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## (54) Time and attendance or controlled access reporting system means and method.

(57) A system for time and attendance or other controlled access includes : a portable electronic memory device ; and a time clock terminal to which the portable electronic memory device may be temporarily operatively attached by a user thereof, the portable electronic memory device having stored therein use restrictions as to the use of the portable electronic memory device ; and the time clock terminal including means to determine whether or not the use restrictions are satisfied. The time clock terminal may record in the portable memory device the times of use. The holder of the portable memory device may temporarily attach the portable memory device to the time clock terminal and use the time clock terminal to display information stored in the portable memory device.

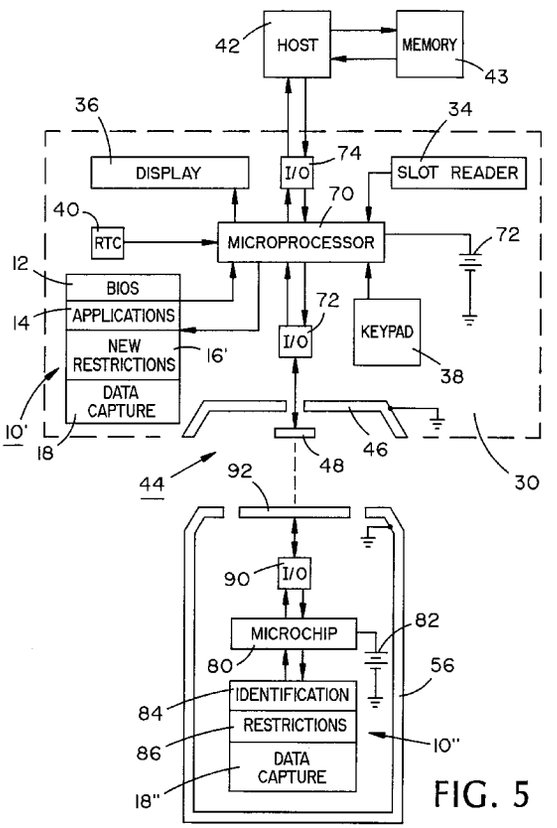


FIG. 5

EP 0 564 064 A2

The present invention relates to time and attendance or controlled access reporting generally and, more particularly, but not by way of limitation, to a novel reporting system with a greatly increased capacity which is particularly useful in time and attendance reporting.

While the present invention is described with specific reference to time and attendance systems, it will be understood by those skilled in the art that it is applicable as well to many other types of controlled access situations.

Time and attendance systems are widely used in a number of workplace situations and, in the past, almost universally employed one or more time clocks into which employees inserted their time cards when arriving at and leaving work and when taking lunch and coffee breaks, etc. The clocks imprinted the time cards with the current time, the cards were periodically collected, and the information thereon was manually taken off and used for purposes of paying the employees and for accumulating statistical data.

More recently, time clocks have been connected to a mainframe, or host, computer, the time cards have been eliminated, and the employees insert their identification cards having bar code or magnetic identifying stripes thereon into or through a slot in a time clock terminal with the time of insertion. The information is read by the time clock terminal and transmitted to the host computer. The host computer checks to see that each employee is authorized to be clocking in or out at that time, that the identification card is valid, stores the time information, and may transmit a message to the employee on a display at the time clock terminal that it is the wrong time, or the wrong place, or etc. This consumes a large amount of time of the host computer if any significant numbers of employees are involved, since each employee will likely have six to ten transactions per day.

In timekeeping systems which handle a relatively large number of employees, having the host computer online occupies too much of the host computer's time, especially since most of the transactions occur within relatively short time spans. To alleviate this problem, electronic memories have been built into time clock terminals, called "smart clocks" and the employee information is downloaded into the clocks so that many of the functions can be performed locally. Changes in scheduling restrictions and other information are periodically downloaded from the host computer at convenient times. Thus, mainframe computer time is saved and the system can be used even when the mainframe computer is out of service.

In many cases, such memories have limited capacity to store the information required. For each employee, it is necessary to store information as to the validity of the employee's identification card. It may be necessary to store information as within what time periods an employee may clock in and out, which days are to be worked by the employee, the number of hours an employee is to work before before coffee and lunch breaks, the length of coffee and lunch breaks, and whether that employee is authorized to use that particular time clock terminal to clock into an associated department or job site. All the foregoing scheduling restrictions are subject to change for individuals employees or groups of employees. Additionally, in a large operation, there may be employees starting and stopping work at different times, which times may periodically change, part-time employees must be accommodated in the system, there may be different rules for union and non-union employees and/or salaried and hourly paid employees, and there may be other information required to be stored in the local memory. Of course, there must be sufficient memory capacity to record the times of clocking in and out for each employee. As memory capacity increases, physical size and cost increase, as well as does the size of battery backup equipment if used.

As the amount of information required to be stored in the local memory for each employee has expanded, the number of employees that can be handled by any one time clock terminal has decreased. This has resulted in the necessity to assign time clock terminals to employees. That, in turn, can decrease productivity. For example, an employee may have to leave a work assignment in a distant part of a facility in order to clock out on time at the employee's assigned time clock terminal.

A further disadvantage of conventional time clock terminals is that they usually require the insertion therein of a card having thereon a magnetic stripe or bar code. Both such types of identifying indicia are subject to damage, often during the reading process, which damage can interfere with the proper reading of the indicia.

Accordingly, it is a principal object of the present invention to provide a system for controlled access reporting that is not limited by the memory capability of a time clock terminal and can service a few or a great number of employees.

It is another object of the invention to provide such a system that requires a minimum amount of host computer time.

It is a further object of the invention to provide such a system that minimizes the required memory size of time clock terminals.

It is an additional object of the invention to provide such a system that is economical to implement.

It is yet another object of the invention to provide such a system with which an employee can easily verify his recorded information as to activities, scheduling, restrictions, etc.

It is yet another object of the invention to provide identification means that is not easily scratched or marred.

Other objects of the present invention, as well as

particular features, elements, and advantages thereof, will be elucidated in, or be apparent from, the following description and the accompanying drawing figures.

The present invention achieves the above objects, among others, by providing, in a preferred embodiment, a system for time and attendance or other controlled access, comprising: a portable electronic memory device; and a time clock terminal to which said portable electronic memory device may be temporarily operatively attached by a user thereof, said portable electronic memory device having stored therein use restrictions as to the use of said portable electronic memory device; and said time clock terminal including means to determine whether or not said use restrictions are satisfied. Said time clock terminal may record in said portable memory device the times of use. The holder of the portable memory device may temporarily attach said portable memory device to said time clock terminal and use said time clock terminal to display information stored in said portable memory device.

Understanding of the present invention and the various aspects thereof will be facilitated by reference to the accompanying drawing figures, submitted for purposes of illustration only and not intended to define the scope of the invention, in which:

Figure 1 is a schematic diagram of the memory of a conventional time clock terminal.

Figure 2 is a side elevational view of a time clock terminal according to the present invention.

Figure 3 is a perspective view of an employee identification card according to the present invention.

Figure 4 is a perspective view of an alternative embodiment of employee identification means.

Figure 5 is a schematic/block diagram of the system of the present invention.

Reference should now be made to the drawing figures in which similar or identical elements are given consistent identifying numerals throughout the various figures thereof and in which parenthetical references to figure numbers direct the reader to the view(s) in which the element(s) being described is (are) best seen, although the element(s) may be seen also in other views.

Figure 1 illustrates schematically the memory, generally indicated by the reference numeral 10, of a conventional time clock terminal, or "smart clock" (not shown). Memory 10 includes a first section 12 which contains the basic operating system for a microprocessor in the time clock terminal. A second section 14 contains the applications programs which determine how stored data and data read from an employee's identification card are processed. Sections 12 and 14 are required for the operation of the time clock terminal.

A third section 16 includes data as to scheduling restrictions imposed on each employee. This section will be periodically updated as such restrictions change. A fourth section 18 contains the time data taken as employees clock in and out. This section is periodically read by a host computer and erased. While there is a practical limit to the amount of data that can be stored in any memory, the expansion of the data required to be stored in section 16, as noted above, reduces the number of employees that can be accommodated by a single time clock terminal and, thus, such terminals are severely limited in the number of employees that any one such terminal can service.

Figure 2 illustrates a time clock terminal, generally indicated by the reference numeral 30. Time clock terminal 30 includes conventional elements such as a housing 32 containing a slot reader 34 through which an employee identification card (not shown) may be passed for the reading thereof. Housing 32 further contains a conventional display 36 on which employees can receive messages, a keypad 38 for manually inputting information, and a real time clock 40 (normally disposed within the housing). Time clock terminal 30 is connected to a host computer 42 which includes a memory 43. The nonconventional element of time clock terminal 30 is a "touch sensor" 44 element, the function of which touch sensor will be described in detail below.

Figure 3 illustrates an employee identification card, generally indicated by the reference numeral 50, which may include a conventional magnetic stripe 52 thereon in which is encoded identification information and the identification card may include a photograph 54 of the employee. The nonconventional element of identification card 50 is a raised "touch memory" 56 disposed thereon, the function of which touch memory will be described in detail below.

Figure 4 illustrates an alternative embodiment of employee identification means, generally indicated by the reference numeral 60, which includes a touch memory button 56' attached by means of a chain 62 to a key ring 64.

Reference now should also be made to Figure 5 together with Figures 2-4 for an understanding of the operation of the present invention. Time clock terminal 30 (Figure 5) includes a microprocessor 70 to which is connected a source of power 72. Memory 10' in time clock terminal 30 includes recorded therein basic operating systems in section 12 and applications programs in section 14 as described above with reference to Figure 1. Section 18 for data capture is also included in memory 10' as described above with reference to Figure 1. It should be noted that only a small section 16' is provided for scheduling restrictions and this only for changes in such restrictions, in contrast to memory 10 (Figure 1) in conventional time clock terminals which must allow substantial memory capacity for scheduling restrictions.

Touch sensor 44 (Figure 5) includes a grounded

housing portion 46 and a data communication portion 48. Microprocessor 70 is connected to contact surface 48 through input/output circuitry 72 and to host computer 40 through input/output circuitry 74.

Touch memory 56 (Figure 5) includes a microchip 80 to which is connected a source of power 82 which may be a long life lithium battery. Microchip 80 is connected to a memory 10" containing employee identification in a section 84, use restrictions in a section 86, and data capture in a section 18". Microchip 80 is connected through input/output circuitry 90 to a contact surface 92. When touch memory 56 is touched to touch sensor 44 contact surfaces 48 and 92 are electrically engaged to permit communication between microprocessor 70 in time clock terminal 30 and microchip 80 in touch memory 56.

Touch sensor 44 and touch memory 56 may be similar to those furnished by Dallas Semiconductor, of Dallas, Texas, and are conventionally used, for example, in a variety of hospital systems, for example. When contact surfaces 48 and 92, respectively of touch sensor 44 and touch memory 56 are metal contact surfaces which, when contacted with each other, provide "one-wire" bidirectional communication therebetween. Touch memory 56 typically has a 4K capacity, which capacity is more than adequate for the above purposes.

In operation, an employee who wishes to clock in or out touches touch memory 56 on identification card 50 (Figure 3) to touch sensor 44 (Figure 2). Microprocessor 70 (Figure 5) reads the employee identification information and the restrictions in memory 10" of touch memory 56 and, if the restrictions are satisfied for that employee, the microprocessor will cause microchip 80 to enter the time in memory 10". Each employee will have a similar identification card with restrictions recorded therein applicable to that employee and will have clocking times recorded in memory 10" in each employee's identification card.

Thus, it will be understood that the employees identification cards will contain the restriction information that formerly consumed substantial space in the memories of conventional time clock terminals. The only restriction information recorded in memory 10' is a limited amount of changed restriction information that is temporarily stored until transferred to memory 10". The storage of scheduling restrictions and data capture is distributed among the various identification cards held by the employees. With a large amount of memory thus made available, time clock terminal 30 may handle a very large number of employees as easily as very few, limited only by how fast the employees can touch their touch memories 56 to touch sensor 44. Rate of communication between microchip 80 and computer 70 (Figure 5) is extremely rapid. Data captured in memory 10' is periodically transferred to host computer 42.

Another advantage of the present invention is that redundant data is recorded and, if the data transferred to the host computer is lost, the data can be read from the employees' identification cards and transferred to the host computer the next time the employees clock in or out.

When identification card 50 is issued, memory 10" can have recorded therein the name and identification number of the employee, the employee's schedule, and the validation period for the schedule. Time clock terminal 30 then can complete the employee transaction locally. The only time that time clock terminal 30 has to refer to host computer 42 is when the employee is attempting to clock in or out outside of his validation period. If the validation period has expired, host computer 42 is alerted and display 36 (Figure 2) displays "PROCESSING" and the employee is instructed to again touch touch sensor 44 and new data is transferred into memory 10" (Figure 5) from memory 43 of host computer 42.

If the employee is late to work or back from lunch, time clock terminal 30 can display a message for the employee to see the employee's supervisor, for example. If the supervisor approves the recording of the time, the supervisor's identification is entered by touching the supervisor's touch memory 56 to touch sensor 44 and pressing appropriate commands on keypad 38. The employee then clocks in and the supervisor's approval is recorded as part of the transaction in memories 10' and 10".

Other messages for a particular employee, but unrelated to the clocking transaction, may be displayed.

Another feature of the present invention addresses the need for employees to be able to check the time and attendance data recorded on their identification cards. Time clock terminal 30 includes a "journal display mode." An employee touches touch sensor 44 (Figure 2) with touch memory 56 (Figure 3) and presses DISPLAY JOURNAL on keypad 38. With appropriate commands, the employee can display total hours worked in a selected period, overtime worked, times in and out, vacation or sick time remaining, work schedule, use restrictions etc. This can be done on any time clock terminal. There is no longer a need to have host computer 42 connected on line to retrieve this information.

Another advantage of the invention is that bar codes and magnetic stripes that can become damaged can be eliminated. This means that slot 34 on time clock terminal 30 can also be eliminated; although is may be desirable to retain that feature as an alternative means of inputting data.

A further advantage of the present invention is that touch memory 56 can be re-used by another employee if the original holder of the memory is no longer employed. It is only necessary that the new employee's information be recorded in memory 10". If touch memory 56 is lost, a replacement is easily pro-

vided with information from memory 43 of host computer 42.

If desired, not only can time clock terminals at one location be used by an employee, but terminals at any geographical location of the organization can be used.

Time clock terminal 30 is small and inexpensive, but can process very large numbers of employees.

Yet another advantage of the present invention is that touch memories 56 and 56' are not subject to damage by marring or scratching and, furthermore, are not subject to damage by proximity to external magnetic devices as are conventional magnetic stripes on identification cards.

An additional advantage of the use of touch memories 56 and 56' is that they have, or can easily have, a laser etched serial number therein which is read along with the other identifying information. If a employee's identification has been lost or stolen, it is simple matter to instruct the time clock terminals to reject the identification and to alert supervisory personnel when use of that identification is attempted.

Touch memory 56 may also be furnished with a real time clock therein for access by microprocessor 70, instead of providing real time memory 40 in time clock terminal, and such is within the intent of the present invention.

It is also within the intent of the present invention that memories 56 can be replaced with a conventional "smart card" having a memory embedded therein. In that case, the time clock terminals would has provision for a slot for insertion therein of the smart card for reading thereof.

It will thus be seen that the objects set forth above, among those elucidated in, or made apparent from, the preceding description, are efficiently attained and, since certain changes may be made in the above construction without departing from the scope of the invention, it is intended that all matter contained in the above description or shown on the accompanying drawing figures shall be interpreted as illustrative only and not in a limiting sense.

It is also to be understood that the following claims are intended to cover all of the generic and specific features of the invention herein described and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

## Claims

**1.** A system for controlled access, comprising:
(a) a portable electronic memory device;
(b) a time clock terminal to which said portable electronic memory device may be temporarily operatively attached by a user thereof;
(c) said portable electronic memory device having stored therein use restrictions as to the use of said portable electronic memory device; and
(d) said time clock terminal includes means to determine whether or not said use restrictions are satisfied.

**2.** A system, as defined in Claim 1, further comprising:
(e) a real time clock; and
(f) means to access said real time clock and to record in said memory device the real time at which said memory device is temporarily operatively attached to said time clock terminal.

**3.** A system, as defined in Claim 1, wherein said use restrictions include valid periods of use of said portable electronic memory device.

**4.** A system, as defined in Claim 1, wherein said portable electronic memory device includes recorded therein information identifying said user.

**5.** A system, as defined in Claim 1, wherein said portable electronic memory device is disposed on an identification card.

**6.** A system, as defined in Claim 1, wherein said portable electronic memory device is attachable to a keychain.

**7.** A system, as defined in Claim 2, wherein said time clock terminal includes means to indicate to said user the time information recorded in said portable electronic memory device.

**8.** A system, as defined in Claim 1, wherein:
(a) said portable electronic memory device includes a "touch memory"; and
(b) said time clock terminal includes thereon a "touch sensor" to which said touch memory may be temporarily operatively attached.

**9.** A method for providing controlled access, comprising:
(a) temporarily attaching a portable electronic memory device to a time clock terminal; and
(b) said time clock terminal determining whether or not use restrictions stored in said portable electronic memory device are satisfied.

**10.** A method, as defined in Claim 9, further comprising: said time clock terminal recording in said memory device the real time at which said portable electronic memory device is temporarily op-

eratively attached to said time clock terminal.

**11.** A method, as defined in Claim 9, further comprising: verifying use restrictions including valid periods of use of said portable electronic memory device.

**12.** A method, as defined in Claim 9, further comprising:

(a) recording in said portable electronic memory device information identifying said user; and

(b) said time clock terminal reading said information.

**13.** A method, as defined in Claim 9, further comprising providing said portable electronic memory device disposed on an identification card.

**14.** A method, as defined in Claim 9, further providing said portable electronic memory device attachable to a keychain.

**15.** A method, as defined in Claim 10, further comprising said time clock terminal indicating to a user thereof time information recorded on said portable electronic memory device.

**16.** A method, as defined in Claim 9, further comprising:

(a) providing said portable electronic memory device as a "touch memory"; and

(b) providing on said time clock terminal thereon a "touch sensor" to which said touch memory may be temporarily operatively attached.

**17.** A portable electronic memory device, comprising:

(a) a first memory section having recorded therein restrictions as to the use of said portable electronic memory device; and

(b) a second memory section for recording therein data as to the times of use of said portable electronic memory device.

**18.** A system for controlled access, comprising:

(a) a portable electronic memory device;

(b) a time clock terminal to which said portable electronic memory device may be temporarily operatively attached by a user thereof;

(c) a real time clock;

(d) means to access said real time clock and to record in said memory device the real time at which said memory device is temporarily operatively attached to said time clock terminal; and

(e) means to indicate to said user the time information recorded on said portable electronic memory device.

**19.** A method for recording and reading controlled access data, comprising:

(a) temporarily attaching a portable electronic memory device to a time clock terminal;

(b) said time clock terminal recording in said memory device the real time at which said portable electronic memory device is temporarily operatively attached to said time clock terminal; and;

(c) later attaching said portable electronic memory device to said time clock terminal; and

(d) said time clock terminal indicating to a user thereof time information recorded in said portable electronic memory device.

**20.** Every novel apparatus, system, method, process, or article disclosed herein.

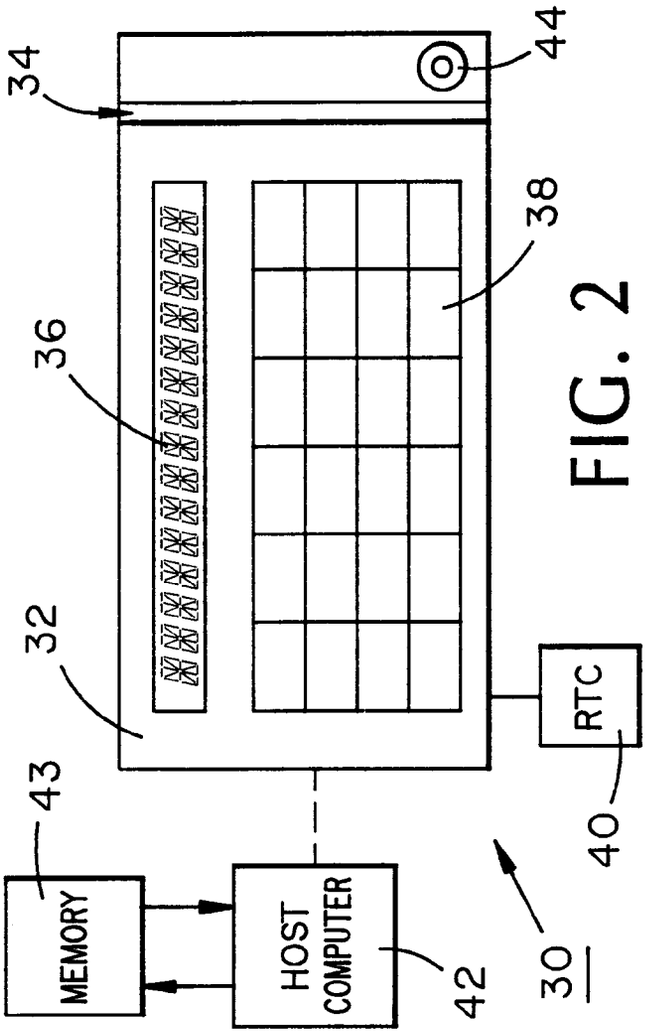


FIG. 2

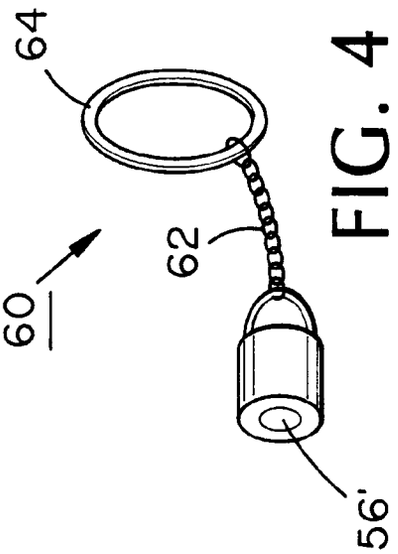


FIG. 4

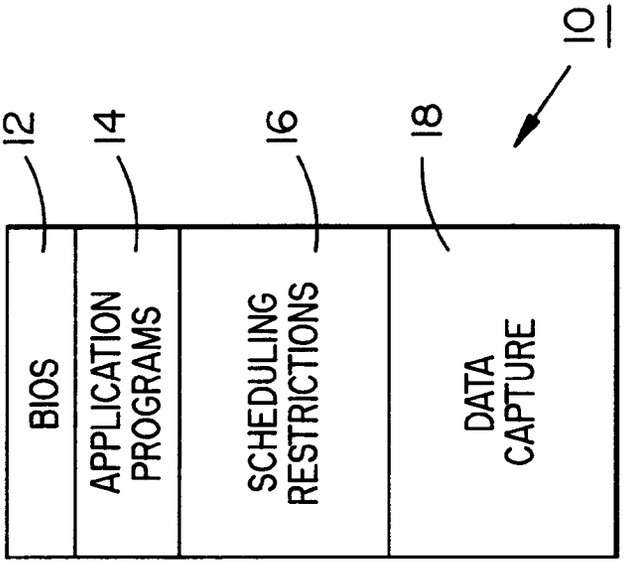


FIG. 1
(PRIOR ART)

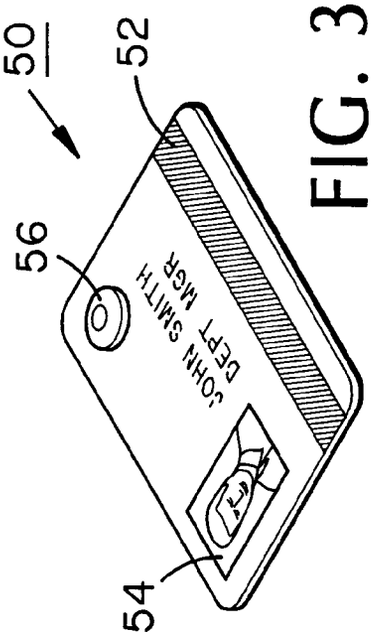


FIG. 3

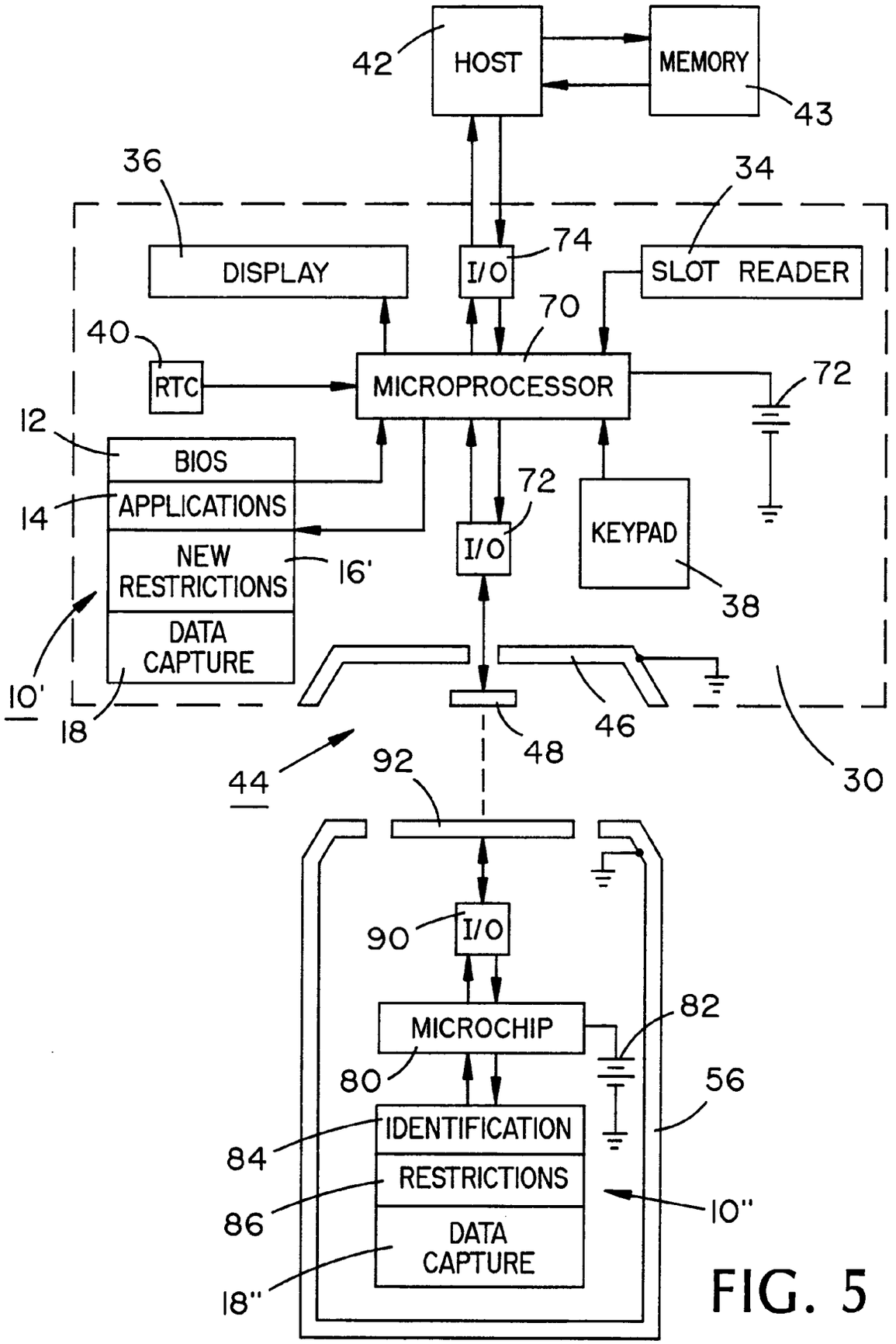
42
HOST
MEMORY
43
36
34
DISPLAY
I/O
74
SLOT READER
70
40
RTC
MICROPROCESSOR
72
12
BIOS
APPLICATIONS
14
NEW RESTRICTIONS
16'
DATA CAPTURE
10'
18
72
I/O
KEYPAD
38
46
48
30
44
92
90
I/O
MICROCHIP
82
80
56
84
IDENTIFICATION
RESTRICTIONS
86
10"
DATA CAPTURE
18"

FIG. 5