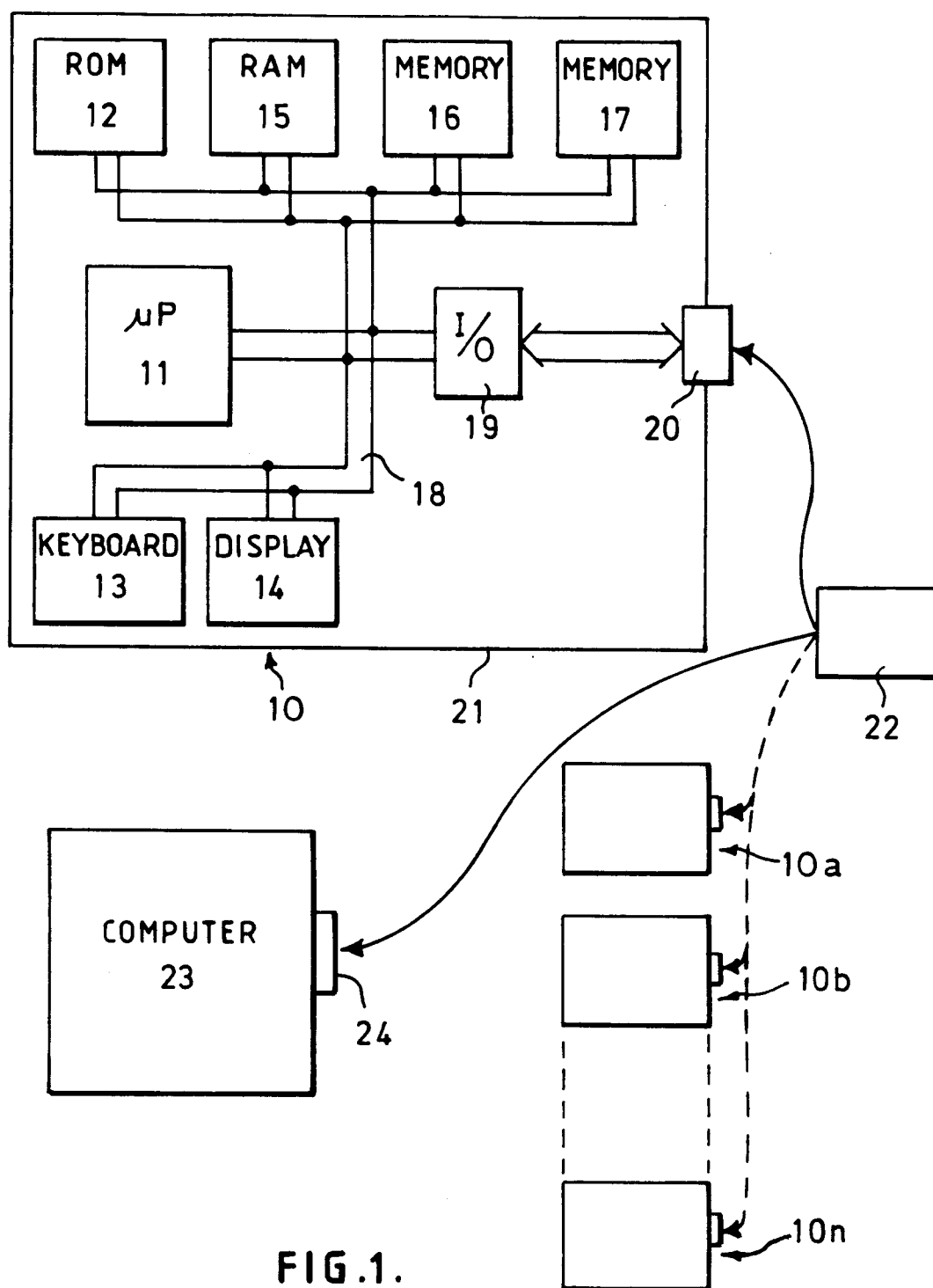


FIG.1.

