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(54) Interrogation of coin operated equipment

(57) Apparatus for the interrogation of coin operated equipment, comprising a coin data unit (16) in the equipment, said unit having a microprocessor controlled memory (32) partitioned into areas into which input information relating to differing operations performed on the equipment is appropriately distributed, some in conjunction with storage of real time data derived from a real time clock (36) provided in said unit, and an interrogator unit (20) alternatively connectible to said data unit and a download computer (26), said interrogator unit also having a microprocessor controlled, partitioned memory for selective storage of information retrieved from the data unit, some for immediate usage by a built-in printer and some for subsequent transmission to said computer.

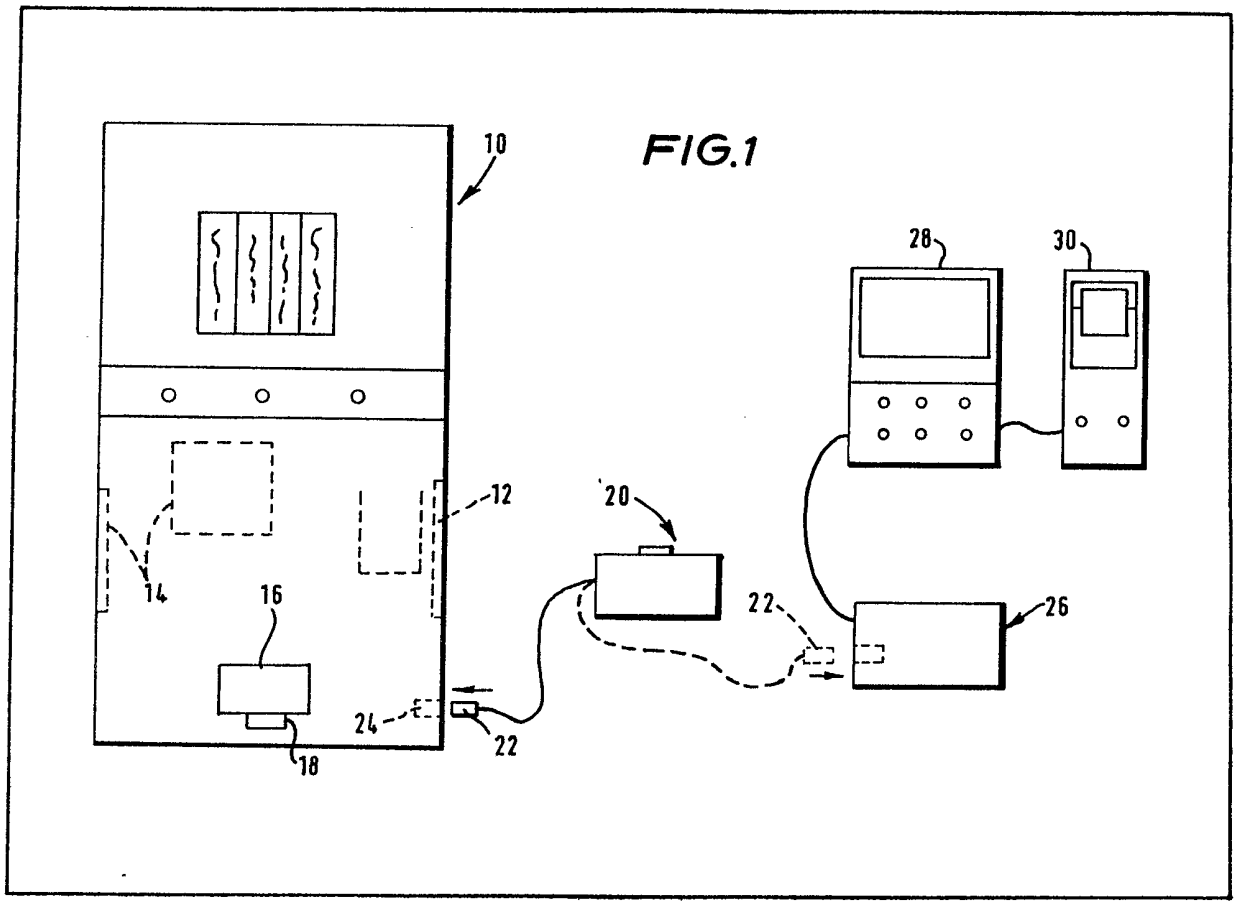

FIG.1

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The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.

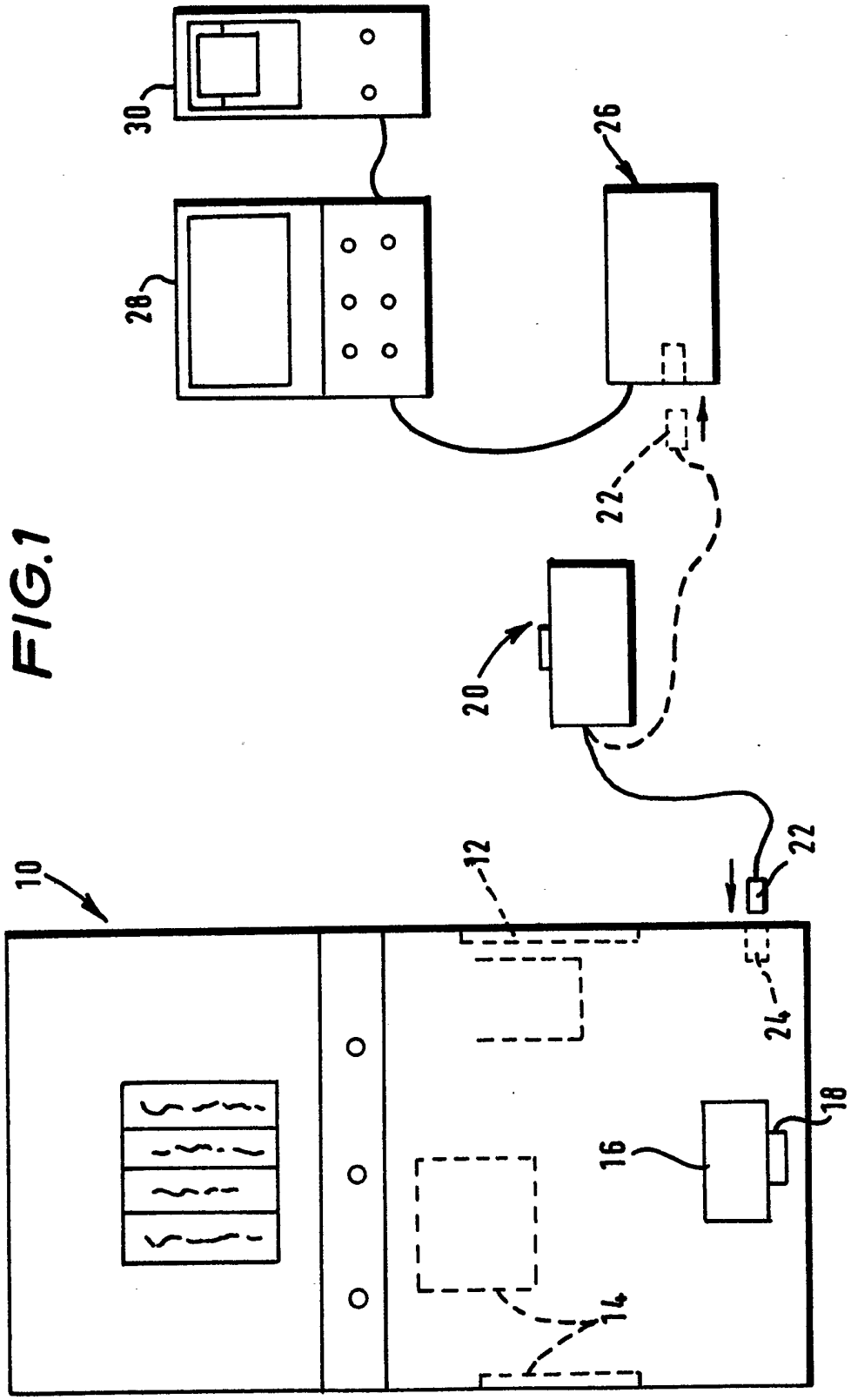


FIG.1

FIG. 2

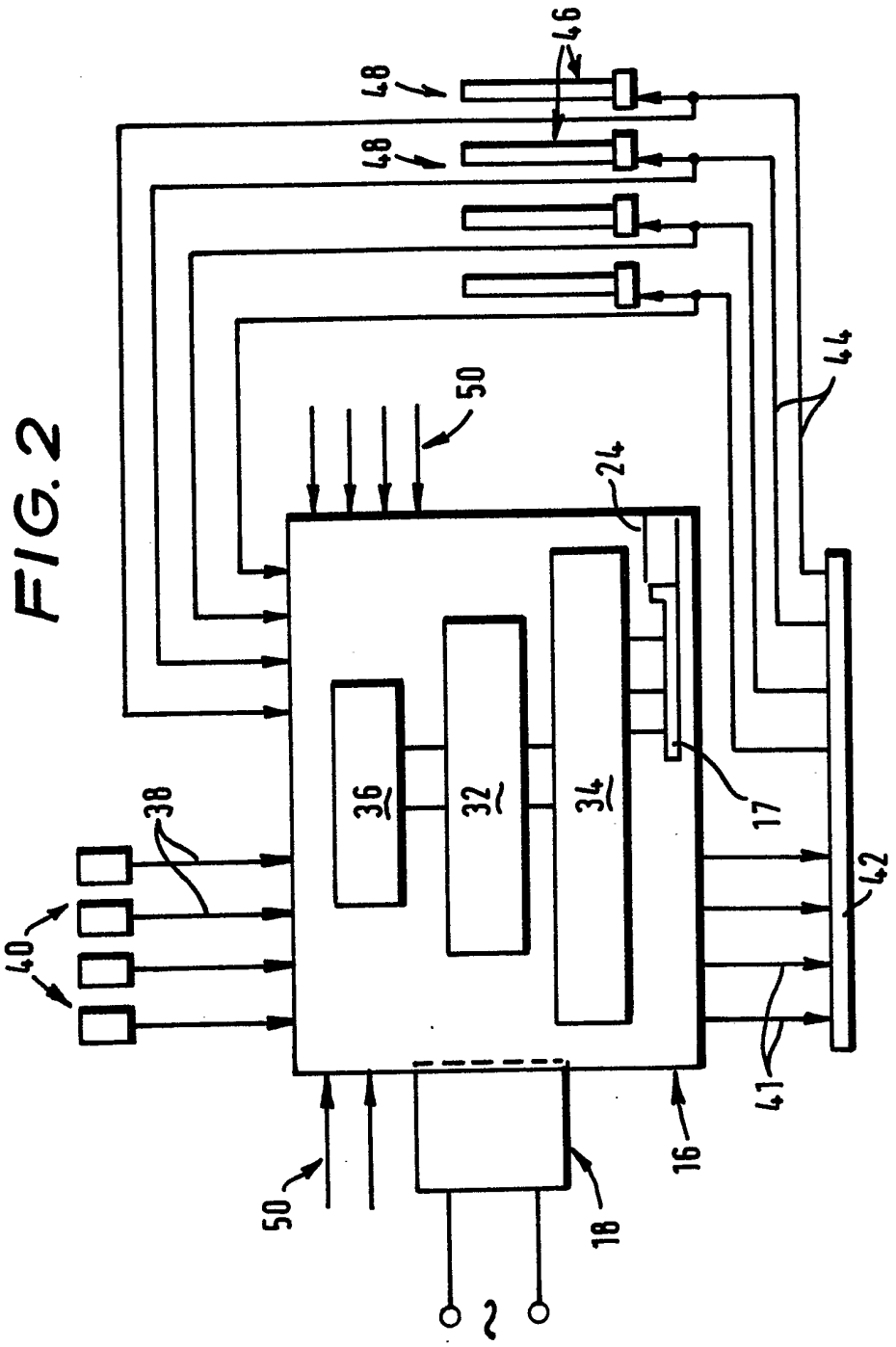
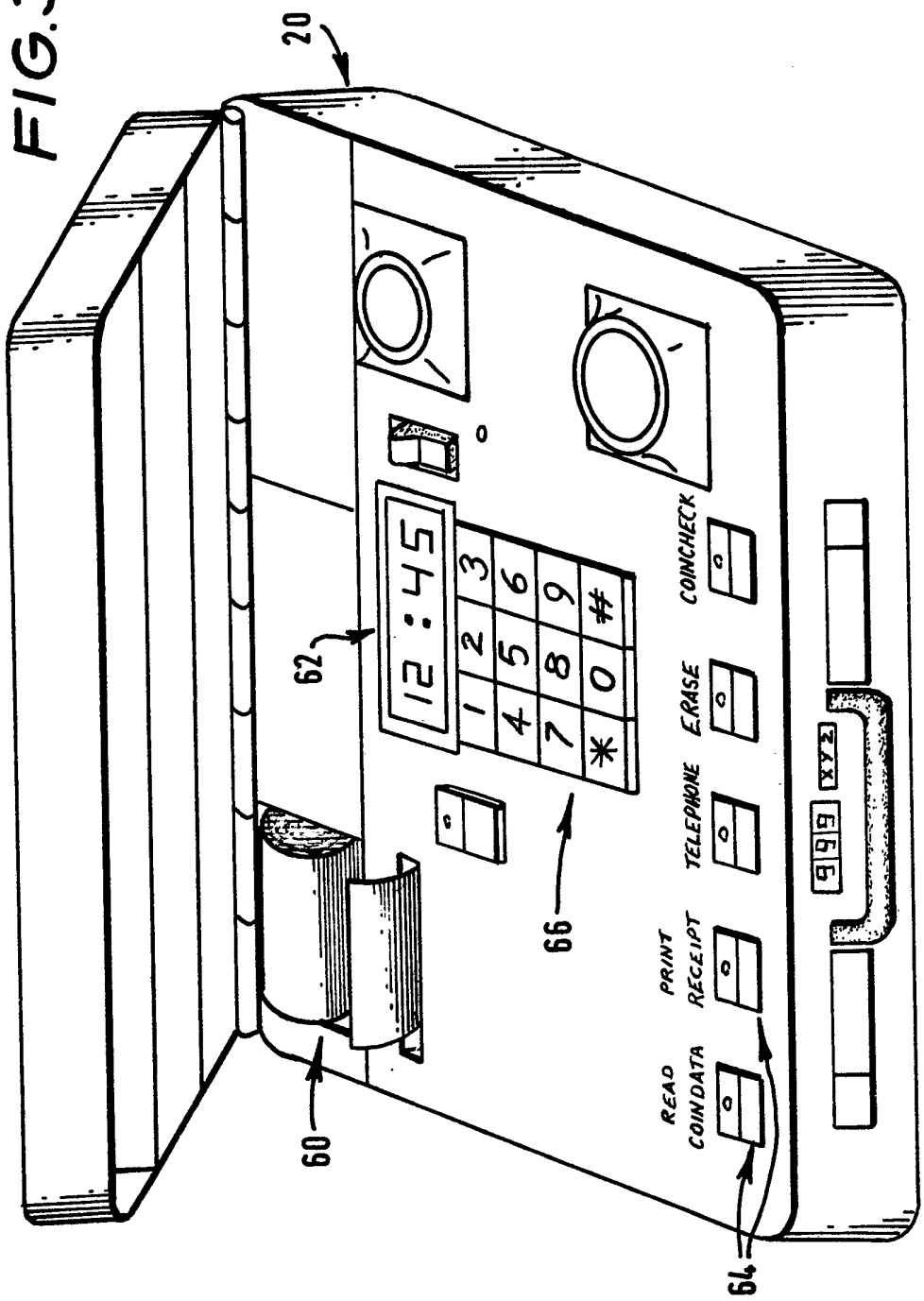


FIG.3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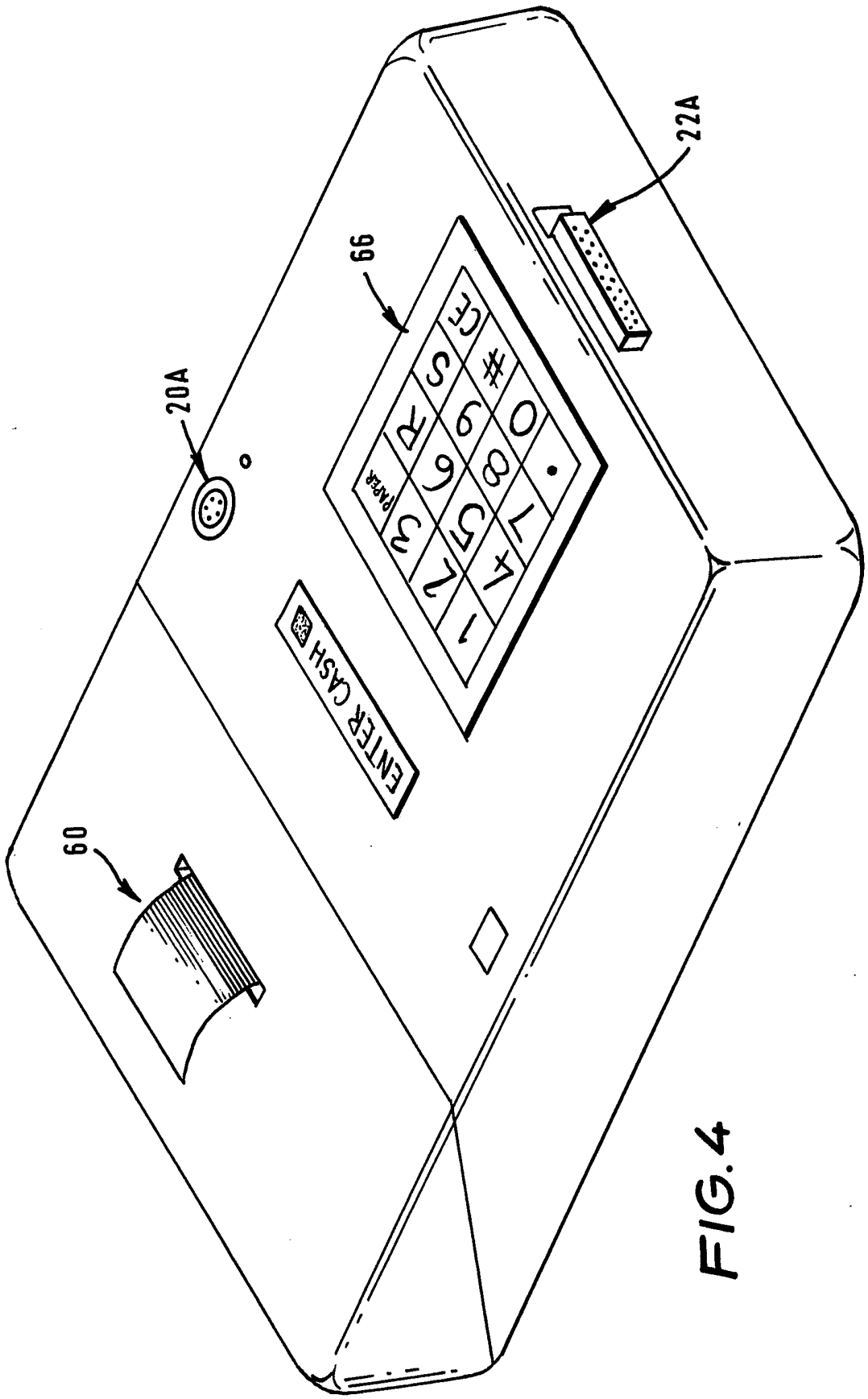

FIG.4

SPECIFICATION

Electronic interrogation of coin operated equipment

This invention relates generally to apparatus for the interrogation of coin operated equipment, the latter term including video games, juke boxes and possibly vending machines, although the invention is of particular interest in relation to gaming or gambling machines, all such equipment being equipment which is left unattended for substantial periods during which it is available for use by coin insertion and which periodically has coins emptied from its cash store by a collector.

Referring to gaming machines in particular, these are commonly provided with mechanical counters which record coin inputs and payouts. A collector is thereby able at least roughly to check if the amount of cash available from the cash store corresponds to the amount to be emptied on the basis of the counter readings, assuming for example that the payout tubes are always left full. Discrepancies may indicate either a malfunction, fraudulent operation of the equipment or simple theft. Clearly, however, the security provided by such mechanical counters is relatively minimal. Collectors, engineers and sometimes owners or other persons able to gain access to the interior of the machine, even if not able simply to tamper with the counters to enable a simple theft, are able to devise various schemes for causing the machine to make false payouts, and such fraudulent operations can remain virtually non-detectable, even over a long period of time. Additional security problems can arise because the counters are usually arranged not to operate when the door to the cash store or the engineer's access is open.

It is therefore an object of this invention to provide interrogation apparatus which can provide substantially increased security in relation to coin operated equipment, especially gaming machines.

In accordance with one aspect of the invention, there is provided apparatus comprising a coin data unit for location in coin operated equipment, said unit having a memory, a real-time clock and a microprocessor whereby information indicative of cash through-put, door opening and closing and time related events performed at the equipment can be stored in conjunction with a record of the times at which such events occurred, and a portable interrogator unit which can be communicated with the coin data unit for accessing such information.

In accordance with another aspect of the invention, there is provided apparatus comprising an equipment identification module for location in coin-operated equipment and having a memory storing a number identifying the equipment, a coin data unit which attaches to the identification module and is rendered operative only when so attached, said coin data unit having a memory for receiving through a microprocessor information relating to cash flow through the equipment, and a portable interrogator unit which can be communicated with the coin data unit to accept both information in the memory of the identification module and in the memory of the coin data unit. Power for the data unit is preferably supplied thereto through the identification module. Furthermore, the apparatus may be adapted to recognise a change of identification module and thence partition the data previously stored prior to the change of identification module into a separate area.

In accordance with still another aspect of the invention, there is provided apparatus comprising a coin data unit for location in coin operated equipment, said unit having a memory for receiving through a microprocessor information signals indicative of cash flow through the equipment, said memory having a location for current cash flow information and a location for cash flow history, the history being updated to provide cumulative totals to date relating to that coin operated equipment, and portable interrogator means for extracting current information with or without history information. The portable interrogator means is preferably adapted, when used to retrieve current information, to up-date the history information location in the memory and after current information retrieval to erase the current information location in the memory.

The above described apparatus is preferably used in combination with a download computer having a real time clock, and to which the interrogator unit can be coupled for information exchange therewith, the real time clock in the interrogator unit being synchronised to the clock in the download computer when said interrogator unit is coupled thereto, whereby a master clock ripples through to all interrogated coin-operated equipments. The interrogator can then have a microprocessor controlled memory and thereby acts as a master controller when connected to the data unit and is adapted for coupling to a download computer to transfer, to said computer, data which has previously been retrieved from the data unit, said interrogator acting as a slave when coupled to the computer.

The interrogator preferably also has a keyboard for information input to the data unit dependently on a receipt algorithm provided by a download computer, this algorithm being stored in part of the interrogator memory and thus being reprogrammable by the download computer.

Further features of the invention will be apparent from the following description of a practical apparatus, making reference to the accompanying drawings, in which:—

Figure 1 shows the basic units of the apparatus of the invention;

Figure 2 shows a coin data unit with connections thereto;

Figure 3 shows an interrogator unit; and

Figure 4 shows a modified interrogator unit.

Figure 1 shows the basic components of the

apparatus of the invention, assuming its use for interrogating a gaming machine 10.

The machine has an access door 12 enabling a collector to empty a cash store, and one or more access doors 14 enabling an engineer to perform maintenance and servicing operations.

Contained in an isolated situation within the machine is a coin data unit 16, mounted to a machine identification module 18 which is a permanent fixture within the machine.

A portable interrogator unit 20 has a flying lead bearing a plug 22 which can enter a socket 24 available on the machine 10, whereby information exchange can take place between the interrogator unit 20 and the coin data unit 16.

Alternatively, the interrogator unit 20 can plug into a download computer 26 having an associated VDU 28 and printer 30. Whereas the gaming machine 10 will usually be sited in a club or inn or like environment, the computer 26 will usually be remotely sited elsewhere, for example in an orifice or depot at which the operation of a large plurality of gaming machines is monitored.

The general aim of the equipment is to enable a collector, when emptying the cash store, to be able to plug in the portable interrogator unit in order to obtain from the coin data unit a limited amount of information and then to print a receipt for the owner or hirer of the machine. The interrogator unit will also extract other information from the coin data unit, but this will not be available to the collector. However, all the information collected and stored in the interrogator unit will be passed to the download computer when the collector returns the interrogator unit to the depot. In addition, a slightly modified interrogator unit will be available to a security supervisor so that at least some of the further information referred to can be made available on site, i.e. at the gaming machine, when a security check is necessary.

However, a more specific aim of the apparatus is to minimise risk of fraudulent operations of the machine or of thefts from the machine by persons, e.g. collectors, engineers or owners, having keys to one or more of the access doors, more especially because information can be made available, through the interrogator unit, which facilitates the detection of such fraudulent operations or thefts and can indicate times at which such actions may have taken place.

Having regard to the above aims, the general structure of the coin data unit will be first described, making reference to Figure 2.

Essentially, the coin data unit 16 comprises a memory 32, inputs to and outputs from which are controlled by a microprocessor 34, and a real time clock 36. The memory, basically any form of non-volatile semi-conductor memory, is partitioned, and includes an area in which real time information is continuously updated. The differing areas of the partitioned memory 32 are respectively employed to store information relating to differing operations which occur at the machine. The microprocessor is programmed so that the information signals fed to the coin data unit as a result of some operations of the machine initiate extraction of the instantaneous real time information and storage of that time, in conjunction with the information relating to a particular operation, in the appropriate area of the memory.

The coin data unit 16 is mounted within the machine to the machine identification module 18 and receives its a.c. mains power through this module. The times for which the machine is externally powered, i.e. switched on, is one of the types of information which is stored in the memory of the coin data unit. Although the coin data unit 16 also contains a d.c. battery for maintenance for a limited period of the real time clock 36 and of vital information stored in the memory 32, and for the continued recordal of vital information during loss of mains power, the physical link between the unit 16 and the module 18 is such that the unit 16 is rendered inoperative unless mounted to a module 18. As the latter is intended to be a permanent fixture in the machine, storing the machine number, it is designed to be a very low power consumption module of extremely high reliability. When the coin data unit 16 is mounted to the identification module 18, the machine number in the module is accessible either directly or indirectly by transfer to the memory in the data unit. In either case, if for any reason a coin data unit is transferred from one machine to another, the change of machine number is noted and recorded in the coin data unit. It will be appreciated that, if the machine number was to be kept in the data unit 16 itself, the replacement and interchange of such data units would be made more difficult and liable to result in information collection in relation to an incorrect machine number. More generally, as an overall safeguard, the data unit is adapted to recognise a change in identification module and partition data stored prior to the change from data stored after the change.

Turning now to the information inputs to the data unit 16, which are either direct inputs buffered on to the data bus or isolated inputs, these primarily comprise, in addition to real time information, inputs from the coin input mechanism(s) of the machine, inputs from the coin payout mechanism(s), and inputs due to opening and closing of the access doors.

In Figure 2, the reference 38 denotes input signals derived from four coin insertion mechanisms 40, more especially from the coin accept microswitches or other coin accept sensors thereof, and reference 42 denotes the machine mechanism control board to which these input signals indicative of coin insertion are to be fed. It is a notable feature of the invention that the coin data unit 16 may be connected in line, i.e. in series, between the coin input mechanism microswitch outputs and the control board inputs, thus both ensuring activation of the data unit before activation of the mechanism controlled by

the machine board and making such data unit less easy to short circuit than if it is connected in parallel with the input signals derived from coin insertion. However, parallel connection of the data unit, whereby coin accept signals pass in parallel to the data unit and the machine board may sometimes be necessary or desirable. Furthermore, some electronic gaming machines have an electronic output port from which data such as receipt and payout of coinage can be extracted, and in this case the data unit may be connected to such an output port on the machine electronic board.

It is, of course, possible that the coin insertion input signals will be derived from electronic sensing circuitry rather than microswitches, in which case the same consideration of in line connection of the data unit applies. However, in the case of microswitch pulses, a pulse width within a given range of durations is to be expected. In the case of a series connected data unit 16, it can be programmed to reject pulses outside this range, so that only pulses of known pulse width are passed on to the machine mechanism control board. Furthermore, it is practicable if desired for the data unit 16 to process such pulses, the width of which will in any event vary with four insertion mechanisms handling coins of differing denominations, so that uniform pulses of a predetermined pulse width are always fed to the machine mechanism control board, regardless of which denomination of coin has been inserted. This will enable the use of a single line from the data unit to the control board, instead of a plurality of lines. In any case, the pulses 41 fed to the control board are preferably transmitted through relays to ensure isolation from one another.

The signals 44 from the machine mechanism board 42 to the payout tubes 46 are conventionally a.c. voltage signals ranging from say 24V up to 240V. For this reason it is impractical to locate the data unit 16 in line, i.e. in series, with these coin payout signals. Accordingly, as diagrammatically indicated in Figure 2, the coin payout signals 44 are coupled into the data unit 16, as indicated at 48 by the parallel connections. In effect, the coin data unit looks through 48 at a normally low impedance and responds to the occurrence of a high impedance due to the advent of a coin payout signal 44.

Figure 2 also shows input signals 50 to the coin data unit 16 from microswitch circuits associated with the collector's and engineer's access doors to the machine. Generally, of course, more than one access door will be available to the engineer, but these may readily be wired together so that a door opening or door closing signal 50 is obtained for operation of any one or more engineer's doors. However, operation of engineer's and collector's doors is distinguished.

It is primarily the door operation signals 50 which are stored in the data unit 16 in conjunction with real time recordal, as previously referred to. Additionally, however, it is an important feature of the present invention that insertion of coins and payout of coins is recorded, not only while the doors are closed when the machine is in normal use, but also when any of the doors are open. Moreover, coin insertion and coin payouts when a door is open are recorded in a separate area of the memory of the data unit, preferably respective separate areas for the collector's door and the engineer's door, and furthermore, in conjunction with real time recordal. Additionally, because of the back-up battery in the data unit, information of machine operation is recorded even if the mains power supply is switched off when a door is open and closed.

It will thus be clear that, when the information stored in the coin data unit is retrieved at a later time, it will be possible by comparing the times of door opening and closing (real time including date as well as time during the day or night) with times of coin insertions and payouts, to determine if a collector or engineer was or was not present at the time in question.

Equally, however, it will generally be preferred for the cash accumulation totals effected in the memory to be made only in respect of coin insertions and payouts during normal operation of the machine, i.e. when the doors are closed.

It should also be mentioned that, when an input signal from the door circuitry indicates a fault, e.g. due to the door switches being tampered with, the microprocessor system in the coin data unit can be selected to go into a programme sequence where it remains until the fault is corrected. With no coin acceptance signals being transmitted to the machine mechanism control board, the machine is thereby rendered inoperative. In addition, the fault in the door and/or its associated circuitry is always recorded in conjunction with a real time recordal.

The description so far relates to the current working area of the memory in the coin data unit, which, as will be clear from later description, is the area of the memory operational between successive interrogations of the data unit. There ia another area of the memory in the coin data unit 16 which has not yet been referred to. This is the so-called history area, and it at least stores information as to the cumulative amount of coins which has passed through the machine while the doors have been closed, ever since a convenient historical starting point, e.g. when the machine was first made operational or coupled to the latest identification module.

When the coin data unit is interrogated by a collector, as described later, the current working area provides a cash total since the previous interrogation. Under the control of the microprocessor of the data unit, which is programmed to supervise all operations at the unit including the inputs and previously described, the current cash total is entered into the history area to be added to the existing cash total therein.

The current cash total working area is then automatically erased.

The history area is necessary to provide for the contingency that an interrogator unit containing information retrieved from a coin data unit may be lost before such interrogator unit has, in turn, been unloaded to the download computer. While the history area will preferably not be accessible to the collector by the use of a collector's interrogation unit, a security officer having a more sophisticated interrogator unit will have access to it, and by comparison of the history information with the information previously unloaded into the download computer after the previous but one interrogation, will be able to retrieve at least some of the information which has been lost.

At this stage it is convenient to briefly describe the collector's interrogation unit, for which purpose reference is made to Figure 3. The collector's interrogation unit 20 is in the nature of a small portable apparatus. The plug 22 communicates with the coin data unit 16 through the socket 24, which leads to a serial communication board 17 (see Figure 2). The interrogation unit has a microprocessor controlled memory generally similar to that provided in the coin data unit, being partitioned in a generally analogous manner. In addition, the interrogation unit memory has an increased capacity to enable data storage of information taken from a succession of interrogated data units and collector entered information. The unit is powered by a rechargeable battery and also includes a real time clock. The microprocessor however is programmed to initiate, supervise and terminate exchange of information between the interrogation unit and data unit, with the interrogation unit acting as a master controller,and also to respond to instructions given by the collector, more particularly the printing out of a cash receipt at a small built-in printer 60. The interrogator unit also has a small built-in liquid crystal display 62. Press-buttons for initiation of operations are indicated at 64, and a keyboard for entry of information is indicated at 66.

A security officer's interrogator unit is generally similar, but has an additional switch enabling the microprocessor to supervise additional functions, more especially the extraction of additional information from the coin data unit, such as information in the history area of the memory thereof, which cannot be directly accessed by the collector's interrogator unit.

An alternative and in practice smaller interrogator unit 20A is shown in Figure 4, wherein simliar reference numerals to Figure 3 are used for similar components. Furthermore, by means of a key-operable switch, the unit 20A is convertible from an apparatus capable of retrieval of only current information in the data unit to apparatus capable of retrieval of both current and history information, the key being available only to a security officer.

It will be apparent from the preceding description that when a coin data unit is interrogated, information is transferred to the interrogator unit in conjunction with the machine number stored in the identification module permanently fixed in the machine. Other code numbers are also employed in the apparatus primarily to facilitate traceability of information and/or increased security. One such number is a number associated with the coin data unit. Another code number employed is an interrogator unit code. By suitable complementary programming of a collector's interrogator and the coin data units which are to be interrogated by this collector, it can be arranged that a handshake operation is performed when the interrogator is plugged in, which handshake operation will not be performed, and data transfer will not be initiated, if the interrogator unit is plugged into an incorrect coin data unit or vice versa. Clearly this check is desirably made within software capability, so that problems are not created with exchange of coin data units.

When the collector has complied with the initial checking procedures, information transfer to the interrogator can be initiated. On completion of information transfer, the collector can initiate printing of a dated cash receipt for the machine owner or hirer. The receipt information is based essentially on the information keyed in by the collector. From the receipt (printed in duplicate), the collector is able to determine the amount of cash to be given to the site, VAT, rent and any percentage shares and the like in accordance with the existing legal conditions of machine usage. The collector's usage of the interrogator unit is now completed at one machine, and the interrogator unit is automatically reset ready for the next interrogation. It will thus be appreciated that the interrogator unit is extremely simple for the collector to use. It is often only necessary to interface the unit with the data unit in the machine, complete identification procedures and press two or three instruction buttons in succession. A cash receipt is calculated and printed automatically, the cash receipt being calculated solely on information keyed in from the keyboard by the collector. The algorithm for calculating said receipt is stored in the interrogator and said algorithm can be updated by the download computer, the receipt format being requested by the collector in conjunction with the interrogator unit. The collector can enter any relevant information supplied by the owner which may affect the cash calculations, in which case this information will automatically be taken into account when the cash receipt is computed. The interrogator unit may, as a final step, advise the collector that a data block in the unit appertaining to the interrogation of one machine has been properly completed.

It should also be mentioned, in relation to the interrogator unit, that it preferably has a key operable switch (the key being available only to a security officer or the like) which enables the memory to be taken out and located in an

alternative interrogator unit, more especially to enable the memorised information to be transferred to the download computer. This facility is useful in the event of fault development in an interrogator unit which contains vital information.

While the above description applies to a collector's interrogator unit, it is equally applicable to a security officer's interrogator unit with the exception of the additional information which can be displayed and/or printed out, as previously referred to.

Turning now to the download computer system, this is primarily a conventional data interpretation and storage arrangement, and need not be described in detail. The essential point to be understood is that, whereas the interrogator unit serves as a master controller when interrogating the coin data unit in the gaming machine, the interrogator unit serves as the slave when plugged into the download computer.

In Figure 1, the download computer is one into which the interrogator unit plugs in directly. Alternatively, however, the interrogator unit may be adapted for coupling through a Modem telephone link to a central download computer.

When the interrogator unit is linked to the download computer, information in the interrogator unit (stored in data blocks one for each machine which has been interrogated) is transferred and analysed and stored by the computer, e.g. in page format. Clearly, many conventional information handling computers are suitable for use as the download computer used in this invention, which computers may be capable of analysing the received information to a lesser or greater depth of interpretation.

Having described the complete system, certain further features of the apparatus should be mentioned.

First, the provision of real time clocks in the data unit and in the interrogator unit is important for reasons which have already been mentioned. Another purpose of the clock is to enable the data unit to record the real times at which the a.c. mains power to the machine is switched on and off. This is in fact done by recording the power up periods of the microprocessor in the coin data unit. Thus, for example in the case of a tenanted landlord or an inn or the like, if the machine is not switched on to be available for use during appropriate times, i.e. hours during which the inn is open, then this real time information initially stored in the data unit can be retrieved through the interrogator unit and thence transferred to the download computer, so that the machine owner can be made aware of the reason why the machine appears to have little use.

In addition, of course, the time periods for which the machine is powered for use between interrogations is an essential factor in computation of the profitability of the machine.

Another point to be mentioned, in relation to the real time clocks, is that the clock in the interrogator unit is automatically updated (corrected) when this unit is coupled to the download computer, and then the data unit clock in the machine is automatically updated when the interrogator unit is plugged in. In this way, as machines are interrogated, the master clock ripples through to all the interrogated machines.

Finally, the back-up battery in the coin data unit has previously been mentioned. However, although this battery is capable of maintaining the memory in the data unit in the event of a failure of the mains power supply, it cannot provide sufficient power for information exchange with an interrogator unit. For this reason, the interrogator unit has the facility to power up the coin data unit, when necessary in the event of a mains power failure (e.g. due to removal of a fuse in the gaming machine), sufficiently to enable an exchange of credentials and a transfer of data to take place.

Clearly, various modifications of the above-described arrangement are possible within the scope of the invention as defined in the appended claims.

Claims

1. Apparatus comprising a coin data unit for location in coin-operated equipment, said unit having a memory, a real-time clock and a microprocessor whereby information indicative of cash through-put, door opening and closing and time related events performed at the equipment can be stored in conjunction with a record of the times at which such events occurred, and a portable interrogator unit which can be communicated with the coin data unit for accessing such information.

2. Apparatus comprising an equipment identification module for location in coin-operated equipment and having a memory storing a number identifying the equipment, a coin data unit which attaches to the identification module and is rendered operative only when so attached, said coin data unit having a memory for receiving through a microprocessor information relating to cash flow through the equipment, and a portable interrogator unit which can be communicated with the coin data unit to accept both information in the memory of the identification module and in the memory of the coin data unit.

3. Apparatus comprising a coin data unit for location in coin operated equipment, said unit having a memory for receiving through a microprocessor information signals indicative of cash flow through the equipment, said memory having a location for current cash flow information and a location for cash flow history, the history being updated to provide cumulative totals to date relating to that coin operated equipment, and portable interrogator means for extracting current information with or without history information.

4. Apparatus according to claim 1 or claim 2 or claim 3, including means whereby time-related data can be stored in the coin data unit memory without the coin-operated equipment having external power applied.

5. Apparatus according to claim 1 or claim 2 or claim 3 or claim 4, wherein the data unit in the equipment is normally powerable from a mains supply and the real times for which the data unit is so powered are recorded in the memory thereof.

6. Apparatus according to any of claims 1 to 5, wherein the interrogator unit has a real time clock to which the clock in the data unit is synchronised when the interrogator unit is connected to the data unit.

7. Apparatus according to claim 6 in combination with a download computer having a real time clock, and to which the interrogator unit can be coupled for information exchange therewith, the real time clock in the interrogator unit being synchronised to the clock in the download computer when said interrogator unit is coupled thereto, whereby a master clock ripples through to all interrogated coin-operated equipments.

8. Apparatus according to any of claims 1 to 7 wherein the interrogator unit has a microprocessor controlled memory and thereby acts as a master controller when connected to the data unit and is adapted for coupling to a download computer to transfer, to said computer, data which has previously been retrieved from the data unit, said interrogator acting as a slave when coupled to the computer.

9. Apparatus according to any of claims 1 to 8, wherein said memory in the coin data unit receives through the controlling microprocessor information signals indicative of coin input to and coin outputs from the equipment, both when any access door to the equipment is open and when it is closed, the microprocessor acting to direct into separate memory locations the doors closed information and the doors open information.

10. Apparatus according to any of claims 1 to 9, wherein the coin data unit is located in the coin operated equipment between a coin input system and a mechanism to be activated in response to an accept signal received from the coin input system to indicate valid coin acceptance, whereby the coin data unit must be activated before activation by the mechanism.

11. Apparatus according to any of claims 1 to 10, wherein the interrogator unit has means whereby the interchange of data between said interrogator and coin data unit is not dependent on the power being applied to the coin-operated equipment, the necessary power for interchange being sourced by the interrogator.

12. Apparatus according to any of claims 1 to 11, wherein the interrogator unit has an integral printer which enables a receipt to be printed at the point of interrogation responsively to some information extracted from the memory of the coin data unit by the interrogator unit.

13. Apparatus according to any of claims 1 to 12, wherein the interrogator unit has a keyboard for information input to the data unit dependently on a receipt algorithm provided by a download computer, this algorithm being stored in part of the interrogator memory and thus being reprogrammable by the download computer.

14. Apparatus according to claim 2 or any claim appendant thereto, wherein power for the data unit is supplied thereto through the identification module.

15. Apparatus according to claim 14, adapted to recognize a change of identification module and thence partition the data previously stored prior to the change of identification module into a separate area.

16. Apparatus according to claim 3 or any claim appendant thereto, wherein the portable interrogator means comprises an interrogator apparatus adapted to extract only current cash flow information and apparatus adapted to extract both current and history information.

17. Apparatus according to claim 16, wherein the interrogator means is a portable interrogator unit convertible between an apparatus for current information retrieval and an apparatus for both current and history information.

18. Apparatus according to claim 16 or claim 17, wherein the portable interrogator means is adapted, when used to retrieve current information, to up-date the history information location in the memory and after current information retrieval to erase the current information location in the memory.

19. Coin operated equipment interrogation apparatus substantially as hereinbefore described with reference to the accompanying drawings.

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