(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number : **0 417 474 B1**

(12) EUROPEAN PATENT SPECIFICATION

(45) Date of publication of patent specification : **01.02.95 Bulletin 95/05**

(51) Int. Cl.[6] : **G07F 7/00**

(21) Application number : **90115247.0**

(22) Date of filing : **04.11.85**

(54) Data input device in a card lock system.

(30) Priority : **05.11.84 JP 233491/84**

(43) Date of publication of application : **20.03.91 Bulletin 91/12**

(60) Publication number of the earlier application in accordance with Art. 76 EPC : **0 180 948**

(45) Publication of the grant of the patent : **01.02.95 Bulletin 95/05**

(84) Designated Contracting States : **AT BE CH DE FR GB IT LI LU NL SE**

(56) References cited :
FR-A- 2 370 308
US-A- 4 283 710
US-A- 4 458 142

(73) Proprietor : **OMRON CORPORATION**
10, Tsuchido-cho
Hanazono
Ukyo-ku
Kyoto 616 (JP)

(72) Inventor : **Uemura, Yoshitaka, OMRON Corporation**
Intellectual Property Center,
20, Igadera
Shimo-Kaiinji, Nagaokakyo-shi, Kyoto 617 (JP)
Inventor : **Ito, Hiroyuki, OMRON Corporation**
Intellectual Property Center,
20, Igadera
Shimo-Kaiinji, Nagaokakyo-shi, Kyoto 617 (JP)
Inventor : **Tsuchida, Katsuhiro, OMRON Corporation**
Intellectual Property Center,
20, Igadera
Shimo-Kaiinji, Nagaokakyo-shi, Kyoto 617 (JP)
Inventor : **Takahashi, Hisato, OMRON Corporation**
Intellectual Property Center,
20, Igadera
Shimo-Kaiinji, Nagaokakyo-shi, Kyoto 617 (JP)

(74) Representative : **WILHELMS, KILIAN & PARTNER Patentanwälte**
Eduard-Schmid-Strasse 2
D-81541 München (DE)

EP 0 417 474 B1

Description

The present invention relates to a data input device in a card lock system.

Cards having a magnetic recording surface have found wide use in various fields. They vary widely in function and use. For example, bank cards and credit cards are used to authorize the user for transactions, while key cards substitute for mechanically unlocking keys. However, any of the conventional cards is adapted to serve a particular purpose when it is used after having been issued, and the card issuing machine merely has the function of issuing cards. It has not been conceived that the card is to give a security to the operation of the card issuing machine; it is current practice to mechanically lock the card issuing machine.

When a mechanically operable key is lost, the portion of the card issuing machine associated therewith needs replacement. Further the card issuing machine can be operated by any person irrespective of his qualification, provided that he carries the specific key.

The magnetic card is adapted to record a relatively large amount of data which can be secured effectively and is therefore suited to the foregoing uses of which reliability is required.

A data input device according to the preamble of claim 1 is known from FR-A- 2 370 308.

The invention is as defined in claim 1.

The present invention will become apparent from the following description of embodiments. In the drawings:

Fig. 1 is a perspective view generally showing a hotel card lock system;

Fig. 2 shows various kinds of cards and security levels thereof;

Fig. 3 shows the items of data recorded in the different kinds of cards;

Fig. 4 is a perspective view showing the appearance of a card issuing console (parent machine);

Fig. 5 shows on an enlarged scale groups of switches on the operation panel of the card issuing console;

Fig. 6 is a block diagram showing the electrical construction of the console;

Fig. 7 shows the data stored in a RAM and ROM included in the console;

Fig. 8 schematically shows authorization card issuing and initial data setting procedures;

Fig. 9 is a flow chart showing the main routine for the console;

Fig. 10 is a perspective view showing the appearance of a data input unit;

Fig. 11 is a block diagram showing the electrical construction of the data input unit;

Fig. 12 shows data stored in a memory included in the data input unit;

Fig. 13 is a perspective view showing a card lock unit attached to the door of a hotel room;

Fig. 14 is a block diagram showing the electrical construction of the card lock unit;

Fig. 15 shows data stored in a memory included in the card lock unit;

Fig. 16 is a time chart showing the operation of a solenoid included in the card lock unit;

Fig. 17 is a flow chart showing the operation of the data input unit;

Fig. 18 is a flow chart showing the data input-output process to be executed by the card issuing console with use of the data input unit; and

Fig. 19 is a flow chart showing the unlocking process to be executed by the card lock unit.

The present invention will be described below in detail as embodied as a hotel card lock system.

1. Outline of Hotel Card Lock System

Fig. 1 schematically shows the overall construction of the hotel card lock system. Hotels have a large number of rooms which need locking. Each of such rooms is usually provided with a mechanical lock, such as a tumbler lock,which is unlockable by rotating a key. The present hotel card lock system is adapted to electrically lock and, especially, unlock the door of the room with a card (termed a "key card KC") having given data recorded therein, for example, magnetically.

The key card KC is issued by a card issuing console 10 or 11. To issue the key card KC, authorization cards AC are necessary as will be described later in detail. Card issuing consoles include a parent machine 10 and one or a plurality of satellite machines 11 connected thereto by transmission cables. All types (to be stated later) of key cards KC can be issued by the parent machine, whereas key cards KC of the specified type only can be issued by the satellite machine. The consoles 10 and 11 have the function of storing and printing data relating to the issue of cards in addition to the function of issuing cards. The number of satellite machines 11 is dependent on the scale of the hotel to be equipped with the hotel card lock system. The parent machine 10 only may be installed in a small hotel.

A card lock unit 70 is attached to the door of the hotel room. The unit 70 includes a card reader for reading data from the key card KC. The card data is checked before unlocking. The card lock unit 70 has a battery incorporated therein and operates in off-line mode. There is no need to provide a line for supplying power to the unit 70 or a data line for connecting the unit 70 to the console 10. A data input unit 50 is used for reading from the card issuing console (parent machine) 10 the data necessary for operating the card lock unit 70 and feeding the data to the card lock unit 70.

As is well known, the door is provided with a dead bolt in addition to a latch bolt. The dead bolt is manually forced outward by the guest from inside the room for locking. While there are various types of key cards KC, some are not usable for unfastening the dead bolt by the card lock unit 70.

2. Kinds of Cards and Their Security Levels

Fig. 2 shows the kinds of cards to be used for the hotel card lock system and the security levels thereof. A grand authorization card (hereinafter abbreviated as a "GR card") is the highest in security level (grand level). This card is to serve as a "key" for the overall system.

The cards of the second highest level (authorization level) are a master authorization card, sub-master authorization card and guest authorization card (hereinafter referred to briefly as "MA card," "SMA card" and "GA card," respectively). These three kinds of cards at the authorization level correspond to the authorization cards AC shown in Fig. 1.

The level for unlocking the hotel room (unlocking level) is divided into management level, guest level and maintenance level. Available at the management level are an emergency card, master card and maid card. The cards at the guest level are a standby card, guest card A and guest card B. The cards at the maintenance level are a maintenance card, lockout card and cancelling card. These nine kinds of cards at the unlocking level correspond to the key cards KC shown in Fig. 1. According to the present embodiment, the guest card A or guest card B only is used for one hotel card lock system (or for one hotel), and the two types of cards will not be issued by one system at the same time. Of the cards at the unlocking level, the standby card, guest cards A, B and maintenance card are paper cards, while all the other cards are plastics cards. Paper cards are inexpensive, suited to disposal and convenient in that the desired information can be easily printed on the surface.

The above cards are used for the purposes and have the functions briefly stated below.

GR card

The hotel code concerned is registered in the card issuing console with use of this card. The hotel code, which is recorded in every card, is very important as data for recognizing whether a particular card is one issued by the hotel concerned.

The card is used also for issuing MA, SMA and GA.

MA card

To be used for issuing the nine kinds of cards at the unlocking level.

SMA card

To be used for issuing the maid card and guest cards A and B.

GA card

To be used for issuing the guest cards A and B.

Emergency card

To be used for unlocking any desired room in the event of emergency.

Every card lock unit can be unlocked by this card whether the room is locked by the dead bolt or whether the room is locked out.

Master card

To be used as a substitute for the so-called master key.

All card lock units can be undone by this card except for those fastened by the dead bolt.

Maid card

To be used by the maid for cleaning the room or for access to the interior for other work.

In a specified time zone, the card is used for opening the card lock units for the rooms within a specified range of room numbers, except those locked by the dead bolt. The term "specified range of room numbers" refers to the rooms assigned to the maid bearing the card for her to work in. The term "specified time zone" refers to the period of time during which the main is to work, e.g. from 10 to 15 o'clock. The time zone is not always provided as will be stated later.

Guest card A

This card is handed to the guest upon checking in for him to freely use (lodge in) a specified room.

The card lock unit of specified room number can be opened by the card except when it is fastened by the dead bolt. The term "specified room number" refers to the room number assigned, upon checking in, to the guest carrying the guest card A.

Guest card B

This card opens the card lock unit of the specified room number irrespective of whether it is fastened by the dead bolt.

Maintenance card

To be used by the maintenance worker for the in-

spection, maintenance and repair of the room.

Except where the room is locked by the dead bolt, the card lock unit with a specified room number can be opened by this card only once on the day of issue of the card. The term "specified room number" refers to the room to be maintained, inspected, repaired or otherwise worked in by the worker.

Lockout card

To be used for locking out a specified room.

When locked out by this key card, the card lock unit is no longer openable by any of the master card, maid card, guest cards A, B, maintenance card and standby card.

Cancelling card

The card lock unit, when in locked-out state, is opened by this card. When the unit is not locked out, the card clears the sequence number (to be described later) relating to a specific card and stored in the memory within the card lock unit. With the present embodiment, sequence numbers relating to the guest card and maintenance card are cleared.

Standby card

A spare card for the guest card. It is used, for example, when the card issuing console malfunctioned.

The card lock unit of a specified room number is undone by this card except when the room is locked by the dead bolt.

3. Card Date and Unlocking Method

Fig. 3 shows the data recorded in the foregoing different types of cards. Each card has a magnetic stripe affixed thereto or printed thereon. Data specific to the card type is magnetically recorded in the stripe.

The items of data common to all card types are formality codes and the hotel code. The formality codes include start of test (STX), end of text (ETX), longitudinal redundancy check (LRC), etc. The hotel code is a specific code for identifying the hotel concerned.

A classification code is an item of data which is contained in cards of any type. This code identifies the type of a particular card.

The data in the authorization cards other than the GR card, i.e. the MA, SMA and GA cards, further includes a staff code and a staff secret code. These cards are carried and used by only some of the hotel empolyees who are in specific positions and called a staff. The staff code specifies the staff. The staff secret code is intended for checking whether the person using an authorization card is authorized to do so. The staff secret code is a number comprising several digits. When the authorization card is to be used on the card issuing console by a staff member, he keys in his staff secret code, and the keyed-in code is checked with the staff secret code in the card data for matching.

The eight kinds of key cards other than the standby card have recorded therein a sequence number and sequence subnumber. When a key card is used on the card lock unit, these numbers serve to check whether or not the unit is to be opened by the card. These are important items of card data.

As the most typical case wherein the sequence number and sequence sub-number are required for unlocking, use of guest cards will be considered. The user (guest) of a hotel room frequently changes, and when a day elapses, another guest is very likely to use that room. A key card is issued to every guest, who need not return the card to the hotel. Accordingly, it will not be good enough if the room can be unlocked only when the sequence number on a guest card matches the sequence number stored in the memory of the card lock unit, because even after the guest at the room has changed, the previous quest will be able to unlock the room with use of his card.

To make it possible for the latest guest only to use the room, there arises the need to change the sequence number every time a new guest card is issued. Since the card lock unit operates in off-line mode, there is no means for transmitting the data of a new sequence number from the card issuing console to the card lock unit, so that the unit is unable to know the new sequence number. Japanese Patent Publication SHO 59-21422 or U.S.P. No. 4,385,231 discloses a method of changing the sequence number upon change of guest for use in a hotel card lock system equipped with card lock units which operate in off-line mode. The method of unlocking with use of key cards according to the present embodiment is basically the same as the disclosed method.

Suppose the sequence number and sequence sub-number of the preceding key card are CN1 and SN1, respectively. The preceding sequence number CN1 is stored in the memory of the card lock unit. Further suppose the sequence number and sequence sub-number of the current key card are CN2 and SN2, respectively. Under such a circumstance, the card lock unit checks whether the current sequence number CN2 is in a definite relation with the preceding sequence number CN1 and the current sequence subnumber SN2. If it is in this relation, the unit opens. The unlocking condition is represented by the following equation,in which f is a function.

$$CN2 = f(CN1, SN2)$$

If this unlocking condition is satisfied, the sequence number in the memory of the unit is renewed by the new sequence number CN2. Consequently, the sequence number on the current key card thereafter

matches the sequence number stored in the memory until another new key card is issued.

When a sequence number is prepared for the first time, a desired number (e.g. random number) will be used. If no sequence number is stored in the memory of the card lock unit, the unit stores the sequence number on the card as the current sequence number and opens.

With the present embodiment, the standby card is to be collected by the hotel after the room is used, so that there is no sequence sub-number for this card.

The card data recorded on the maid card further includes a starting room number and an ending room number to show the room range, and the aforementioned time zone.

The card data on the guest cards A and B further includes a room number indicating the room to be used, card issue date (date of check-in) and check-out date, time.

The maintenance card has further magnetically recorded therein a room number indicating the room to be used and card issue date (to show the day on which the card is usable).

The standby card also contains a room number indicating the room to be used, as card data.

4. Construction of Card Issuing Console

Fig. 4 shows the appearance of the card issuing console (parent machine) 10. A totalling printer 19 is provided on the top of the console 10 at one side thereof. The console 10 is provided at its upper portion a display panel having a display 12 and a card issuing opening 13. The console lower portion has an operation panel provided with function switches 15 and a ten-key arrangement 16. An authorization card inlet 14 is formed further below these members. The display 12 shows alphanumeric characters entered by the function switches 15 and ten-key arrangement 16, and simple instructions for the procedure to be followed next, such as "INSERT CARD." Although not shown, the console 10 has, for example on its rear or lateral side, a connector 23 for the satellite machine 11 and a connector 24 for the data input unit 50 (see Fig. 6). A power switch 17 is mounted on one side of the console 10.

The card issuing console satellite machine 11 also has nearly the same appearance as the parent machine 10. However, the totalling printer 19 and the connector 23 for the data input unit 50 are not mounted on the satellite machine 11.

Fig. 5 shows the operation panel of the console 10 on an enlarged scale. The function switches 15 include five switches arrangea in a horizontal row at the left side of the ten keys 16, and four switches arranged in a vertical row at the right side of the ten keys 16. The five horizontally arranged switches, which are lighted up when depressed, are used for entering "GUEST," "CANCEL (ROOM)," "TOTAL," "MONITOR (CARD)" and "OTHER FUNCTION." The four vertically aligned switches have such functions as "ENT (entry)" and "ITEM." These functions will be described later in detail. The ten-key arrangement 16 includes keys for entering the numerical values of 0 to 9, and a cancelling key "C."

Fig. 6 schematically shows the electrical construction of the card issuing console (parent machine) 10. The console 10 includes a control unit 20 comprising a central processing unit (CPU), a ROM having stored therein the program to be executed by the CPU and other fixed data, and a RAM for storing variable data. Connected to the control unit 20 through a suitable interface are the foregoing ten-key arrangement 16, function switches 15, display 12, totalling printer 11, satellite connector 23 and data input unit connector 24, and further a card reader 21 and a card reader 22 with a printer. The card reader 21 is disposed inside the card inlet 14 for reading data from the authorization card inserted into the inlet 14 and also for recording specified data in the GR card to issue the card.

The printer-equipped reader 22 is used for writing specified data in all the cards other than the GR card to issue these cards, and also for printing check-out date and time, room number, etc. on paper cards including the guest card when required. The card issuing opening 13 shown in Fig. 4 is provided for this reader 22.

For issuing cards other than GR cards, a blank card for the card to be issued is inserted into the opening 13. Further the authorization card AC is inserted into the card inlet 14.

Fig. 7 chiefly shows the data stored in the memory of the control unit 20 in the card issuing console (parent machine) 10.

A secret code is stored in the ROM by the maker on completion of fabrication of the console 10. This code will be stated later.

The RAM has an operation mode area, initial data area, sequence number area, room data area, issued AC registration area, totalling area, etc.

The following data is stored in the operation mode area.

Guest card A or B

As already mentioned, there are two kinds of guest cards: A and B. Guest cards of only one of these types can be issued by the console of the hotel card lock system installed in one hotel. This operation mode data represents whether the guest cards to be issued are of the A type (unable to unlock the room locked by the dead bolt) or of the B type (unlockable even when the dead bolt is in locking position).

Time zone set or not

The term "time zone" refers to the period of time for the maid to work in the room. This operation mode data represents whether the time zone is set or not. When no time zone is set, the maid is free to work in the room at any time. Thus, the card lock unit of a room within the specified range of room numbers can be opened by the maid card at any time.

Room number printing needed or not

This represents whether it is needed to print the room number on the guest card.

Number of satellite machines

This data indicates the number of satellite machines connected to the parent machine.

The foregoing four items of data are set by a dip switch (not shown) provided inside the console (parent), for example,when it is installed. These items of data thus set are read by the CPU and stored in the RAM.

At each satellite machine, a satellite machine number for identifying the machine is similarly set by a dip switch therein and is stored in the RAM.

The initial data area stores the following initial data.

Hotel code

As already stated, this is a code for specifying the hotel equipped with the hotel card lock system.

GR secret code

A confidential code for checking whether the person using the CR card is authorized to do so. The code keyed in is checked with the GR secret code stored for matching to judge whether the user is authorized.

Clock

This data represents the present time (year, month, day, hour, minute and second) and is renewed with the lapse of time by the CPU of the control unit 20.

Unlocking duration (seconds)

The period of time for the card lock unit 70 to be held open. It is set, for example, to several seconds to about 10 seconds. Details are given later.

Check-out time

As a rule, determined by the hotel.

Allowable check-out overtime (minutes)

As stated above, the check-out time is recorded in the guest card, by which the room can be unlocked only until the check-out time as a rule. The allowable time is a period of time (e.g. about 20 to about 30 minutes) during which unlocking is possible with use of the guest card even after the lapse of time.

Registered room number

A list of the numbers of the rooms available at the hotel. Generally, the room numbers of all rooms are registered.

Time zone

As already mentioned, the period of time during which the maid can work in the room. When to be set, a time zone, for example, of 10 to 15 o'clock is set. When no time zone is set, the data is set, for example, to 0 to 23:59.

The foregoing items of initial data are set by the initial data setting procedure to be described later.

The data stored in the sequence number area are the sequence numbers of issued emergency card, master card, maid card, lock-out card and cancelling card. Since there are a plurality of maids, a plurality of maid cards are issued, one to each maid. With the present embodiment, same sequence number is recorded in all maid cards. The same is true of the other cards. In the sequence number area, therefore, one sequence number only is stored for each type of card. However, different sequence numbers may be recorded in cards of the same type and stored in this area.

Data is stored for each room number in the room data area. This data includes the sequence numbers of the guest card and maintenance card issued for the room, and the check-out date and time of the guest assigned the room. Although not shown, the number of guest cards issued and other data as to the guest may be stored.

The staff codes and staff secret codes on the effective MA, SMA and GA cards already issued are registered in the issued AC registration area.

The types of cards other than the GR card and the number of issued cards of each type are stored in the totalling area. Preferably, further detailed data as to the issue of cards is stored.

5. Outline of Authorization Card Issuing and Initial Data Setting Procedures

Fig. 8 schematically shows the procedures of issuing GR card, setting initial data and issuing other authorization cards, i.e. MA, SMA and GA cards.

The whole equipment of hotel card lock system fabricated by the maker is delivered to an installing company, which installs the equipment in a hotel. Before the equipment is delivered to the installing company, the RAM of the card issuing console (parent machine) 10 is cleared, and a maker side secret code is stored in the ROM of the console 10 by a responsible person of the maker. The GR card furnished by the maker has recorded therein only a formality code and a classification code for identifying the card and is still an incomplete card. Preferably only one GR card is delivered to the installing company.

The responsible person of the maker notifies only a responsible person of the installing company of the maker side secret code. The responsible person of the installing company determines a hotel code for identifying the hotel and enters the hotel code into the console 10. It is only the responsible person of the installing company that knows the hotel code in order to assure high security.

As will be described later, the GR card is issued (completed) at the time of input of the hotel code as will be described in detail later. Stated conversely, the hotel code is keyed in when the GR card is issued (completed). The responsible person of the installing company inserts into the card inlet 14 of the console 10 the GR card delivered from the maker and keys in the maker side secret code informed from the responsible person of the maker. When the keyed-in secret code matches the secret code stored in the RAM, the input of the hotel code becomes acceptable, and the responsible person of the installing company keys in the hotel code. The keyed-in hotel code is stored in the initial data area of the RAM of the console 10 and also recorded in the GR card. The GR card is thus issued, with all the required data prepared therefor.

The console 10 having the hotel code entered and stored therein is installed in the hotel, and the completed GR card is delivered to the responsible person of the hotel. Of course, the hotel responsible person is not informed of the hotel code.

The GR card, although completed, is still unusable for issuing the other authorization cards (MA, SMA and GA cards); there is the need to key in a GR secret code. The console 10 does not operate before the input of initial data. Accordingly, the responsible person of the hotel enters initial data (inclusive of GR secret code), which is then stored in the RAM. It is only the hotel responsible person that knows the GR secret code. At this time, the foregoing operation modes are also set by the dip switch.

The other authorization cards are issued by the hotel responsible person with use of the GR card by the following procedure. The GR card is inserted into the card inlet 14 of the console 10, and the GR secret code is keyed in. Only when the keyed-in GR secret code matches the GR secret code stored in the RAM, the process for issuing the authorization cards follows. A blank card carrying no data is inserted into the card issuing opening 13, and a staff code and staff secret code are keyed in, whereupon a sequence No. is produced within the console 10. These items of data are recorded in the blank card by the printer-equipped card reader 22. In this way, MA, SMA and GA cards are issued from the opening 13.

Although the installing company is present between the maker and the hotel according to the above description, the maker is serviceable also as an installing company, in which case, the hotel code is entered into the console 10 by the maker.

6. Main Routine for Card Issuing Console and Process with GR Card

Fig. 9 shows the main routine to be executed by the card issuing console 10. When the power switch 17 on the console 10 is turned on, the display 12 shows an instruction, "INSERT AUTHORIZATION CARD." When a card inserted is detected by a card sensor (not shown) provided inside the inlet 14 (step 101), the data on the card is read by the card reader 21 (step 102). Every card, even if it is GR card before completion, bears a classification code, so that the type of card inserted is detected with reference to this code (step 103 to step 106). Since authorization cards AC only are inserted into the inlet 14, the inserted card is checked as to which of GR, MA, SMA or GA card it is, followed by a process in accordance with the card type detected (steps 113 to 116). When the process with use of each of the authorization cards has been completed as will be described in detail later, the card is withdrawn (step 107), whereby the main routine is completed.

7. Construction of Data Input Unit

Fig. 10 shows the appearance of the data input unit 50, which is made compact and convenient to carry. A reduced number of keys are provided for the ease of manipulation. Provided on the upper side of the unit 50 are a small display 51, keyboard 52 and power switch 53. A battery (indicated at 63 in Fig. 11) is incorporated in the unit 50. A connector 54 for connection to the parent console 10 or to the card lock unit 70 is attached to the free end of a cable extending outward from the unit 50. The cable includes a data bus and a power line. The keyboard 52 includes ten keys 61 and function keys 62 (see Fig. 11).

Fig. 11 shows the electric construction of the data input unit 50. A control unit 60 comprises a micropro-

cessor MPU and a memory and is connected to the ten-key arrangement 61, function keys 62 (keyboard 52), display 51 and connector 54.

The battery supplies operating power to the unit 50.

Fig. 12 shows the data stored in the memory of the control unit 60. The memory has an initial data area, room number area, and initial data set room number registration area. The initial data forwarded from the console 10 is stored in the initial data area, the data including the hotel code, clock (year, month, day, hour, minute, second), unlocking duration (seconds) and allowable check-out overtime (minutes). The clock data is renewed by the MPU of the unit 60 with the lapse of time. The room number entered by the ten-key arrangement 61 is stored in the room number area. The initial data forwarded from the console 10 and the room number keyed in are written in the memory of the card lock unit 70 corresponding to the room number by the data input unit 50 as its main function. This process will be termed initial data setting process. The room number for which such process has been completed is chiefly stored in the initial data set room number registration area. This area also stores data indicating that other process (such as the sequence number clearing process to be stated later) has been completed.

The operation modes of the unit 50 will be described briefly. These modes are set by A to D keys among the function keys.

Initial data setting mode (D)

The unit 50 receives initial data from the console and writes the initial data and room number in the card lock unit. Performed in this mode are receipt of the initial data from the console (initial data input, D-01), supply of the initial data and room number to a card lock unit (initial data output, D-02), and report of initial data set room number to the console (room number printing, D-03). The character D means that the unit is set for the process by D key, and 01, 02, 03 mean that the ten-key arrangement is used for setting. For example, the initial data output process is set by depressing D key and then 0 key and 2 key of the arrangement.

Reading mode (A)

The data stored in the memory of the card lock unit is read and displayed on the display 51. This mode is set by the function key "A".

Writing mode (B)

Specified data stored in the memory of the card lock unit is changed. This mode is set by the function key "B".

Clearing mode (C)

All sequence numbers or specified sequence numbers stored in the memories of card lock units are cleared. This mode is set by the function key "C".

Backup mode

The power of the battery 63 in the data input unit 50 is supplied to the card lock unit 70. This mode is available whenever the connector 54 of the unit 50 is connected to a connector 83 (see Fig. 14) of the card lock unit 70.

The backup mode serves to prevent the data in the memory of the card lock unit 70 from disappearing while the battery 88 (see Fig. 14) therefor is replaced.

8. Construction of Card Lock Unit

Fig. 13 shows the apperance of the card lock unit 70 as attached to the door 80 of a hotel room, and Fig. 14 shows the electrical construction of the unit 70.

With reference to Fig. 13, a dead bolt 71 and a latch bolt 72 are provided for locking the door 80. By a small knob (not shown) on the inner side of the door 80, the dead bolt 71 is mechanically moved to an advanced position indicated in a broken line. This position is the dead bolt locking position. The dead bolt 71 is of course mechanically movable to a retracted position by the small knob for unlocking. While the dead bolt 71 is in locking position, it is electrically brought to the unlocking position only by a specified key card as will be described later. The dead bolt 71 as located in the locking position is detected by a dead bolt sensor 87 (see Fig. 14).

The latch bolt 72 is coupled to an outer knob 75 and to an inner knob (not shown), and these are driven only by a solenoid 85 incorporated in the card lock unit 70 (see Fig. 14). The solenoid 85 assumes two stationary positions: one is the locking position and the other is the unlocking position. For example, when positive voltage is applied to one input terminal of the solenoid 85, with negative voltage applied to the other input terminal, the unit 70 is opened, whereas when the voltages are applied in reverse relation, the unit is fastened. As will be stated later, the solenoid 85 is operated according the result obtained by checking the key card for validity. When the unit 70 is undone, the latch bolt 72 is movable to the retracted position by manually turning the outer knob 75 or inner knob. When the unit 70 is in the locking position, these knobs are not rotatable, and the latch bolt 72 is held in its advanced position. A guard bolt 73 is movable with the latch bolt 72. When the unit is electrically undone by a key card, the dead bolt 71 is also brought to its retracted position by the solenoid 85. The solenoid 85 as located in one of the two stationary positions is detected by a solenoid sensor 86 (see Fig.

14). The card lock unit 70 is automatically brought to the locking state when the door 80 is closed.

On the outer side of the door 80, there is a key card scanning groove 74, which is provided with a green pilot lamp 76 and a red pilot lamp 77 on its opposite sides. The green pilot lamp 76 goes on chiefly when the unit 70 is in the unlocking position. The lamp 76 is used also for indicating the result of checking of a battery 88 (see Fig. 14). The red pilot lamp 77 goes on when the key card is found to be not effective for unlocking.

A card reader 82 (see Fig. 14) is provided inside the scanning groove 74. Although not shown in Fig. 13, the unit 70 has a connector 83 connectable to the connector 54 of the data input unit 50. As seen in Fig. 14, the unit 70 has incorporated therein a control circuit 81, battery 88, battery check circuit 89, the above-mentioned solenoid 85, drive circuit 84 therefor and sensor 87.

With reference to Fig. 14, the control circuit 81 includes a microprocessor MPU and a memory. Connected to the control circuit 81 are the card reader 82, pilot lamps 76, 77, connector 83, solenoid 85, solenoid drive circuit 84, sensors 86, 87 and battery check circuit 89. These circuits are operated by the power supplied from the battery 88. The battery check circuit 89, which can be a known one, is used for checking whether the output voltage of the battery 88 has dropped to a predetermined level or lower. The term "predetermined level" means a voltage not higher than the normal voltage to be supplied to the card lock unit 70. Of course, the level is determined with some allowance.

Fig. 15 shows part of the memory of the control circuit 81. The memory has the unlocking program to be stated later, and further includes areas for storing the illustrated data. The main data to be stored in the memory are initial data, room number, data read from key card and sequence number. The initial data includes the hotel code, clock, unlocking duration and allowable check-out overtime. These items of data are delivered from the data input unit 50. The clock data is renewed by the MPU with the lapse of time. The room number is the number of the room equipped with the card lock unit and is fed from the unit 50. Stored as the sequence number is that of one of the eight types of key cards at the unlocking level (guest card A or B). The memory further has areas for use as a lockout flag and a flag indicating that the maintenance card has already been used.

Fig. 16 shows the usual operation of the solenoid 85, which is usually in a locking state. When the key card is checked for validity and found effective for unlocking, the solenoid 85 is energized, whereupon the solenoid changes from the locking state to unlocking state. The duration of energization is about 100 msec. Upon lapse of a predetermined period of unlocking, current is now passed through the solenoid 85 in the opposite direction, bringing the solenoid 85 into the locking state again. Accordingly, one who is to enter the room must enter during the unlocking duration. Upon the lapse of the unlocking period, the unit 70 moves into the locking state, so that the key card needs to be scanned once again. The term "unlocking period or duration" means the period of time during which the card lock unit is held open by the use of the key card and which is set to several seconds to about 10 seconds (initially set by the console).

9. Initial Data Input/Output Process with Data Input Unit

Fig. 17 shows the operation of the data input unit 50, especially the processing procedure to be performed by the MPU. Fig. 18 shows the data input/output process to be executed by the console 10 with use of the unit 50.

First, the initial data setting process will be described in which initial data is forwarded from the console 10 to the data input unit 50, and the initial data and room number are fed from the data input unit 50 to the card lock unit 70 of each room. This process is performed when the card lock unit is intstalled for each room or is replaced, or when the initial data is entirely changed.

The staff member bearing MA card connects the connector 54 of the data input unit 50 to the connector 24 of the parent console 10, whereby the control unit 60 of the data input unit 50 is connected to the control unit 20 of the console 10 through a bus line. The staff member turns on the power switch 53 of the unit 50.

Next, the staff member keys in at the console 10 the item number for input/output process with use of the data input unit, whereupon the sequence changes to the routine of Fig. 18. The display 12 of the console 10 shows an instruction to select either the transfer of initial data to the data input unit or reading of data from the data input unit. The staff selects the transfer of initial data (from step 301 to step 302 in Fig. 18). With use of the function key "D" and "0" and "1" keys of the data input unit 50, the staff member sets initial data input process in the initial data setting mode (connector checking in step 271 in Fig. 17, followed by steps 272 and 273).

With the card issuing console 10, the hotel code, clock, unlocking duration and allowable check-out overtime are read from among data items stored in the RAM, and these items are transferred to the data input unit 50 (step 303 in Fig. 18). The initial data transferred to the unit 50 is stored in the initial. data area of its memory (Fig. 17, step 274). This is effected, for example, by DMA transfer. The display 51 further shows that data setting is completed. This means that the initial data has been delivered from the console 10 to the data input unit 50. The staff member turns off the power supply for the unit 50 and discon-

nects the unit 50 from the console 10.

The staff member carries the data input unit 50 to the front of the door of the hotel room. He connects the connector 54 of the unit 50 to the connector 83 of the card lock unit 70 mounted on the door and turns on the power switch 53, whereby the lock unit 70 is connected to the unit 50 through a bus line. Subsequently the staff member sets an initial data output process in the initial data setting mode, using "D", "0" and "2" keys. (The sequence proceeds to steps 271, 272, 273 to 275.) Using the ten-key arrangement, the staff member further keys in the room number of the room, and the input data is accepted (step 276). The initial data stored in the memory of the data input unit 50 is transferred to the unit 70 and stored in the memory thereof along with the room number. To accomplish this, the memory of the card lock unit 70 is directly accessible by the MPU of the data input unit 50. The room number is further stored in the initial data set room number registration area of the memory of the unit 50. The display 51 shows completion of data setting, whereupon the staff member turns off the power supply of the unit 50 and disconnects the unit 50 from the unit 70.

The staff member repeats such initial data output process for the card lock unit of each hotel room in succession. When this process is completed for all rooms, or when the initial data set room number registration area of the unit 50 is filled up, he returns to the location where the console 10 is installed, and performs printing.

The staff member connects the data input unit 50 to the console 10 again, and turns on the power supply for the unit 50. With the console 10, the staff member selects the data reading item from the data input/output process with use of the data input unit. (The sequence proceeds from Fig. 14 to Fig. 18, steps 301, 303 to 304.) He sets the unit 50 for room number printing process, using "D", "0" and "0" keys (Fig. 17, steps 271, 272, 273, 275 to 278).

When the above setting has been completed, the room number data is read out from the initial data set room number registration area of the unit 50 (Fig. 17, step 279) and transferred to the console 10. A list of the input room numbers is printed by the totalling printer 19 of the console 10 (Fig. 18, step 305).

10. Other Operation of Data Input Unit

When the data input unit 50 is in the reading mode, all items of data, i.e. initial data, room number, card read data and sequence number, stored in the memory of the unit 70 are read out. Of these items, the data of the items specified by the ten-key arrangement are shown on the display 51. However, the hotel code which is confidential is not shown. As to the hotel code, the code read out from the card lock unit 70 is checked with the one stored in the unit 50 for matching, and the result, i.e. OK or NG, is shown on the display. The reading mode process is executed to check the data when the unit 70 malfunctioned or to periodically check the data in the unit 70. The item numbers of the data to be displayed is given for example in a manual.

The staff member connects the data input unit 50 to the card lock unit 70 to be checked by this process, and turns on the powere switfh 53. Further the reading mode is set by the function key "A" (Fig. 17, steps 271, 272 to 281), whereupon the card lock unit memory is accessed by the MPU of the data input unit 50, and the above data stored is all fetched to the unit 50 and stored in the memory thereof step 282). When the item number of the data to be displayed is entered by keying in, the data is shown on the display 51. When there are a plurality of such data items, the item numbers are keyed in successively, and the data concerned is shown for every input.

Finally, the power switch of the unit 50 is turned off, and the unit 50 is disconnected from the unit 70.

The writing mode is so adapted that of the data stored in the unit 70, the room number, clock, unlocking duration and allowable check-out overtime are changed with use of the data input unit 50. Of these items of data, the item to be changed is entered by the ten-key arrangement. The process is used for correcting the clock of the unit 70 and modifying the conditions for using the room.

The writing mode is set when the function key "B" is depressed with the input unit 50 connected to the lock unit 70 (Fig. 17, steps 271, 272, 281 to 285). Subsequently, the data item to be changed is entered by the ten-key arrangement (step 286), and the data to be changed is similarly entered (step 287). The data input is stored in the location concerned in the memory of the lock unit 70 (step 288).

The clearing mode process is used for deleting all or some of the sequence numbers for the eight types of key cards stored in the lock unit memory. This process is executed when an error or disturbance occurs in sequence numbers. An instruction as to whether all sequence numbers are to be deleted, or the sequence number of which key card is to be cleared is given by entering the item number concerned by the ten-key arrangement.

The clearing mode is set by the function key "C" with the input unit 50 connected to the lock unit 50 (Fig. 17, steps 271, 272, 281, 285 to 291). When the key card item whose sequence number is to be cleared is entered by the ten-key arrangement (step 292), the sequence number is deleted from the lock unit memory (step 293).

11. Unlocking Process in Card Lock Unit

(1) Kinds of Key Card Validity Checks

The guest or other person who is to open the lock unit 70 passes his key card through the card scanning groove 74 for scanning, whereby the card data is read by the card reader 82, and a series of specified checks are performed for the card data. When the card is found acceptable by these checks, the solenoid 85 is energized for unlocking. These checks are called key card validity checks and are of the following kinds. All the following checks are not always performed for every type of key card; the combination of checks differs with the type of key card.

Parity check

The parity check includes a vertical parity check and horizontal parity check. If the card data is found not acceptable by at least one of these checks, the card is judged as being invalid, failing to open the lock unit 70. These checks are conducted for the data of every type of key card.

Format check

The card data form is checked as to whether it is in conformity with the specified format. When it is out of conformity with the format, the key card is judged as being invalid. This check is conducted also for every type of key card.

Hotel code check

The hotel code in the card data is checked with the hotel code stored in the lock unit memory for matching. When the two codes do not match, the key card is found to be invalid. This check is conducted also for every type of key card.

Classification code check

The classification code in the card data is checked as to whether it represents the expected type of key card. The types of key cards for opening the lock unit 70 are predetermined as already stated, and the classification codes of these types are stored in the memory or incorporated in the program. Unless the classification code represents the expected type, the card is judged as being invalid. This check is conducted also for every type of key card.

Sequence number check

The sequence number in the card data is checked with the sequence number in the lock unit memory for matching. The former number is also checked as to whether it is in a given relation which is determined by the sequence number in the lock unit and the sequence sub-number in the card data. When a match is found or when it is in the given relation, the card is found acceptable. If otherwise, the card is judged as being invalid. The sequence number in the memory used is of course the number of the key card of the type concerned.

When the sequence number is found to be in the given relation, it is stored as the latest sequence number in the location concerned within the memory sequence number area (renewal of sequence number).

If the corresponding sequence number is not present in the pertinent area of the lock unit memory, the card is not judged as being invalid by the sequence number check but is found acceptable. The sequence number in the card data is then stored in the area concerned. No sequence number will be present in the memory when a key card is used for the first time after the lock unit 70 is installed, or when sequence numbers are cleared by the foregoing clearing mode process with the data input unit 50, or when the sequence number is cleared by a cancelling card.

This check is conducted also for every type of key card.

Dead bolt check

Whether the dead bolt 71 is in advanced position is checked with reference to the detection signal of the dead bolt sensor 87. When the dead bolt 71 is in its advanced position, an unlocking process will not be executed unless emergency card or guest card B is used.

Lockout check

When a process with lockout card is executed normally in the card lock unit 70, the lockout flag in the memory is set to 1. The lockout flag is reset to 0 only by a normal process with cancelling card.

The lockout flag is checked as to whether it is set to 1. If the flag is 1, an unlocking process will not follow unless emergency card is used.

Since the lockout card and cancelling card are not intended for opening the lock unit, these key cards are not checked for lockout.

Time zone check

This check is conducted only for the maid card. The maid card data includes time zone data. If the current time (clock data in the initial data area of the lock unit memory) is within the time zone, the card is acceptable. If otherwise, unlocking process will not follow.

Room range check

This check is conducted also for the maid card only. When the room number stored in the lock unit memory is between the starting room number and the ending room number included in the data on the maid card, the card is acceptable. If otherwise, unlocking process will not follow.

Room number matching check

This check is performed for guest cards (A and B), maintenance card and standby card. When the room number in the card data matches the room number in the lock unit memory, the card is acceptable. If otherwise, unlocking process is not performed.

Stay period check

This check is specific to the guest cards A and B. The guest card data includes date of issue of the card (check-in date) and check-out time. When the present time minus the allowable check-out overtime is between the day of check-in and the check-out day, time, the card is acceptable. If otherwise, the card is judged as being invalid.

Checks specific to maintenance card

The checks specific to the maintenance card are an effective period check and first use check.

The maintenance card is usable only once on the day of issue. The check as to whether the day it is used matches the day of issue of the card is the effective period check. The day of issue in the card data is compared with the present date, and if they match, the card is acceptable. If otherwise, the card is invalid.

When the maintenance card has been used once, the flag indicating the use of card in the lock unit memory is set to 1. The first use check determines whether this flag is 1 when the card was used. If the flag is reset to 0, the card is acceptable, whereas if it is 1, the door is no longer unlockable on that day with use of the card. The flag is automatically reset, for example, at 0:00 by MPU.

Fig. 19 shows an unlocking process, including the above key card validity checks, which is performed by the MPU of the card lock unit 70. Although the validity checks are performed in a predetermined order according to this flow chart, these checks can of course be conducted in a desired order.

The unlocking process will be described in the order shown in Fig. 19.

(2) Checks Common to All Types of Key Cards

When a key card is passed through the card groove 74 for scanning, the card data is read from the card by the reader 82 (step 311). The card is first subjected to the parity check (step 312). When found thereby acceptable, the card data is read (step 313), followed by the format check and then by the hotel code check (steps 314 and 315). When found acceptable by these checks, the data is further checked for classification code (steps 321, 331, 341, 351, 361, 371, 381 and 391). Thus the type of card is identified, and the card is processed according to the type.

(3) Display of Invalidity of Card

If the card is found invalid by one of the parity check, format check, hotel code check and classification code check, the red pilot lamp 77 goes on for 1 second, and the process is completed without unlocking (steps 421 to 423).

(4) Emergency card

When the card is found to be an emergency card by the classification code check (step 321), sequence number check only is conducted (steps 322, 323). For sequence number checking, step 322 checks whether the sequence number in the card data matches that in the memory and whether the two sequence numbers are in the definite relation (this by calculation). The sequence number process for other key cards is conducted similarly (steps 332, 344, 354, 364, 372, 382, 393). When the card is found acceptable, the routine of unlocking and battery check is executed. If otherwise, the above key card invalidity display routine is performed.

(5) Unlocking and Battery Check

In this routine, the solenoid 85 is first energized and brought to the unlocking position. The detection signal of the solenoid sensor 86 confirms that the solenoid 85 has been brought to the unlocking position (steps 401, 402). This check can be accomplished by detecting the change of the output of the solenoid sensor 86 from ON (at one stationary position) to OFF (during movement) and then to ON (at the other stationary position). The unlocking duration measurement is started (step 403).

The battery is checked only when master, maid or maintenance card is used. If the card is such a specific card (step 404), the battery check circuit 89 functions to check whether the output voltage of the battery 88 is up to the predetermined level as already stated (step 410). If it is at this level or lower, the green pilot lamp 76 flickers, indicating the need of replacement of the battery 88 (step 411). If the battery output voltage is at the normal level, the green pilot lamp 76 goes on (step 405).

Also when the card is other than the specific

cards, the green pilot lamp 76 goes on, showing the lock unit is open (step 405). The green pilot lamp 76 is held on or on-and-off until the unlocking duration elapses.

Upon the lapse of unlocking duration (step 406), a reverse current flows through the solenoid 85 to return the solenoid 85 to the locking position again (step 407). The return of the solenoid 85 to the locking position is detected (step 408), whereupon the lighting or flicker of the lamp 76 is discontinued (step 409), whereby the unlocking process is completed.

(6) Master Card

When the card is found to be a master card by the classification code check (step 331), sequence number check (steps 332, 333), dead bolt check (step 334) and lock-out check (step 335) are performed. When the card is found acceptable by the sequence number check, the dead bolt 71 is in its retracted position and the state is not lockout (lockout flag = 0), the above routine of unlocking and battery check is conducted. If the card fails to pass one of the above check, a key card invalidity display routine follows.

(7) Maid Card

Conducted for the maid card (step 341) are a time zone check (step 342), room number range check (step 343), sequence number check (step 344 and step 345), dead bolt check (step 334) and lockout check (step 335). When the card is found acceptable by all of these checks, unlocking and battery check follow, whereas key card invalidity is on display when the card proves unacceptable by any one of the checks.

(8) Guest Card

In the case where the card is a guest card (step 351), a room number check (step 352), stay period check (step 353) and sequence number check (steps 354, 355) are conducted. When the card passes all of these checks, the card is discriminated (A or B, step 356). When it is guest card A, dead bolt check (step 334) and lockout check (step 335) are further performed. When it is guest card B, lock-out check only further follows without the dead bolt check.

When the results of all these checks are acceptable, an unlocking routine is performed (without the parity check). If even one of the check results is unacceptable, the routine of key card invalidity display is performed.

(9) Maintenance Card

When the card is a maintenance card (step 361), the checks conducted are room number check (step 362), effective period check (step 363), sequence number check (steps 364, 365), first use check (step 366), dead bolt check (step 334) and lockout check (step 335). When the results of all the checks are acceptable, the flag indicating the use of the maintenance card is set to 1 (not shown), followed by unlocking and battery check. If one of the check results is not acceptable, judgement of invalidity is made.

(10) Lockout Card

When the classification check reveals that the card is a lockout card (step 371), the sequence number only is checked (steps 372 and 373). When the card passes this check, the lockout flag is set to 1 (step 374), bringing the lock unit 70 into lockout state. To notify this state, the green pilot lamp 76 goes on for 1 second only (steps 375 to 377), whereby the lockout process is completed without unlocking. When the card fails to pass the sequence number check, the routine of key card invalidity display follows.

(11) Cancelling Card

The cancelling card has the foregoing two functions. One is to release the lock unit 70 from the lockout state, and the other is to clear the sequence numbers of guest card and maintenance card which are stored in the lock unit memory.

When the card is found to be a cancelling card (step 381), the sequence number only is checked (steps 382 and 383). When the card passes the check, the lockout flag is checked as to whether it is set to 1 or reset to 0 (step 384).

If the lockout flag is 1, the flag is reset to 0 to bring the unit out of the lockout state (step 386). Further if it is not in the lockout state, the sequence numbers of the guest card and maintenance card are cleared from the pertinent area of the memory (step 385).

In either case, the green lamp 76 goes on for 1 second to indicate that the specified process has been completed (steps 375 to 377). The process with the cancelling card is not accompanied by the unlocking routine, either.

To distinguish the lockout cancelling process from the sequence number clearing process-as to the completion thereof, different pilot lamp displays may be used therefor. For example, the green or red lamp 76 or 77 may be flickered to indicate the completion of the former process. Alternatively a pilot lamp of yellow or other color may be turned on.

When the card fails to pass the sequence number check, the routine of key-card invalidity display is performed.

(12) Standby Card

In the case of standby card (step 391), the checks conducted are room number check (step 392), sequence number check (steps 393, 394), dead bolt check (step 334) and lock-out check (step 335). When the card passes all of these checks, an unlocking routine follows (without battery check). If the card fails to pass one of the checks, key card invalidity routine is performed.

12. Features and Modifications of Embodiment

(1) Secrecy of Hotel Code

The hotel code is keyed in the console 10 by the responsible person of the maker or installing company. The code is encoded in authorization cards AC and key cards KC when these cards are to be issued. It is further entered in the card lock unit 70 provided for each hotel room through the data input unit 50. Once entered in the console 10, the hotel code is transferred to cards and lock units 70 in an invisible state, so that none of the persons at the hotel inclusive of the responsible person recognize the code.

Furthermore, the input of the hotel code into the console 10 is possible only with the issue of GR card which is handed to the hotel personnel, so that the responsible person of the maker or installing company can no longer change the hotel code.

Thus, the hotel code retains high secrecy.

(2) Security of GR Card

GR card is issued by the responsible person of the maker or installing company only with the input of hotel code into the console. Moreover, it is only after the hotel responsible person has entered a GR secret code into the console that the GR card is usable for issuing the other authorization cards (MA, SMA and GA cards).

Stated conversely, the maker or installing company can issue the GR card but is unable to know the GR secret code and is therefore unable to issue the other authorization cards. On the other hand, the hotel personnel is unable to issue any GR card. Accordingly when the GR card is so limited that only one GR card is available to one hotel, the GR card retains high security. This serves to prevent unauthorized issue of other authorization cards and key cards.

(3) Security of MA, SMA and GA Cards

The authorization cards which are usable for issuing key cards are MA, SMA and GA cards. These authorization cards must therefore retain high security. Security of these cards is maintained in the following manner.

First, MA, SMA and GA cards are issued only with use of GR card which retains high security as mentioned above and which is carried only by the hotel responsible person. Consequently these cards will not be issued in an unauthorized manner.

Second, the staff code, etc. of the issued MA, SMA and GA cards are registered in the issued AC registration area of the console RAM. Such cards are invalidated with use of GR card. The invalidated card is no longer usable for issuring key cards. This prevents wrongful use of MA, SMA and GA cards that would otherwise result when the card is lost or staff members retired.

(4) Security of Key Card Issue

MA, SMA and GA cards which are indispensable to the issure of key cards retain high security as mentioned above. Moreover, when a key card is to be issued with use of the authorization card, the staff secret code is checked, and the authorization card used is checked as to whether it is one registered in the issued AC registration area of the RAM. This serves to check the card issuing staff member for authorization and to check the authorization card for validity.

Thus, the key cards can be issued only under stringent control and are therefore given a high level of security.

Furthermore, the key cards other than the guest card and maid card can be issued only with use of MA card, and the maid card only by using MA and SMA cards, so that the staff members who can issue these key cards are limited.

Additionally, when a key card is issued, a key card issue record is printed out, showing the type of the key card, the type of authorization card used, the issuing person (staff code) and the time of issue. A trouble, even if occurred, can therefore be handled satisfactorily.

The embodiment is so adapted that the key card issue record is printed out upon the issue of a key card. However, key card issue record may be stored in the RAM so as to print out such items of data at specified time interval or every day or only with use of a specific authorization card.

(5) Card Issuing System

From the viewpoint of security, the cards can be divided into three types. The first type, which is highest in security level, is GR card, whereby the cards of second type, i.e. MA, SMA and GA cards, are issued. Key cards, which are of third type, are issued with use of cards of the second type.

GR card of the first type is issued by the card issuing console on condition that the maker side secret code in the console RAM matches the keyed-in secret code. Thus, the hotel code is recorded in incomplete

GR card, whereby the GR card is completed. This associates the completed GR card with the console which issued the card.

Next, GR secret code is entered with use of GR card and stored in the console RAM, whereby the GR card is associated with the bearer and with the console.

MA, SMA and GA cards of the second type are issued with use of GR card and on condition that the GR secret code keyed in matches the GR secret code in the console. In other words, the card of the second type is issued on condition that the card of the first type, the bearer of the card and the console are associated. Moreover, the card data of the second type is registered in the console, while the registered data can be deleted by using GR card of the first type, with the result that the card of the second type is closely related to the first-type card, the bearer thereof and the console.

When the card of the second type is to be issued, the staff secret code is registered and recorded on the card, so that the staff member carrying the second-type card is also closely related to the second-type card and the console.

The key card of the third type is issued using a card of the second type and on condition that the second card is registered in the console and that the keyed-in staff secret code matches with the staff secret code in the card or the console. In other words, the third-type card is issued on condition that the second-type card, the bearer thereof and the console are associated.

In this way, a plurality of types of cards having a kind of hierarchical structure are issued successively in the order of descending level, each with use of a card of higher level, on condition that the card of higher level, issuing person and card issuing machine are associated.

Although the maker side secret code is not recorded in GR card according to the embodiment, the code may be so recorded by the maker.

(6) Card Issuing Console Having Two Card Readers

The card issuing console has a first card reader for reading the card data from an authorization card, and a second card reader having a card reading-writing function for issuing cards. The authorization card is inserted into the first reader, and the card data is read and checked (secret code check and check as to whether the card is a registered valid card). When the card is found acceptable, a card can be issued by the second card reader. The first card reader and the check of the authorization card inserted therein serve as a "key" for giving the console a permission to issue the card.

Generally the key for permitting the operation of machines is mechanical. When the key is lot, the portion of the machine concerned needs replacement. Moreover, irrespecitve of authorization to manipulate the key, one carrying the key can operate the machine.

With the card issuing console having the above two card readers, the authorization card, even if lost (in the case of MA, SAM or GA card), can be reissued using GR card, so that there is no need to repair the console. Further if the registration of the lost authorization card is eliminated, it becomes impossible to use the card, hence high security. Moreover, one issuing the card can be checked for authorization by the secret code check. This eliminates the likelihood that any one can issue cards.

(7) Usefulness of Card Issuing Console and Authorization Cards in Hotel System

The card issuing console is very useful for the card lock system of hotels. MA, SMA or GA cards are issued to a plurality of specified hotel staff members according to the position of the member. The guest card for the quest to use the room assigned to him can be issued using any of these authorization cards. The main routine at the hotel is handling of check-in and check-out for the guest, and a guest card must invariably be issued for check-in. Since the guest card can be issued with use of any authorization card (other than GR card), at least one staff member bearing such an authorization card needs only to be present at the front. This permits staff members to leave the work position or to be be replaced by another one with greater ease.

The maid card, emergency card, master card, etc. need not be issued as routine practice. It may be arranged that only a staff member having a specific authorization card (e.g. MA or SAM card) can issue special cards other than the guest card. This will not entail any particular trouble but is rather favorable in assuring high security because the specified person only can issue special cards.

(8) Two Types of Guest Cards

There are two types of guest cards which can be issued, i.e. A and B. The guest card A is unable to open the card lock unit 70 when it is fastened by the dead bolt 71. The guest card B is usable for unlocking irrespective of whether the dead bolt 71 is in the locking position.

Which type of guest card, A or B, is to be issued is determined by the operation mode of the console. Accordingly, when the hotel card lock system is to be installed, which type of guest card is to issue can be determined according to the request of the hotel.

Instead of determining the type of guest card ac-

cording to the operation mode setting, the card type may be determined every time a guest card is to be issued. In this case, the staff member keys in an input to select A or B when issuing the guest card, and the classification code to be encoded in the guest card is determined according to the result of keying in. In this way, the guest's request can be met in issuing his guest card.

(9) Issue of a Plurality of Identical Guest Cards

While one person lodges in a single-type room as a rule, at least two persons will lodge in a twin-type or triple-type room. When one room is used by two or more guests, the guests are likely to feel inconvenience if a single guest card is issued for one room.

With the card issuing console of the present embodiment, a desired number of guest cards can be issued for one room, so that a guest card can be handed to each of a plurality of guests who share one room. Each person can therefore open the lock unit.

Moreover, when issuing guest cards for one room, the staff member needs to key in only once the data required for issue (room number, check-out time, number of cards), whereby the specified number of guest cards can be issued. The key input procedure is therefore simple.

(10) Reissue of Guest Card

Even after a guest card has been issued, there arises a need to reissue another guest card for the same room if the length of stay is to be changed or the first card was lost. It is not desirable to readily permit the reissue of guest card, because guest cards unlimitedly issued are likely to be used wrongfully to reduce the security of the card lock system.

For the reissue of guest card, a procedure different from the usual issue procedure must be followed so that the staff member in charge will take full care. When issuing a guest card, "GUEST" switch among the function switches 15 is merely depressed to start a card issuing process, whereas in the case of reissue, it is necessary to depress "CANCEL (ROOM)" function switch and to further select one item from among room cancell, check-out change and card reissue according to the indication on the display 12.

These items are classified as follows and are different in procedure and conditions.

Room cancel

The guest card issued is cancelled before it is used on the card lock unit 70. This can be accomplished using key input or guest card.

Check-out change

A change of stay period within the period of stay after the guest card issued has been used at least once on the card lock unit 70. This can be handled only with use of the guest card in use.

Card reissue

Reissue of guest card within the period of stay after the issued guest card has been used at least once on the card lock unit 70. This is the procedure to be followed when the guest card was lost. The new card reissued needs to be immediately used on the corresponding card lock unit.

(11) Use of Paper Cards

Paper cards are used as guest cards (A and B), maintenance card and standby card. Use of paper cards for these key cards which are issued in large quantities leads to a cost reduction and is economical.

Because room number and like card data can be printed on the surface of the paper card, the purpose of the card can be visually recognized to some extent without resorting to the card data monitoring process.

Although the guest card and maintenance card only are printed on according to the embodiment, room number, etc. may be printed also on the standby card. The items of card data to be printed on such key cards can be determined as desired.

(12) Re-Registration of Card Data

The data to be registered in the issued AC registration area and sequence number area of the RAM of the parent console 10 can be read from the card data and written in these areas. When the RAM data disappeared for some cause, this can be a remedy.

(13) Initial Data Input/Output with Data Input Unit

The main function of the data input unit 50 is to receive from the parent console 10 the initial data (hotel code, clock data, unlocking duration and allowable check-out overtime) which is common to the operation of all card lock units 70, and to write the initial data in each card lock unit 70 along with the room number (which is keyed in) of the room equipped with the unit 70 (initial data setting mode).

The card lock unit 70 operates in off-line mode (that is, the unit is not connected to the console by a transmission line). However, since the initial data, etc. are given by the data input unit 50, the unit 70 executes unlocking and other process with use of a key card.

The memory of the data input unit 50 further has

an initial data set room number registration area, in which the room numbers of rooms for which the initial data setting has been completed are registered. When the unit 50 is connected to the console 10, these room numbers are printed out at the console 10. Accordingly the room numbers can be visually recognized and retained as a record.

The data input unit 50 may be usable for writing in card lock units 70 the sequence numbers of various key cards registered in the sequence number area of the RAM in the console 10 and the sequence numbers of room maintenance cards stored in the room data area.

(14) Other Functions of Data Input Unit

The data input unit has, in addition to the above initial data input/output function, the function of reading data from the memory of the lock unit 70 and showing the data on the display 51 (reading mode), the function of writing specified data in the memory of the lock unit 70 (writing mode) and the function of clearing the desired sequence number within the lock unit 70 (clearing mode). With these functions, the lock unit 70 can be maintained and inspected, and the data therein can be modified as required.

(15) Sequence Number Cancellation in Card Lock Unit

The memory of the card lock unit 70 has stored therein the latest sequence number of each key card to be used. When a newly issued key card is used, the sequence number of the card is checked as to whether it is in a predetermined relation with the sequence number in the lock unit 70. If the relation is found, unlocking and other processes are executed, and the sequence number of the key card is registered in the memory of the lock unit to renew the stored sequence number.

For example, suppose a key card of one type was lost, another key card of the same type is issued with a new sequence number and then is also lost before use, and another key card with a further new sequence number is issued. Thus, if two or more key cards,each with a renewed sequence number,are used successively with the sequence number in the lock unit memory remaining unchanged, it is likely that the lock unit 70 will be no longer able to check whether the key card sequence number is in the predetermined relation with the stored sequence number.

To overcome the disturbance of sequence number resulting from such loss of card or an error in use, the corresponding key card sequence number in the lock unit memory is cleared. The sequence number of the new key card is then accepted by the unit 70 and registered in its memory. If a new key card is subsequently issued, the sequence number in the unit 70 will be renewed accordingly.

The sequence number can be cleared from the lock unit memory using the data input unit 50 and a cancelling card. When the unit 50 is used, the sequence number of desired key card can be cleared (clearing mode). Further if the cancelling card is used, the sequence numbers on the guest card and maintenance card are cleared.

The cancelling card may be adapted to clear the sequence number of other key card. Different cancelling cards may be issued for different types of key cards for clearing the sequence number.

(16) Lockout of Room and Unlocking

There arises a need for the hotel to lock out a specified room so as not to permit any-person to use it. In such a case, a lockout card is used. When a lockout flag is set by the lockout card in the lock unit 70, the unit can no longer be opened by any type of key card except the emergency card.

Lockout is cancelled by the cancelling card.

It is also possible to set and/or cancel lockout with use of the data input unit.

(17) Two Functions of Cancelling Card

As stated above, the cancelling card has two functions: one is to clear a specified sequence number in the lock unit 70, and the other is to cancel lockout.

When the cancelling card is used on the lock unit 70, the lockout flag is checked, and if the unit is locked out, the flag is reset to cancel the lockout. Unless the lockout flag is set, the sequence number of guest card as well as of the maintenance card is cleared.

When the cancelling card is used twice successively while the lock unit 70 is in locked-out state, the lockout is cancelled by the first use, and the sequence number is cleared the next time.

Thus, the cancelling card has two functions in combination. This serves to simplify the card lock system.

(18) Battery Check for Card Lock Unit

The lock unit 70 is operated by the power supplied by the battery 88 incorporated therein. The degree of depletion of the battery, which is not visually observable directly, needs to be checked and displayed by an electric circuit. However, if the battery is checked for depletion and the result shown at all times, this will promote depletion. According to the present embodiment, the battery check circuit 89 functions only when master, maid and maintenance cards are used, and the check result is displayed by

the green pilot lamp 76. This assures that the battery check will be done periodically and when required. This is also appropriate in view of the significance of battery check and further from the viewpoint of prevention of depletion of the battery. The master card is carried by a specified staff member and is used for unlocking only for a special purpose, so that it is desirable for the specific staff member to check the state of the battery 88 on such an occasion. Further because the maid cleans the room periodically (e.g. once daily), it is desirable for the maid to check the state of the battery when opening the lock unit 70 with her maid card. This assures periodical check of the battery. It is also appropriate for the maintenance man to check the battery when required or periodically.

On the other hand, key cards, such as guest cards, which are used frequently, or cards such as emergency cards which are used in emergency are not used for battery check. This prevents undesirable depletion of the battery. With unnecessary display thus elimianted, a useless disturbance is avoidable.

(19) Dead Bolt and Key Cards

A lock unit which is easily unlockable with a key card although fastened by the dead bolt disturbs guest's privacy and is undesirable. Nevertheless, it is required to ensure unlocking in an emergency even if the door is locked by the dead bolt. The present embodiment fulfils these conflicting requirements in the following manner.

As already mentioned, two types of guest cards are available: guest card A which is unable to unlock the door locked by the dead bolt, and guest card B which assures unlocking even in such a case. These cards are provided to meet the needs of guests. As already mentioned, it is preferable that one of the two be selectable every time a quest card is to be issued.

The emergency card is prepared for use in an emergency. Even if fastened by the dead bolt, the card lock unit can be opened only when this card is used. This eliminates the likelihood that one will wrongfully enter the room with a usual key card or master card although the door is locked by the dead bolt, consequently giving enhanced security. In the event of emergency, however, the lock unit is quickly openable with use of the emergency card irrespective of whether it is fastend by the dead bolt. The use of the emergency card is limited to emergencies to assure increased security.

Preferably the master card may be modified to have the following function. When the master card is used for a card lock unit, the MPU of the unit checks whether the room is occupied by the guest. The memory of the lock unit has a card read data area, in which the card data on the guest card is stored. The check-in date and check-out day and time included in the card data readily indicate whether the room is still occupied. During the period of stay, the master card is prohibited from unlocking the room which is locked by the dead bolt, such that only during the vacant period, the master card is allowed to unlock the door even if it is locked by the dead bolt. The master card thus modified secures privacy of the guest and yet has greater freedom in that it serves the same function as the emergency card in a specific case.

(20) Emergency Card

The emergency card is used for unlocking rooms in an emergency. The card lock unit can be opened by this card even if the room is locked out or locked by the dead bolt. Such a special key card is provided to satisfactorily meet the special situation of emergency.

(21) Master Card

The card, which corresponds to a so-called master key, is unable to unlock a room which is locked out or locked by the dead bolt. This secures privacy and gives increased security to the room.

As mentioned above, the master card may be so modified that during the period other than the guest's stay period, the room, even if locked by the dead bolt, can be thereby unlocked. Further the master cardd may be adapted to have the function of cancelling lock-out.

(22) Maid Card

The maid card, which is checked for time zone and room number range, is usable for unlocking specified rooms alone for a specified period of time only. Thus, the card is adapted to give enhanced security to the hotel card lock system. Furthermore, the maid card which is unable to unlock the rooms locked by the dead bolt secures the guest's privacy. Locked-out rooms are not unlockable also by this key card.

(23) Maintenance Card

The maintenance card is usable for unlocking one specified room only once and only on the day of issue of the card. The unlocking function thus greatly limited gives increased security to the hotel card lock system.

The maintenance card may be made usable any number of times without the first use check insofar as it is used on the day of issue of the card.

(24) Standby Card

When malfunctioning, the card issuing console is unable to issue key cards, in particular, guest cards,

causing troubles to the hotel business. The sequence number of the guest card issued is renewed under a predetermined rule, and the latest sequence number is stored only in the console,- so that some other backup machine is not serviceable as a substitute for issuing guest cards.

To meet such a situation, standby cards are issued in advance and preserved for each room. In the event of a malfunction of the console, a standby card for the room concerned is handed to the guest in place of the guest card. The standby card, which has a sequence number totally irrelevant to the sequence number of the guest card, is usable free of the influence of the malfunction of the card issuing console.

Claims

1. A data input device (50) in a card lock system for transferring data between a key card issuing unit (10) and a card lock unit (70), the data input device having:

a connector (54) for connecting said data input device to said card issuing unit and to said card lock unit,

first setting means (52, 62) for setting a data transferring mode including input and output modes,

means (60) for receiving specified data from said key card issuing unit and storing the data when the input mode of the data transferring mode is set, and

means (60)for transferring the specified data to said card lock unit when the output mode of the data tranferring mode is set,

characterized in that said data input device further comprises:

key input means (52, 61) for entering a number specific to said card lock unit and other data;

display means (51) for displaying data; and

second setting means (52, 62) for setting a reading mode and a writing mode; and that

when the output mode of the data tranferring mode is set, the number data specific to said card lock unit entered through said key input means as well as the specified data are transferred to said card lock unit;

when the reading mode is set by said second setting means, at least one of the specified data, the number data specific to said card lock unit and key data used in an unlocking process executed by said card lock unit is read out from a memory of said card lock unit and displayed on said display means; and

when the writing mode is set by said second setting means, data entered through said key input means is written into said memory of said card lock unit to renew the corresponding data therein.

2. A data input device as defined in claim 1 which further comprises means (60) for storing data relating to completion of the transfer of the specified data and the specific number data to said card lock unit (70).

3. A data input device as defined in claim 1 which further comprises means (60) for feeding the data stored in the storing means to said card issuing unit (10).

Patentansprüche

1. Dateneingabevorrichtung (50) in einem Kartenschloßsystem zur Übertragung von Daten zwischen einer Schlüsselkartenausgabeeinheit (10) und einer Kartenschloßeinheit (70), wobei die Dateneingabevorrichtung

einen Stecker (54) zum Verbinden der Dateneingabevorrichtung mit der Kartenausgabeeinheit und der Kartenschloßeinheit,

erste Einstellmittel (52, 62) zum Einstellen einer Datenübertragungsbetriebsweise, die Eingabe- und Ausgabebetriebsweisen enthält,

Mittel (60) zum Empfangen spezifizierter Daten von der Schlüsselkartenausgabeeinheit und Speichern der Daten, wenn die Eingabebetriebsweise der Datenübertragungsbetriebsweise eingestellt ist, und

Mittel (60) zum Übertragen der spezifizierten Daten auf die Kartenschloßeinheit, wenn die Ausgabebetriebsweise der Datenübertragungsbetriebsweise eingestellt ist, aufweist,

dadurch gekennzeichnet, daß die Dateneingabevorrichtung ferner

Tasteneingabemittel (52, 61) zum Eingeben einer für die Kartenschloßeinheit spezifischen Nummer und anderer Daten,

Anzeigemittel (51) zum Anzeigen von Daten, und

zweite Einstellmittel (52, 62) zum Einstellen einer Lesebetriebsweise und einer Schreibbetriebsweise aufweist, und daß,

wenn die Ausgabebetriebsweise der Datenübertragungsbetriebsweise eingestellt ist, die mit den Tasteneingabemitteln eingegebene für die Kartenschloßeinheit spezifischen Nummerndaten sowie die spezifizierten Daten auf die Kartenschloßeinheit übertragen werden,

wenn die Lesebetriebsweise mit den zweiten Einstellmitteln eingestellt ist, die spezifizierten Daten, die für die Kartenschloßeinheit spezifischen Nummerndaten oder/und Schlüsselda-

ten, die in einem von der Kartenschloßeinheit ausgeführten Aufschließvorgang verwendet werden, aus einem Speicher der Kartenschloßeinheit ausgelesen und auf den Anzeigemitteln angezeigt werden, und

wenn die Schreibbetriebsweise mit den zweiten Einstellmitteln eingestellt ist, mit den Tasteneingabemitteln eingegebene Daten in den Speicher der Kartenschloßeinheit eingeschrieben werden, um die entsprechenden Daten darin zu erneuern.

2. Dateneingabevorrichtung nach Anspruch 1, welche ferner Mittel (60) zum Speichern von Daten, die sich auf den Abschluß der Übertragung der spezifizierten Daten und der spezifischen Nummerndaten auf die Kartenschloßeinheit (70) beziehen, aufweist.

3. Dateneingabevorrichtung nach Anspruch 1, welche ferner Mittel (60) zum Speisen der Kartenausgabeeinheit (10) mit den in den Speichermitteln gespeicherten Daten aufweist.

Revendications

1. Dispositif d'entrée de données (50) situé dans un système de verrouillage de carte, destiné à transférer des données entre une unité d'édition de carte clé (10) et une unité de verrouillage de carte (70), le dispositif d'entrée de données comportant:

un connecteur (54) pour connecter ledit dispositif d'entrée de données à ladite unité d'édition de carte et à ladite unité de verrouillage de carte,

un premier moyen de positionnenent (52, 62) pour positionner un mode de transfert de données comportant des modes d'entrée et de sortie,

un moyen (60) pour recevoir de ladite unité d'édition de carte clé des données spécifiées, et pour stocker les données lorsque le mode d'entrée du mode de transfert de données est positionné, et

un moyen (60) pour transférer les données spécifiées à ladite unité de verrouillage de carte lorsque le mode de sortie du mode de transfert de données est positionné,

caractérisé en ce que ledit dispositif d'entrée de données comprend en outre:

un moyen d'entrée de clé (52, 61) pour entrer un nombre spécifique à ladite unité de verrouillage de carte, et d'autres données;

un moyen d'affichage (51) pour afficher des données; et

un second moyen de positionnement (52, 62) pour positionner un mode de lecture et un mode d'écriture; et en ce que

lorsque le mode de sortie du mode de transfert de données est positionné, les données du nombre spécifique à ladite unité de verrouillage de carte entrées par ledit moyen d'entrée de clé, ainsi que les données spécifiées, sont transférées à ladite unité de verrouillage de carte;

lorsque le mode de lecture est positionné par ledit second moyen de positionnement, au moins l'une des données spécifiées, des données du nombre spécifique à ladite unité de verrouillage, et des données de clé utilisées dans un processus de déverrouillage exécuté par ladite unité de verrouillage de carte, est lue dans une mémoire de ladite unité de verrouillage de carte, et affichée sur ledit moyen d'affichage; et

lorsque le mode d'écriture est positionné par ledit second moyen de positionnement, les données entrées par ledit moyen d'entrée de clé sont écrites dans ladite mémoire de ladite unité de verrouillage de carte pour renouveler les données correspondantes situées dans celle-ci.

2. Dispositif d'entrée de données selon la revendication 1, qui comporte en outre un moyen (60) pour stocker des données concernant l'achèvement du transfert des données spécifiées et des données du nombre spécifique, vers ladite unité de verrouillage de carte (70).

3. Dispositif d'entrée de données selon la revendication 1, qui comporte en outre un moyen (60) pour charger les données stockées dans le moyen de stockage vers ladite unité d'édition de carte (10).

FIG.1

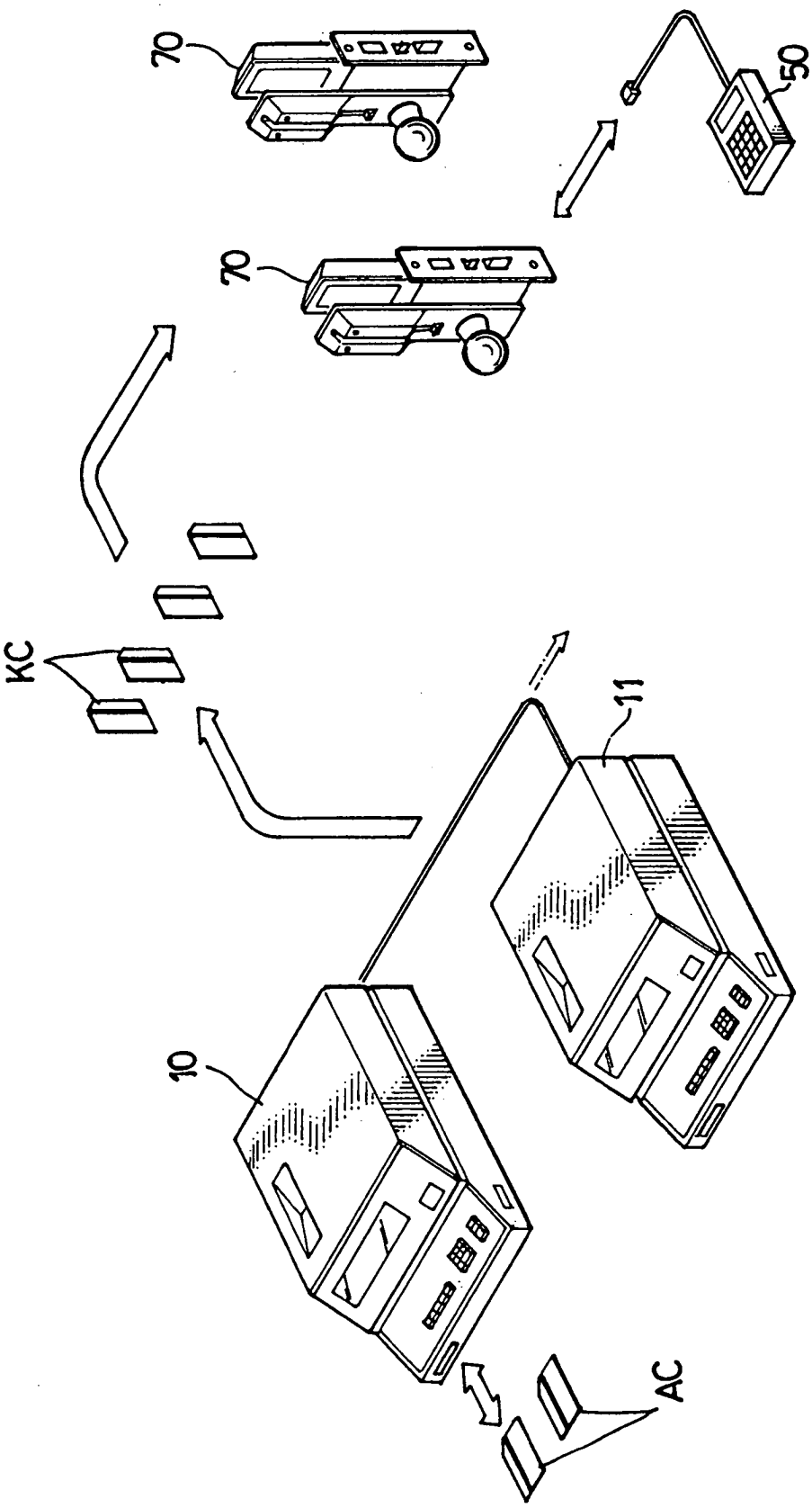


FIG.2

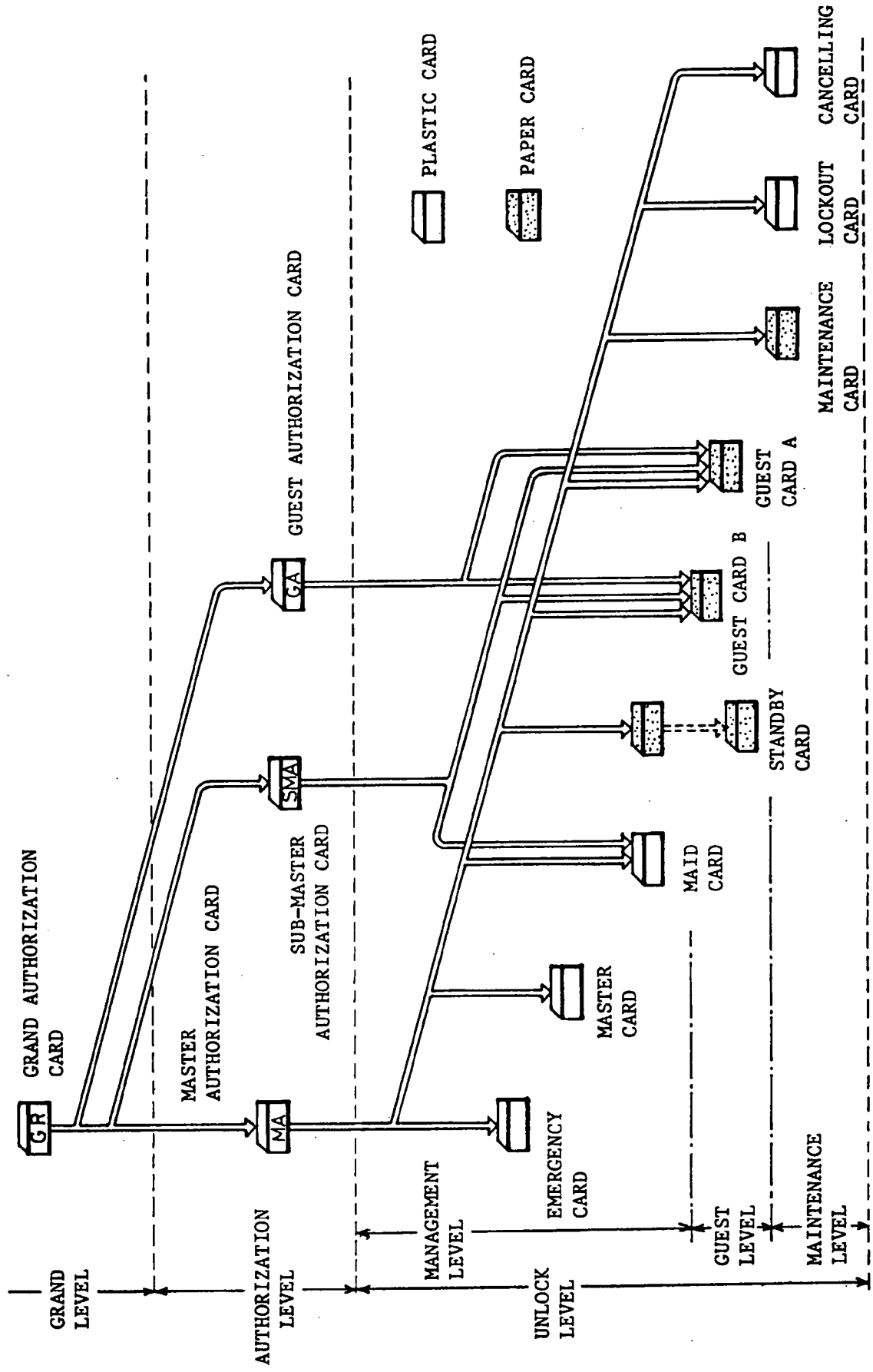

GRAND AUTHORIZATION CARD
GR
MASTER AUTHORIZATION CARD
MA
SUB-MASTER AUTHORIZATION CARD
SMA
GUEST AUTHORIZATION CARD
GA
PLASTIC CARD
PAPER CARD
MASTER CARD
EMERGENCY CARD
MAID CARD
GUEST CARD B
GUEST CARD A
STANDBY CARD
MAINTENANCE CARD
LOCKOUT CARD
CANCELLING CARD
GRAND LEVEL
AUTHORIZATION LEVEL
MANAGEMENT LEVEL
UNLOCK LEVEL
GUEST LEVEL
MAINTENANCE LEVEL

FIG.3

GRAND AUTHORIZATION CARD (GR)	FORMALITY CODE STX,ETX,LRC	HOTEL CODE	CLASSIFICATION CODE	——	——	——	——	——
MASTER AUTHORIZATION CARD (MA)	"	"	"	——	STAFF CODE	STAFF SECRET CODE	——	——
SUB-MASTER AUTHORIZATION CARD (SMA)	"	"	"	——	"	"	——	——
GUEST AUTHORIZATION CARD (GA)	"	"	"	——	"	"	——	——
EMERGENCY CARD	"	"	"	SEQUENCE NO.	——	——	——	SEQUENCE SUB NO.
MASTER CARD	"	"	"	"	——	——	——	"
MAID CARD	"	"	"	"	STARTING ROOM NO.	ENDING ROOM NO.	TIME ZONE	"
GUEST CARD A	"	"	"	"	ROOM NO.	ISSUE DAY (CHECKIN)	CHECKOUT DAY, HOUR	"
GUEST CARD B	"	"	"	"	"	"	"	"
MAINTENANCE CARD	"	"	"	"	"	ISSUE DAY	——	"
LOCKOUT CARD	"	"	"	"	——	——	——	"
CANCELLING CARD	"	"	"	"	——	——	——	"
STANDBY CARD	"	"	"	STANDBY SEQUENCE NO.	ROOM NO.	——	——	——

EP 0 417 474 B1

FIG.4

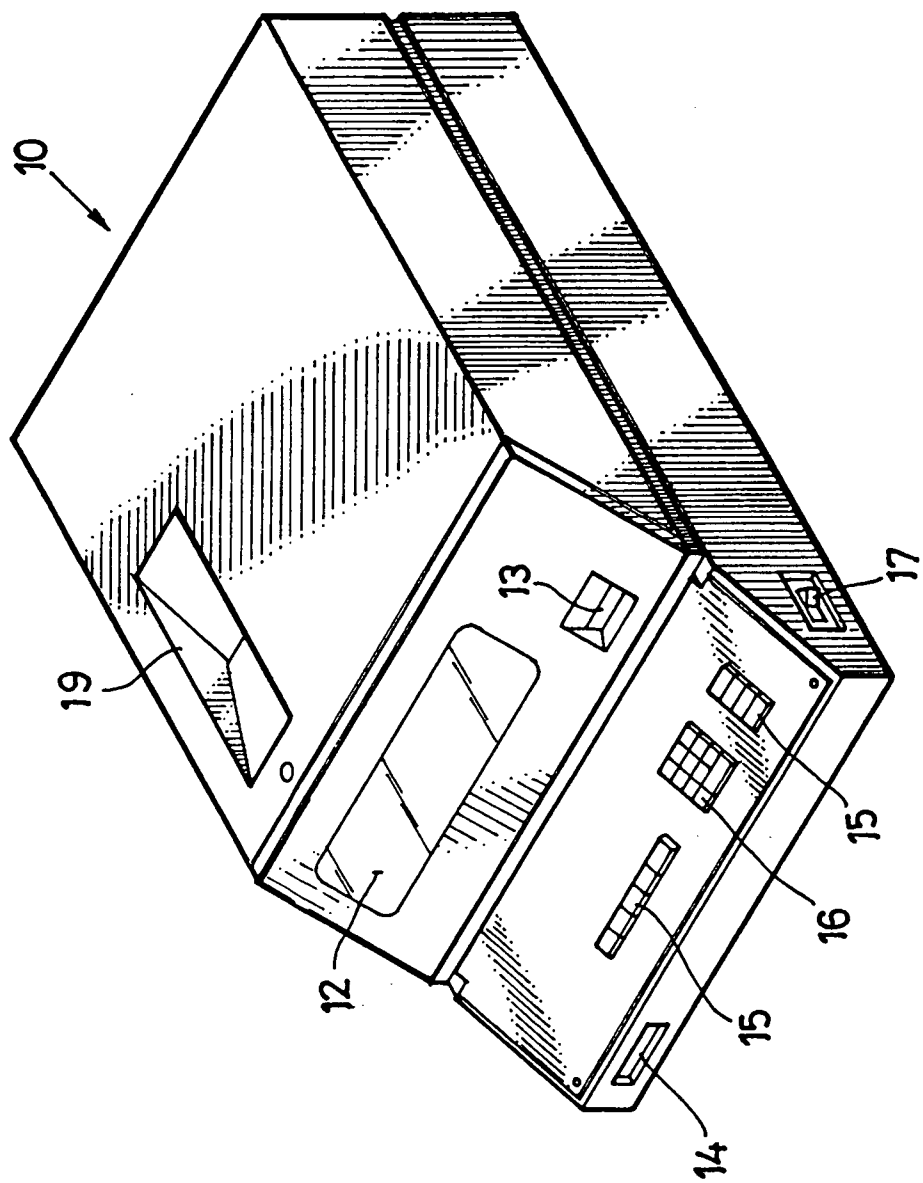


FIG.5

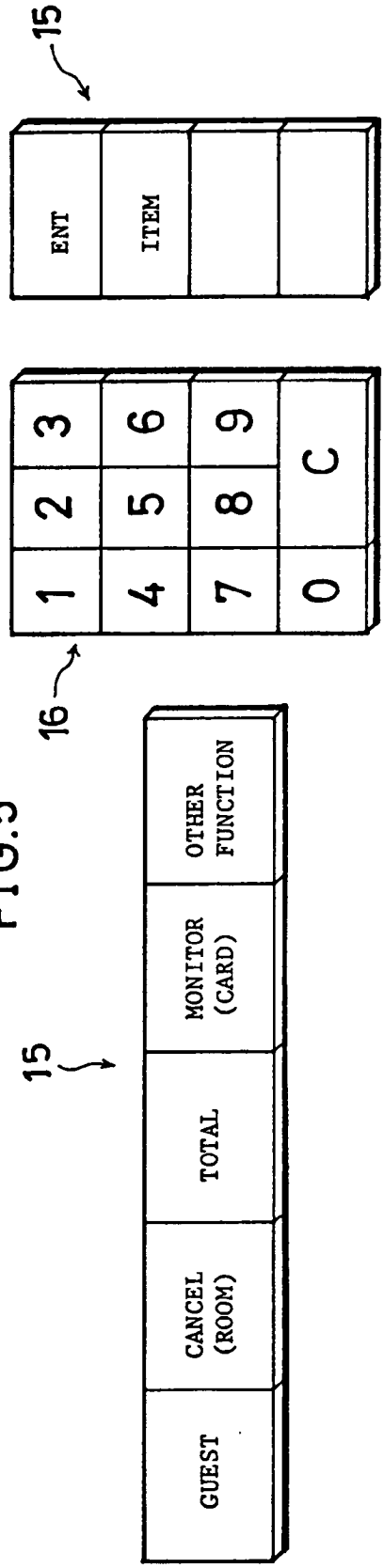

15
ENT
ITEM
1
2
3
4
5
6
7
8
9
0
C
16
15
GUEST
CANCEL (ROOM)
TOTAL
MONITOR (CARD)
OTHER FUNCTION

FIG.6

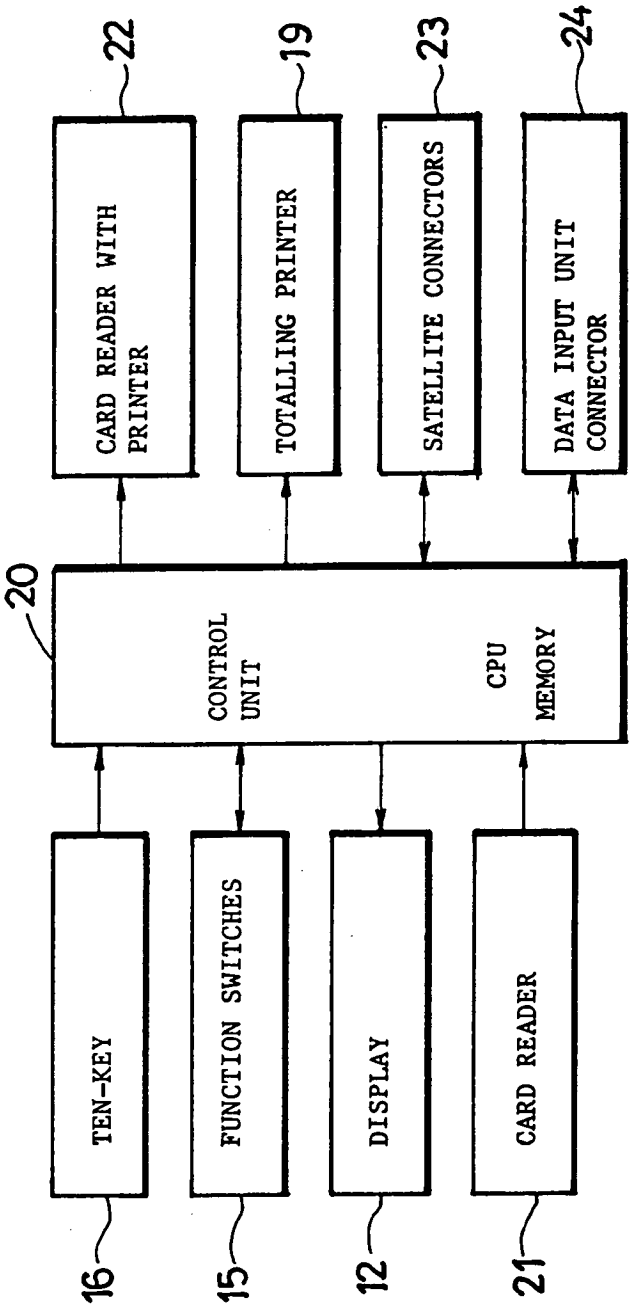

22
CARD READER WITH PRINTER
19
TOTALLING PRINTER
23
SATELLITE CONNECTORS
24
DATA INPUT UNIT CONNECTOR
20
CONTROL UNIT
CPU
MEMORY
TEN-KEY
FUNCTION SWITCHES
DISPLAY
CARD READER
16
15
12
21

FIG.7

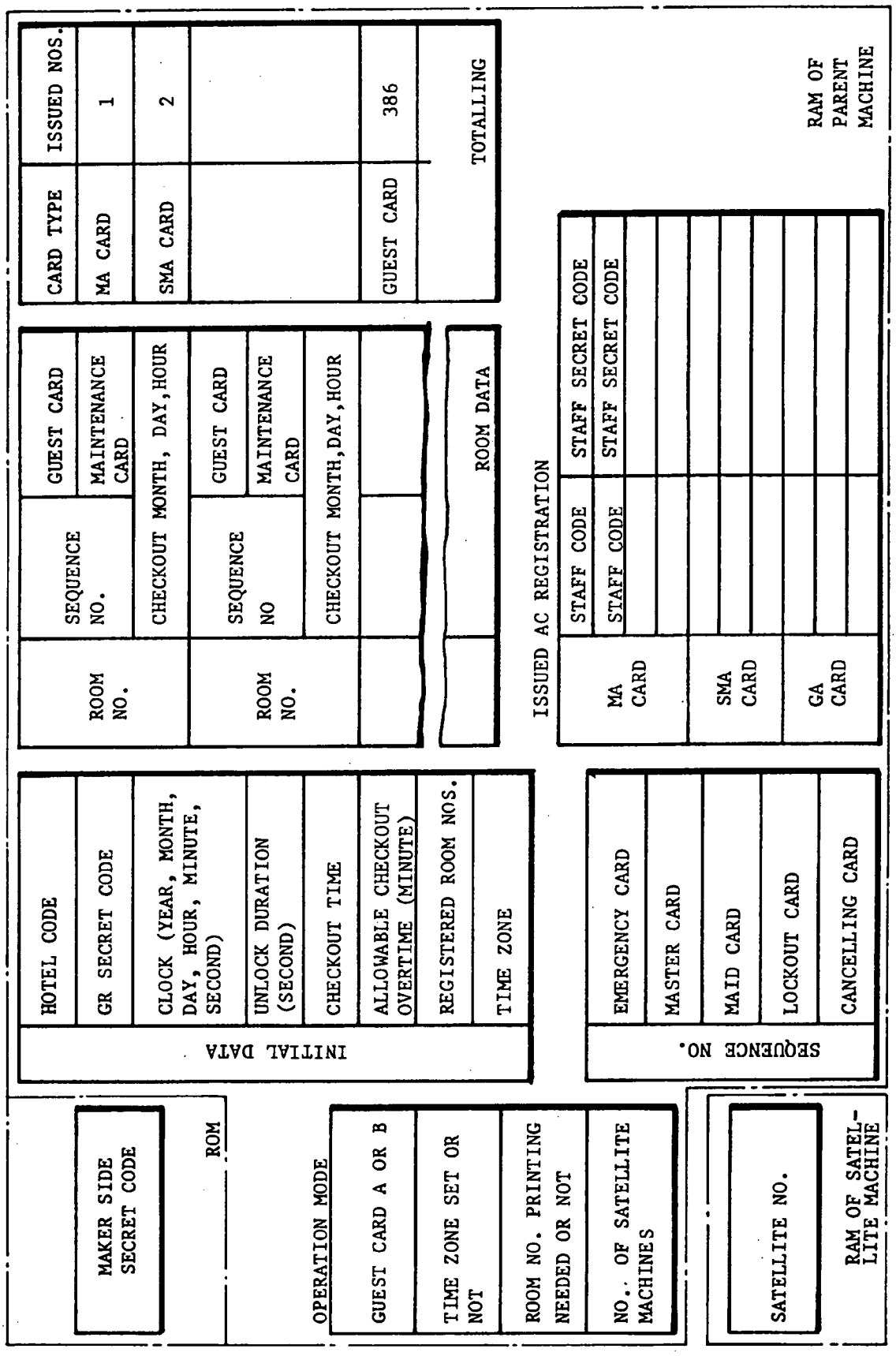

MAKER SIDE SECRET CODE
ROM
OPERATION MODE
GUEST CARD A OR B
TIME ZONE SET OR NOT
ROOM NO. PRINTING NEEDED OR NOT
NO.. OF SATELLITE MACHINES
SATELLITE NO.
RAM OF SATELLITE MACHINE
INITIAL DATA
HOTEL CODE
GR SECRET CODE
CLOCK (YEAR, MONTH, DAY, HOUR, MINUTE, SECOND)
UNLOCK DURATION (SECOND)
CHECKOUT TIME
ALLOWABLE CHECKOUT OVERTIME (MINUTE)
REGISTERED ROOM NOS.
TIME ZONE
SEQUENCE NO.
EMERGENCY CARD
MASTER CARD
MAID CARD
LOCKOUT CARD
CANCELLING CARD
ROOM NO.
SEQUENCE NO
GUEST CARD
MAINTENANCE CARD
CHECKOUT MONTH, DAY, HOUR
ROOM DATA
ISSUED AC REGISTRATION
MA CARD
SMA CARD
GA CARD
STAFF CODE
STAFF SECRET CODE
CARD TYPE
ISSUED NOS.
MA CARD
SMA CARD
GUEST CARD
TOTALLING
1
2
386
RAM OF PARENT MACHINE

FIG.8

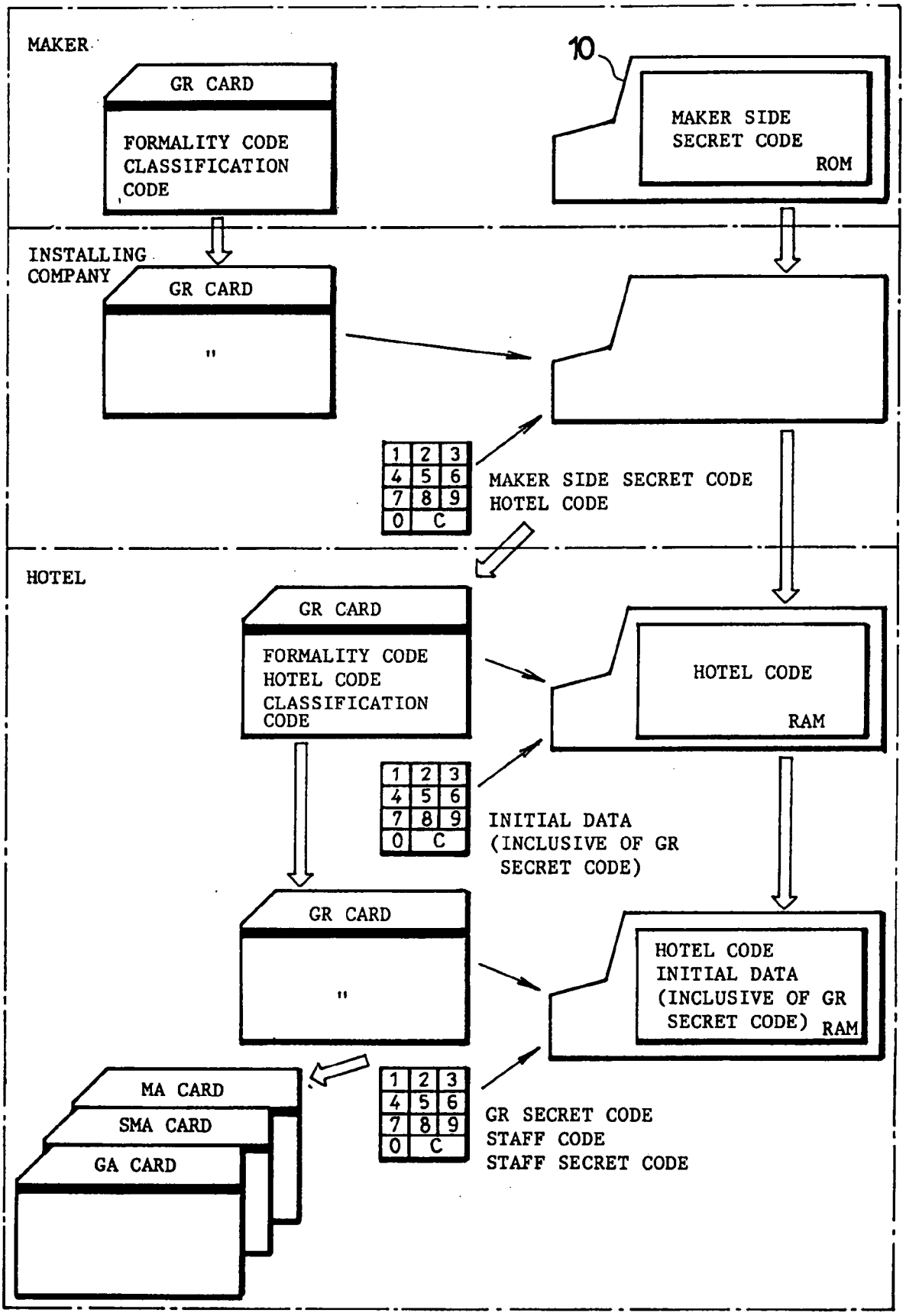

MAKER
GR CARD
FORMALITY CODE
CLASSIFICATION CODE
10
MAKER SIDE SECRET CODE
ROM
INSTALLING COMPANY
GR CARD
"
1 2 3
4 5 6
7 8 9
0 C
MAKER SIDE SECRET CODE
HOTEL CODE
HOTEL
GR CARD
FORMALITY CODE
HOTEL CODE
CLASSIFICATION CODE
HOTEL CODE
RAM
INITIAL DATA
(INCLUSIVE OF GR SECRET CODE)
GR CARD
"
HOTEL CODE
INITIAL DATA
(INCLUSIVE OF GR SECRET CODE)
RAM
MA CARD
SMA CARD
GA CARD
GR SECRET CODE
STAFF CODE
STAFF SECRET CODE

FIG.9

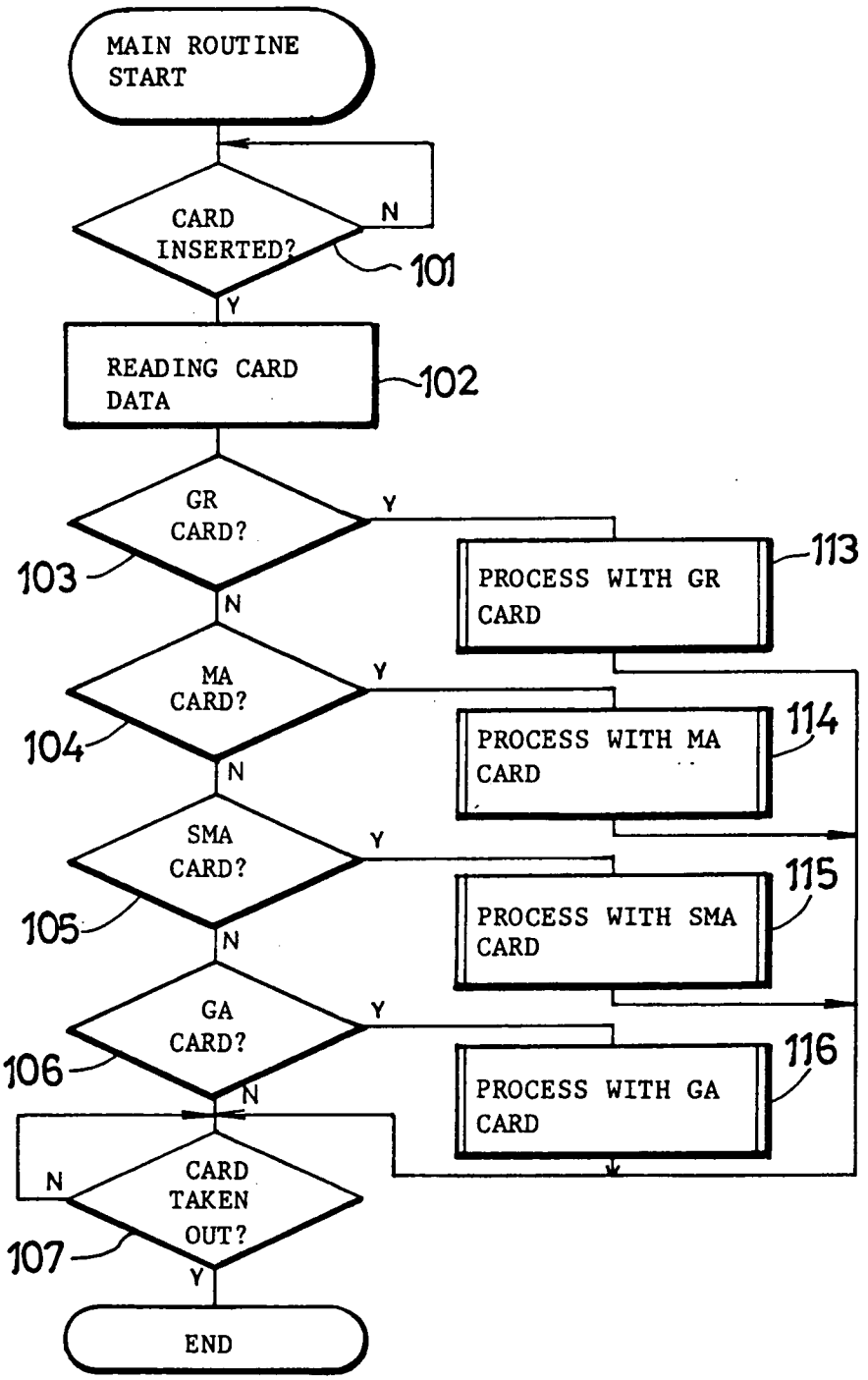

MAIN ROUTINE START
CARD INSERTED?
N
Y
101
READING CARD DATA
102
GR CARD?
Y
N
103
PROCESS WITH GR CARD
113
MA CARD?
Y
N
104
PROCESS WITH MA CARD
114
SMA CARD?
Y
N
105
PROCESS WITH SMA CARD
115
GA CARD?
Y
N
106
PROCESS WITH GA CARD
116
CARD TAKEN OUT?
N
Y
107
END

FIG.10

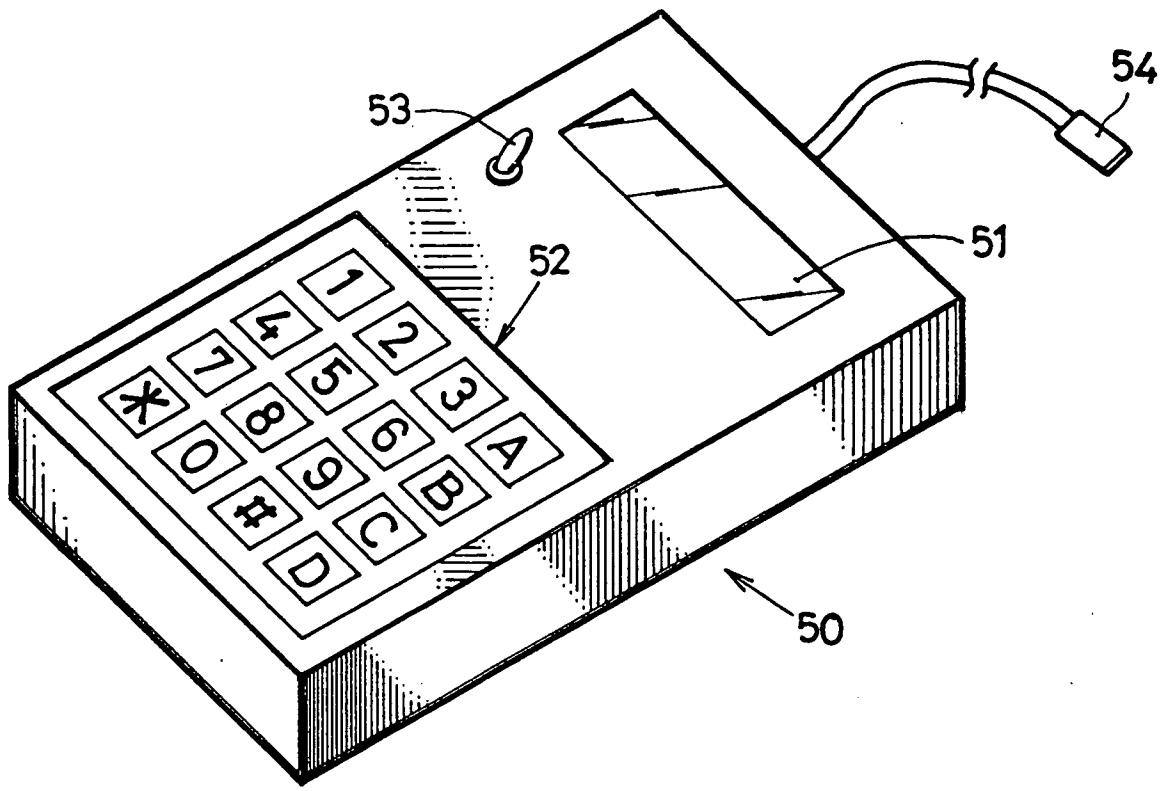


FIG. 11

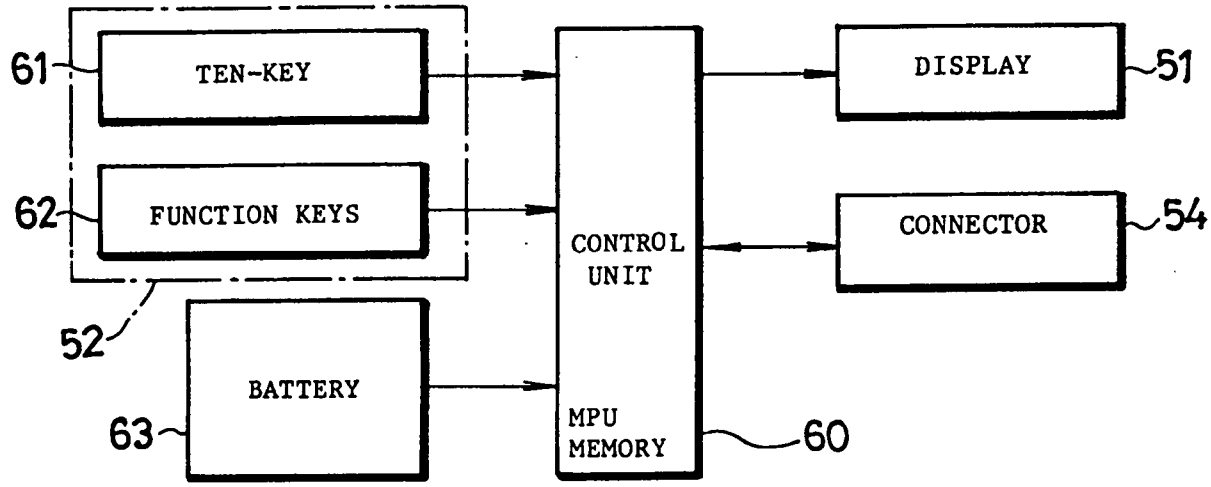

61
TEN-KEY
62
FUNCTION KEYS
52
BATTERY
63
CONTROL UNIT
MPU MEMORY
60
DISPLAY
51
CONNECTOR
54

FIG. 12

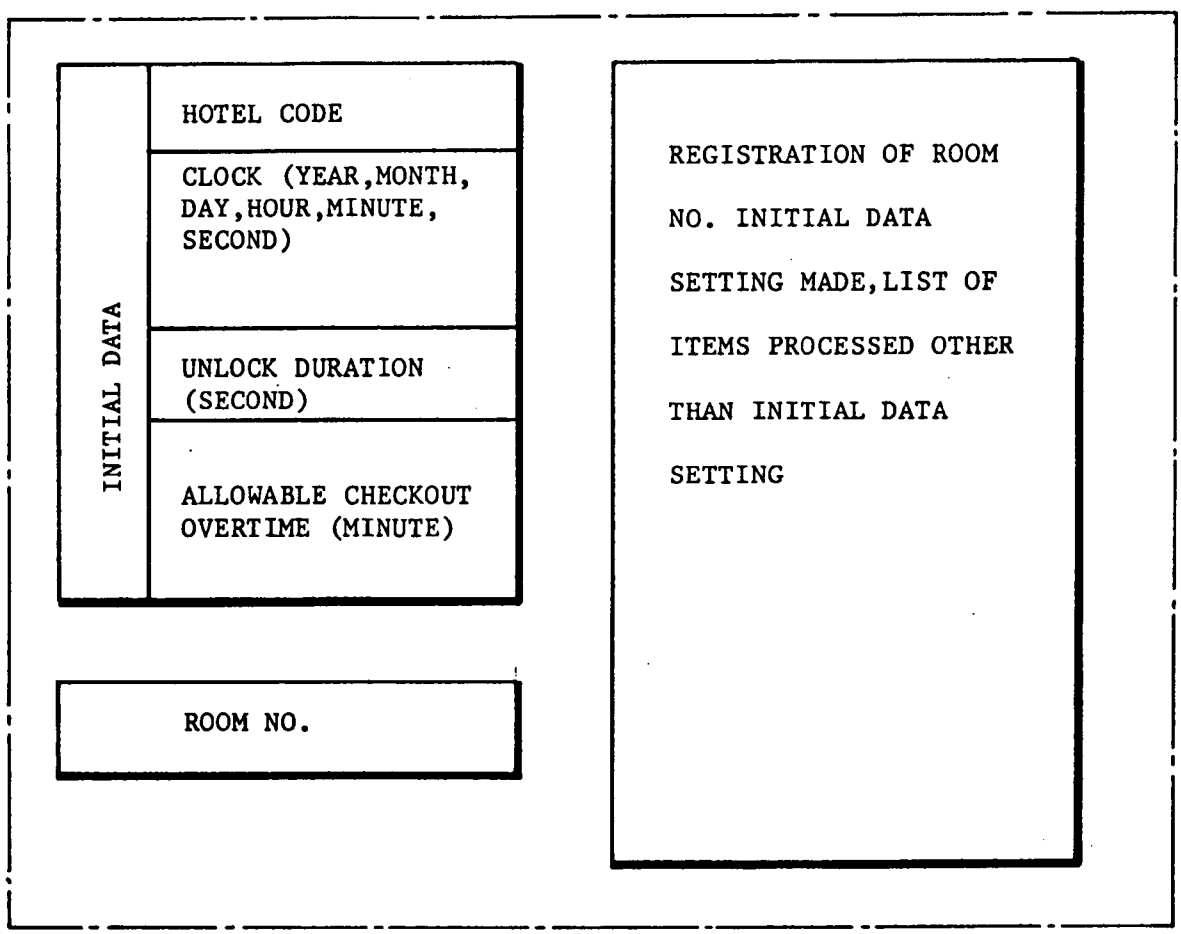

INITIAL DATA
HOTEL CODE
CLOCK (YEAR,MONTH, DAY,HOUR,MINUTE, SECOND)
UNLOCK DURATION (SECOND)
ALLOWABLE CHECKOUT OVERTIME (MINUTE)
ROOM NO.
REGISTRATION OF ROOM NO. INITIAL DATA SETTING MADE,LIST OF ITEMS PROCESSED OTHER THAN INITIAL DATA SETTING

FIG.13

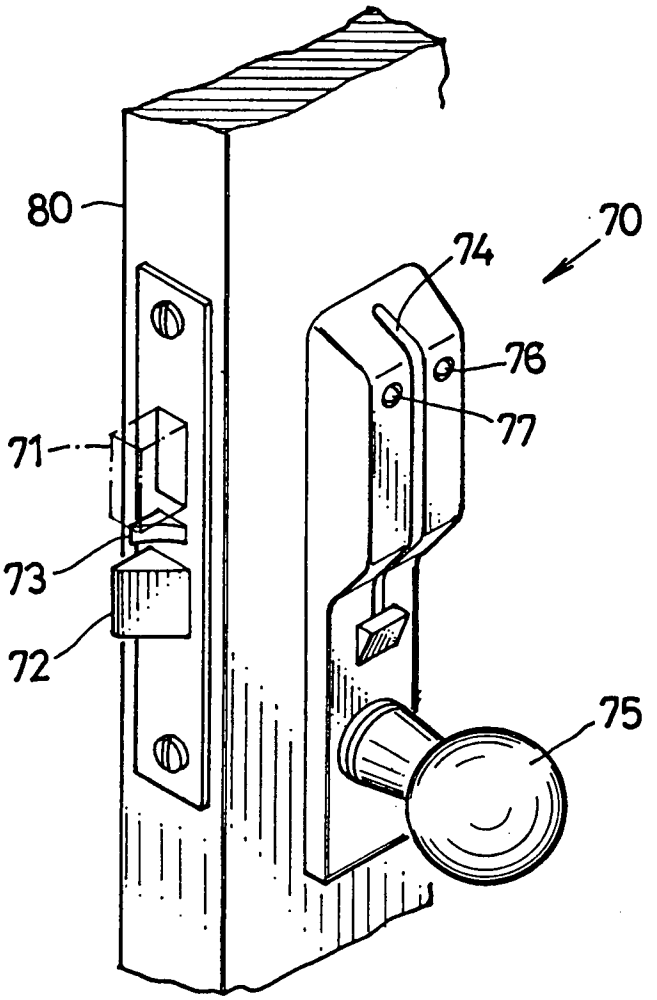

80
70
74
76
77
71
73
72
75

FIG.16

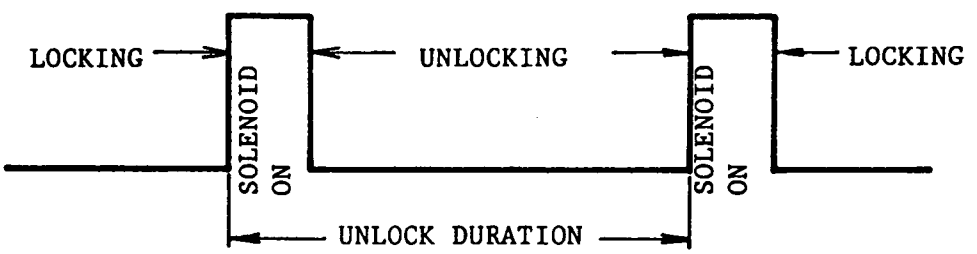

LOCKING
SOLENOID ON
UNLOCKING
SOLENOID ON
LOCKING
UNLOCK DURATION

FIG. 14

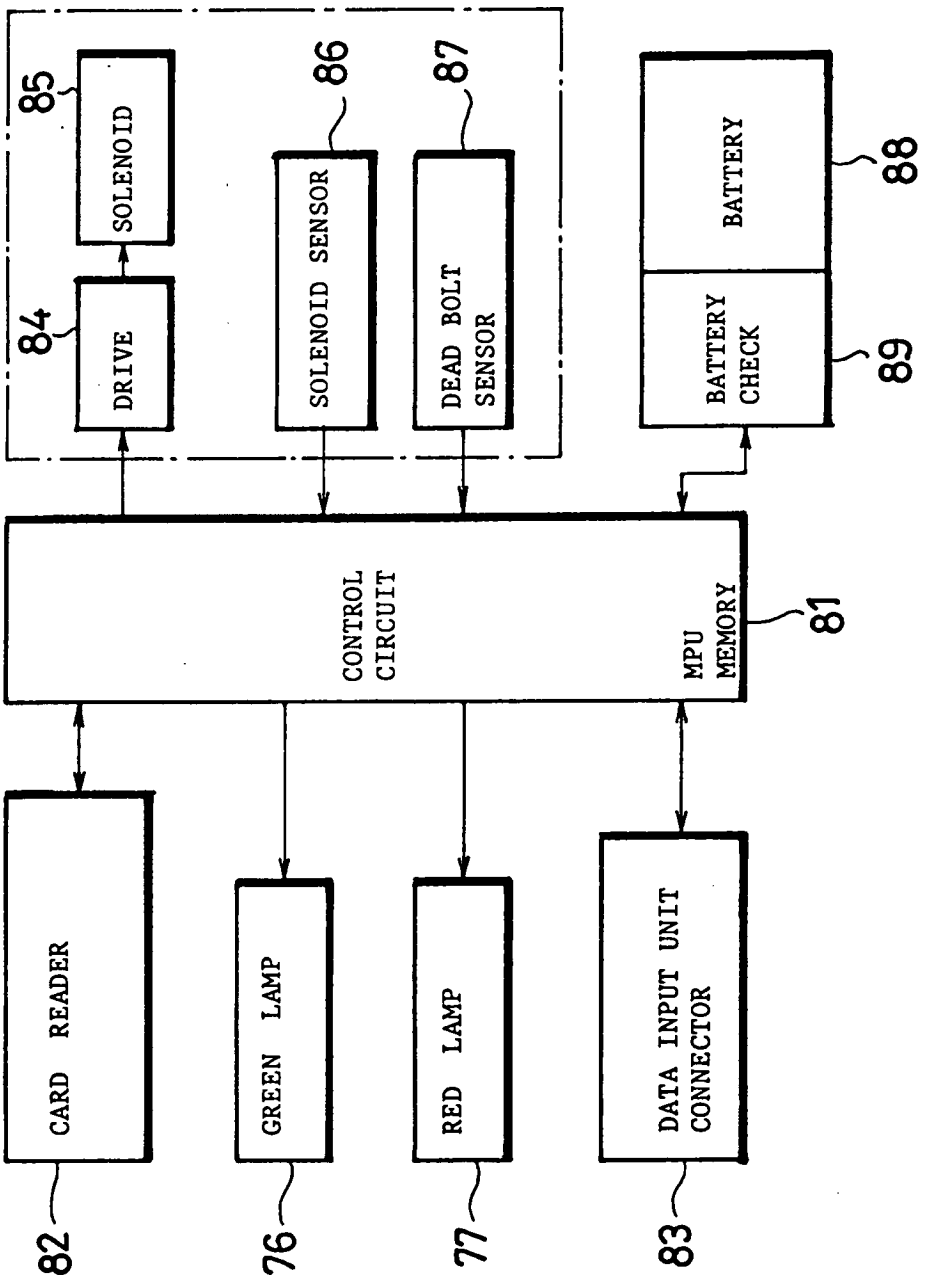

85
SOLENOID
84
DRIVE
86
SOLENOID SENSOR
87
DEAD BOLT SENSOR
BATTERY
88
BATTERY CHECK
89
CONTROL CIRCUIT
MPU MEMORY
81
CARD READER
82
GREEN LAMP
76
RED LAMP
77
DATA INPUT UNIT CONNECTOR
83

FIG.15

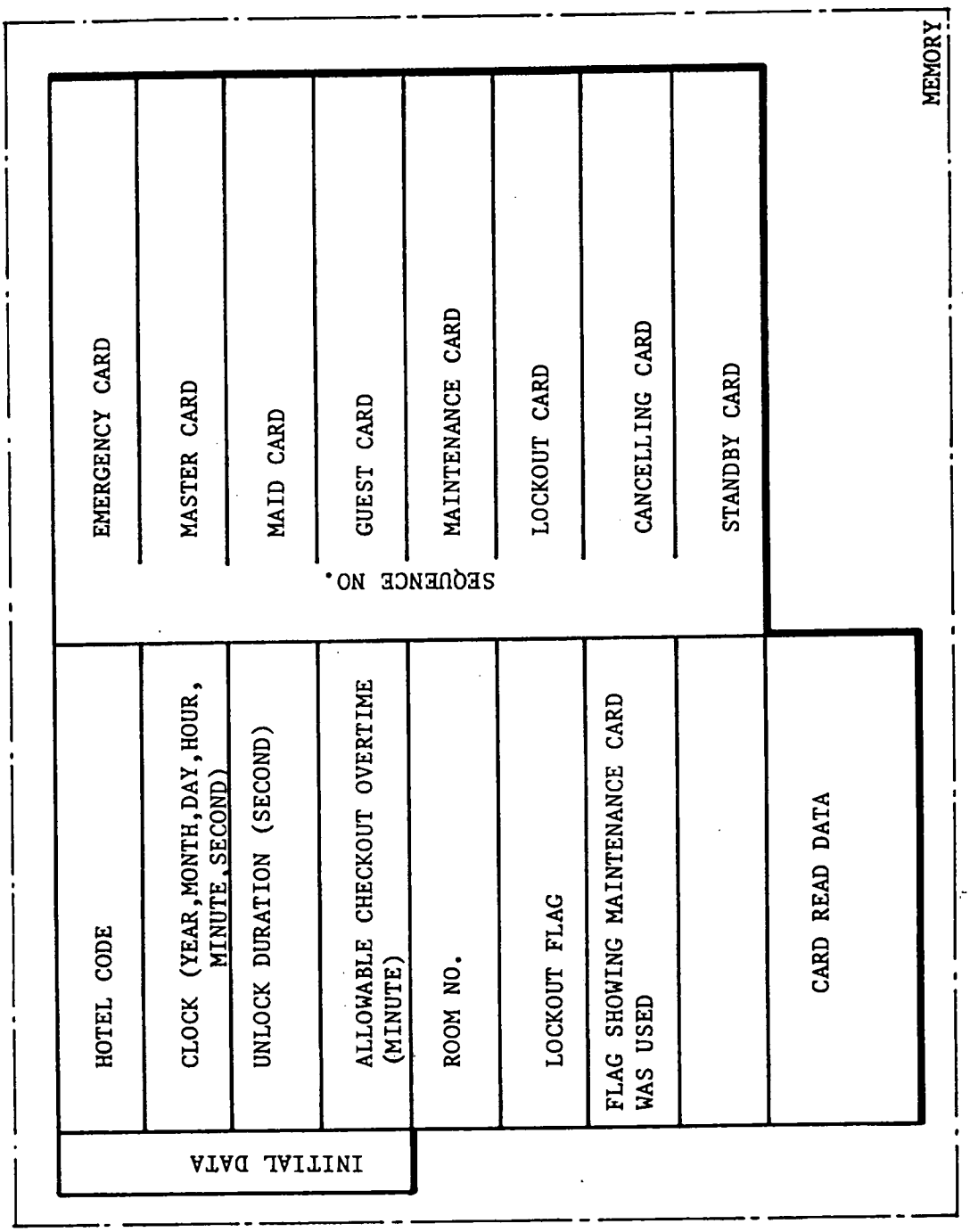

MEMORY
INITIAL DATA
HOTEL CODE
CLOCK (YEAR, MONTH, DAY, HOUR, MINUTE, SECOND)
UNLOCK DURATION (SECOND)
ALLOWABLE CHECKOUT OVERTIME (MINUTE)
ROOM NO.
LOCKOUT FLAG
FLAG SHOWING MAINTENANCE CARD WAS USED
CARD READ DATA
SEQUENCE NO.
EMERGENCY CARD
MASTER CARD
MAID CARD
GUEST CARD
MAINTENANCE CARD
LOCKOUT CARD
CANCELLING CARD
STANDBY CARD

FIG.17a

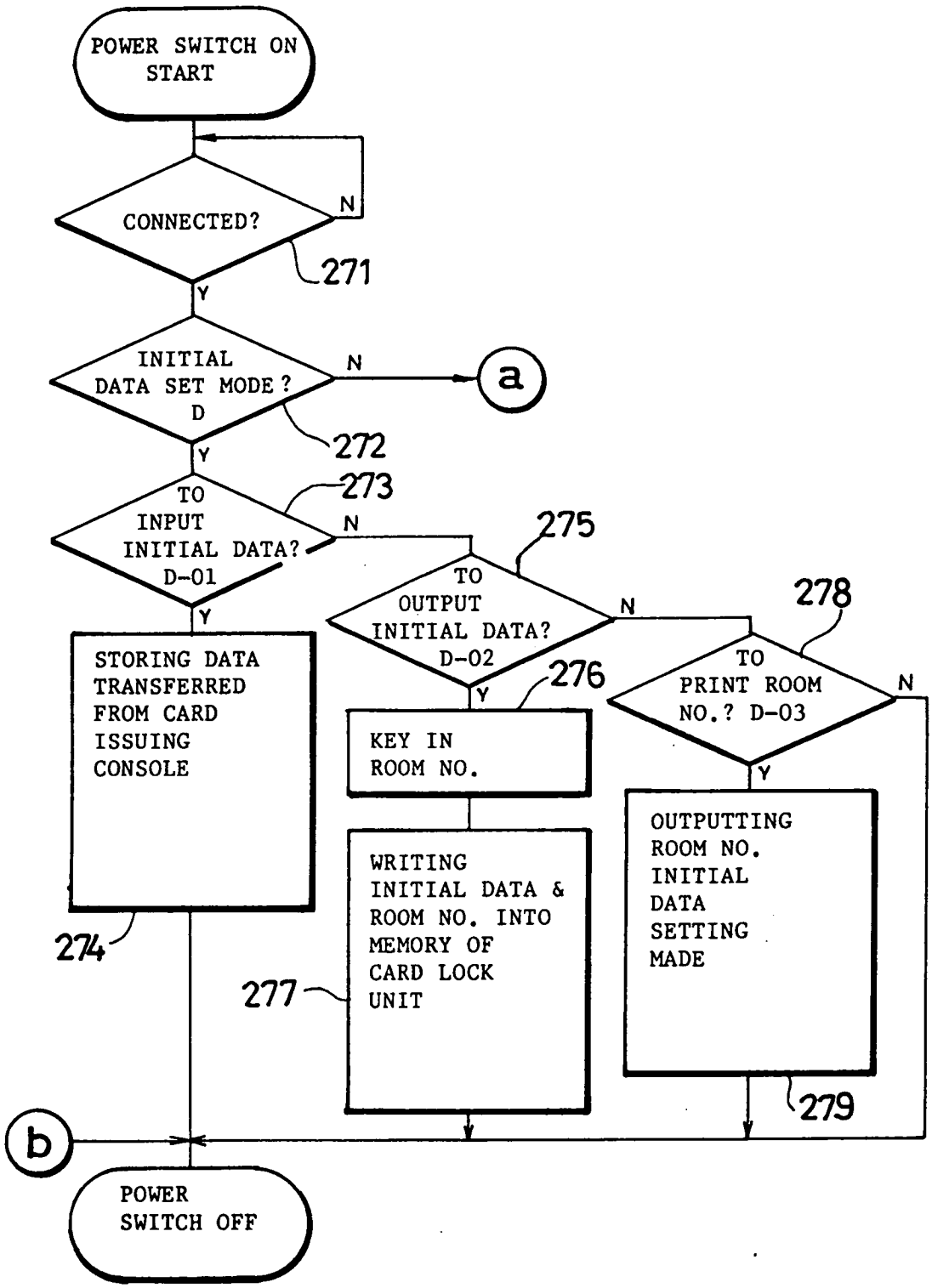

POWER SWITCH ON START
CONNECTED?
N
Y
271
INITIAL DATA SET MODE ? D
N
a
Y
272
TO INPUT INITIAL DATA? D-01
273
N
Y
275
TO OUTPUT INITIAL DATA? D-02
N
Y
276
278
TO PRINT ROOM NO.? D-03
N
Y
STORING DATA TRANSFERRED FROM CARD ISSUING CONSOLE
274
KEY IN ROOM NO.
WRITING INITIAL DATA & ROOM NO. INTO MEMORY OF CARD LOCK UNIT
277
OUTPUTTING ROOM NO. INITIAL DATA SETTING MADE
279
b
POWER SWITCH OFF

FIG.17b

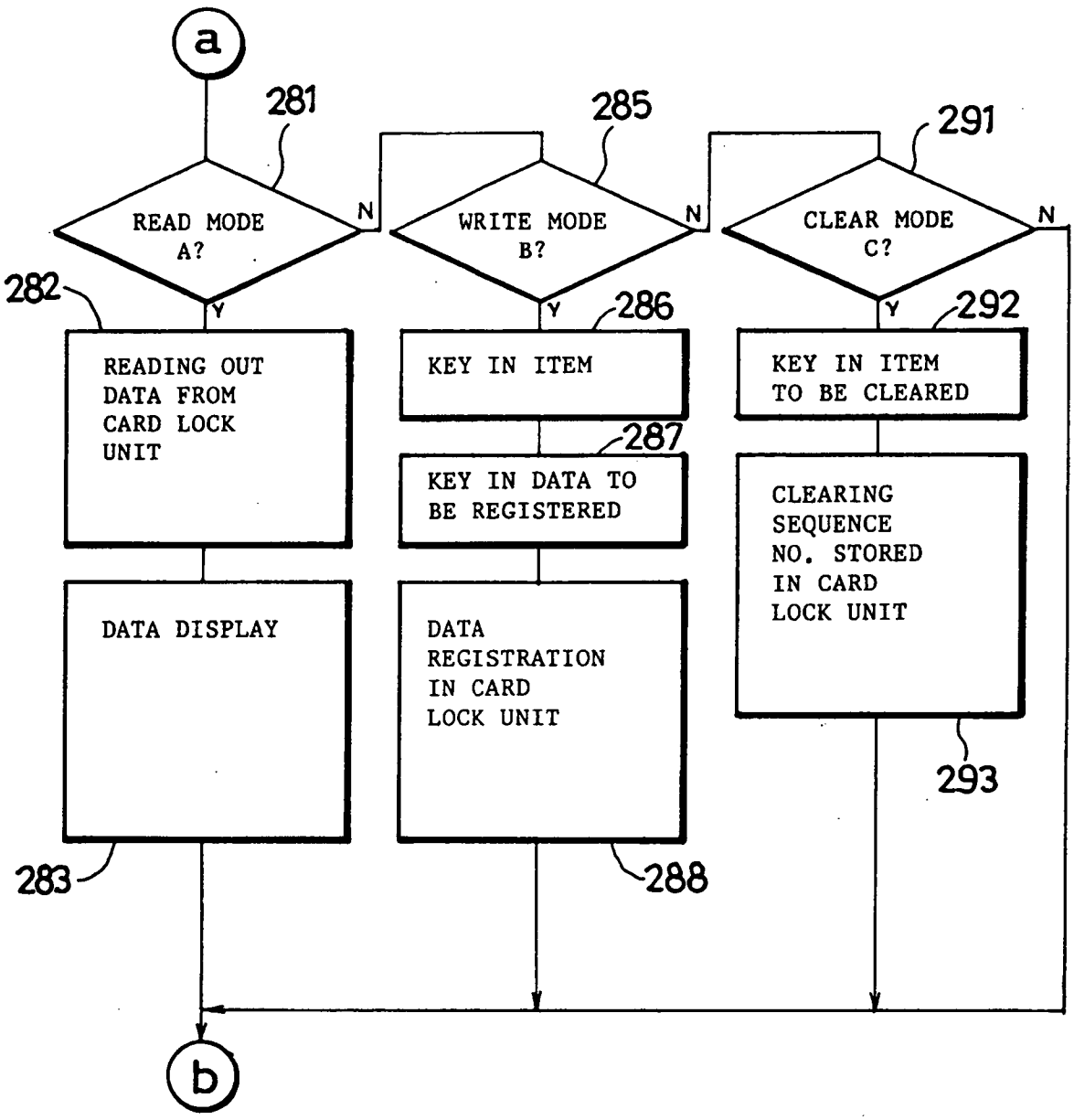

a
281
READ MODE A?
N
Y
282
READING OUT DATA FROM CARD LOCK UNIT
DATA DISPLAY
283
285
WRITE MODE B?
N
Y
286
KEY IN ITEM
287
KEY IN DATA TO BE REGISTERED
DATA REGISTRATION IN CARD LOCK UNIT
288
291
CLEAR MODE C?
N
Y
292
KEY IN ITEM TO BE CLEARED
CLEARING SEQUENCE NO. STORED IN CARD LOCK UNIT
293
b

FIG. 18

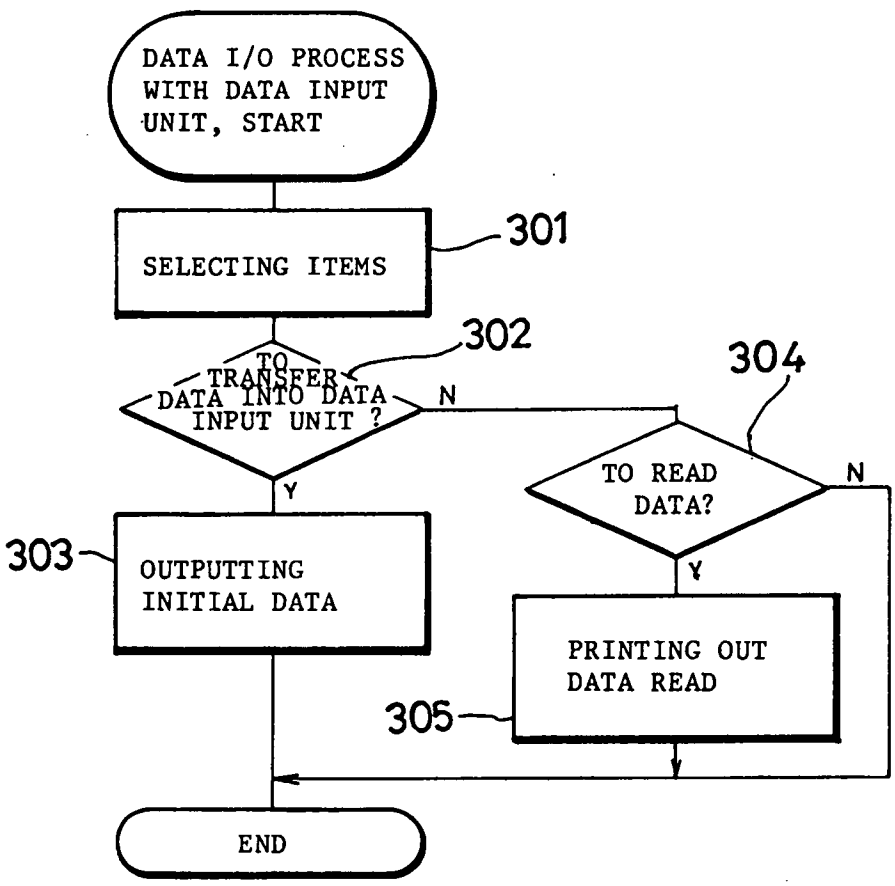

DATA I/O PROCESS WITH DATA INPUT UNIT, START
SELECTING ITEMS
301
TO TRANSFER DATA INTO DATA INPUT UNIT ?
302
N
Y
303
OUTPUTTING INITIAL DATA
304
TO READ DATA?
N
Y
PRINTING OUT DATA READ
305
END

FIG.19a

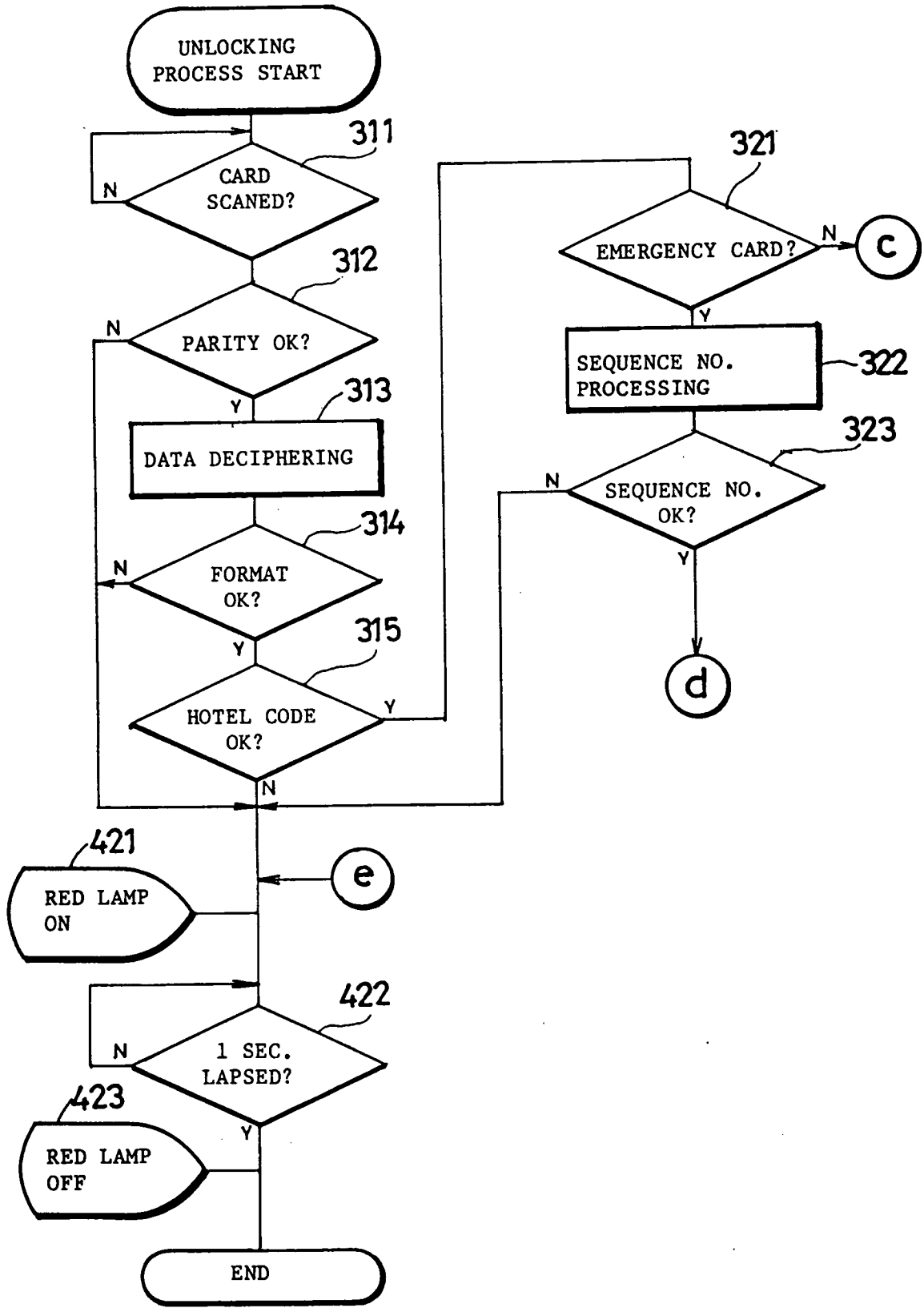

UNLOCKING PROCESS START
311
CARD SCANED?
N
312
PARITY OK?
N
Y
313
DATA DECIPHERING
314
FORMAT OK?
N
Y
315
HOTEL CODE OK?
Y
N
321
EMERGENCY CARD?
N
C
Y
SEQUENCE NO. PROCESSING
322
323
SEQUENCE NO. OK?
N
Y
d
421
RED LAMP ON
e
422
1 SEC. LAPSED?
N
423
RED LAMP OFF
Y
END

FIG.19b

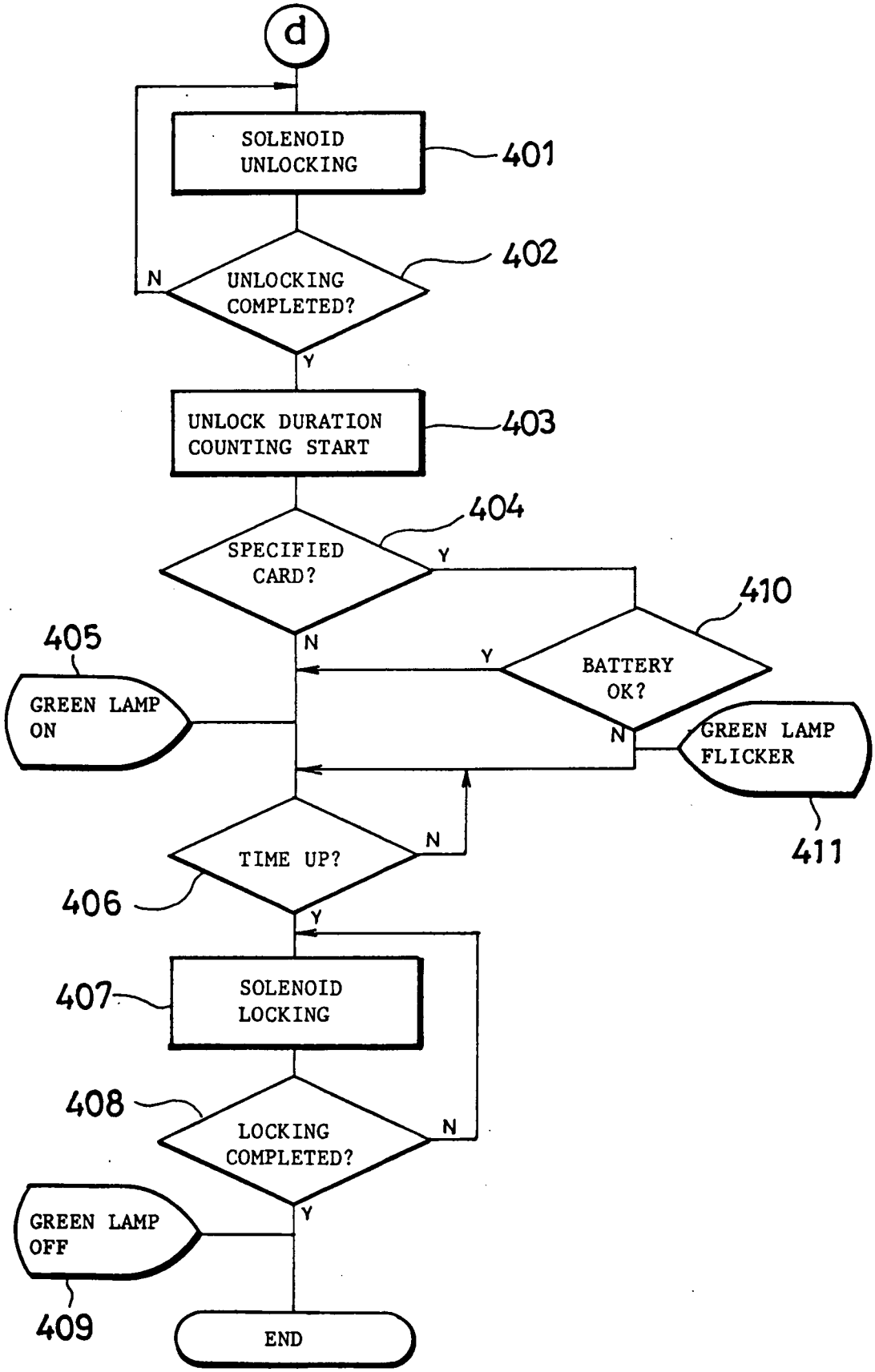

d
SOLENOID UNLOCKING
401
UNLOCKING COMPLETED?
402
N
Y
UNLOCK DURATION COUNTING START
403
SPECIFIED CARD?
404
Y
N
BATTERY OK?
410
Y
N
GREEN LAMP ON
405
GREEN LAMP FLICKER
411
TIME UP?
406
N
Y
SOLENOID LOCKING
407
LOCKING COMPLETED?
408
N
Y
GREEN LAMP OFF
409
END

FIG.19c

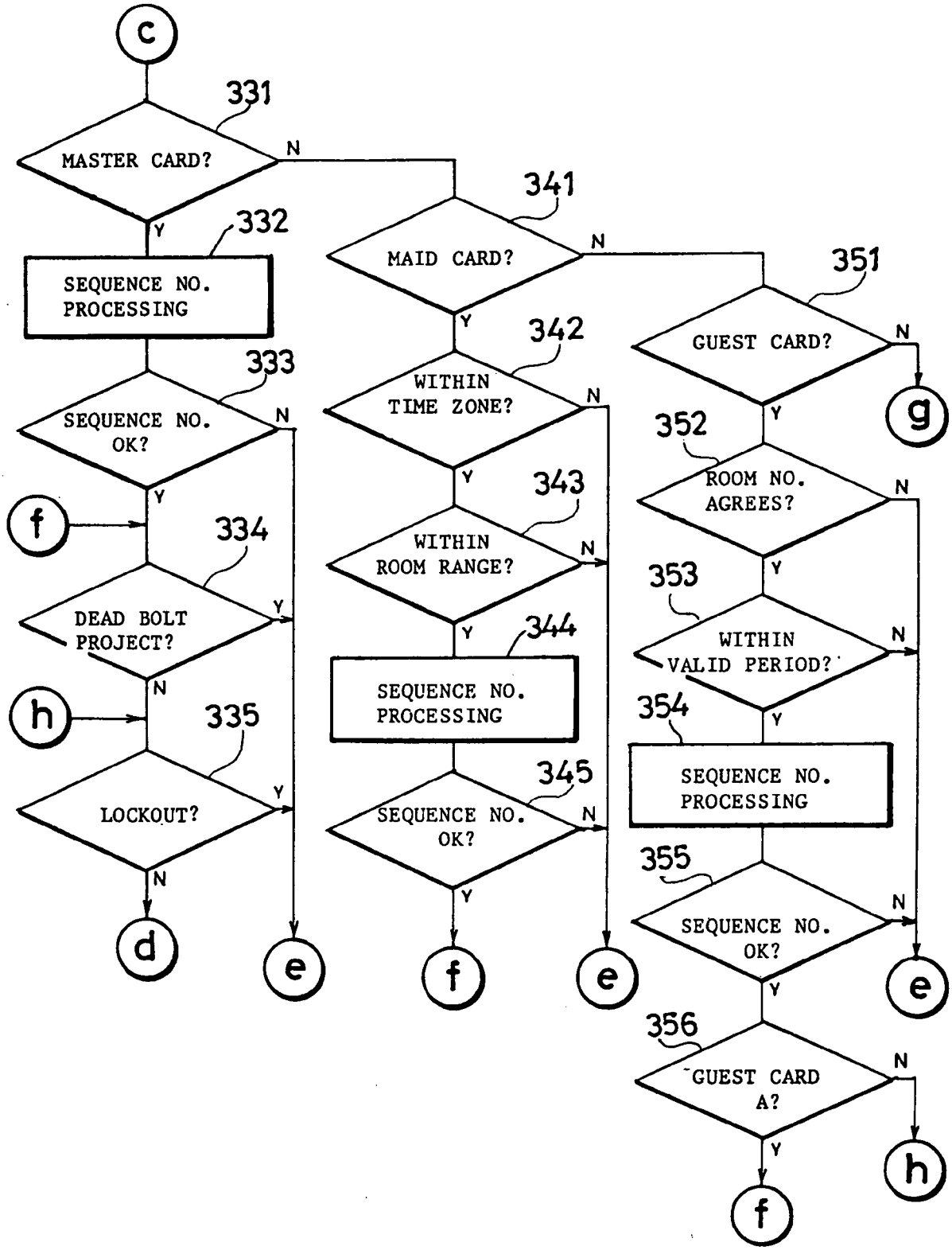

c
331
MASTER CARD?
N
Y
332
SEQUENCE NO. PROCESSING
333
SEQUENCE NO. OK?
N
Y
f
334
DEAD BOLT PROJECT?
Y
N
h
335
LOCKOUT?
Y
N
d
e
341
MAID CARD?
N
Y
342
WITHIN TIME ZONE?
N
Y
343
WITHIN ROOM RANGE?
N
Y
344
SEQUENCE NO. PROCESSING
345
SEQUENCE NO. OK?
N
Y
f
e
351
GUEST CARD?
N
Y
g
352
ROOM NO. AGREES?
N
Y
353
WITHIN VALID PERIOD?
N
Y
354
SEQUENCE NO. PROCESSING
355
SEQUENCE NO. OK?
N
Y
e
356
GUEST CARD A?
N
Y
h
f

FIG.19d

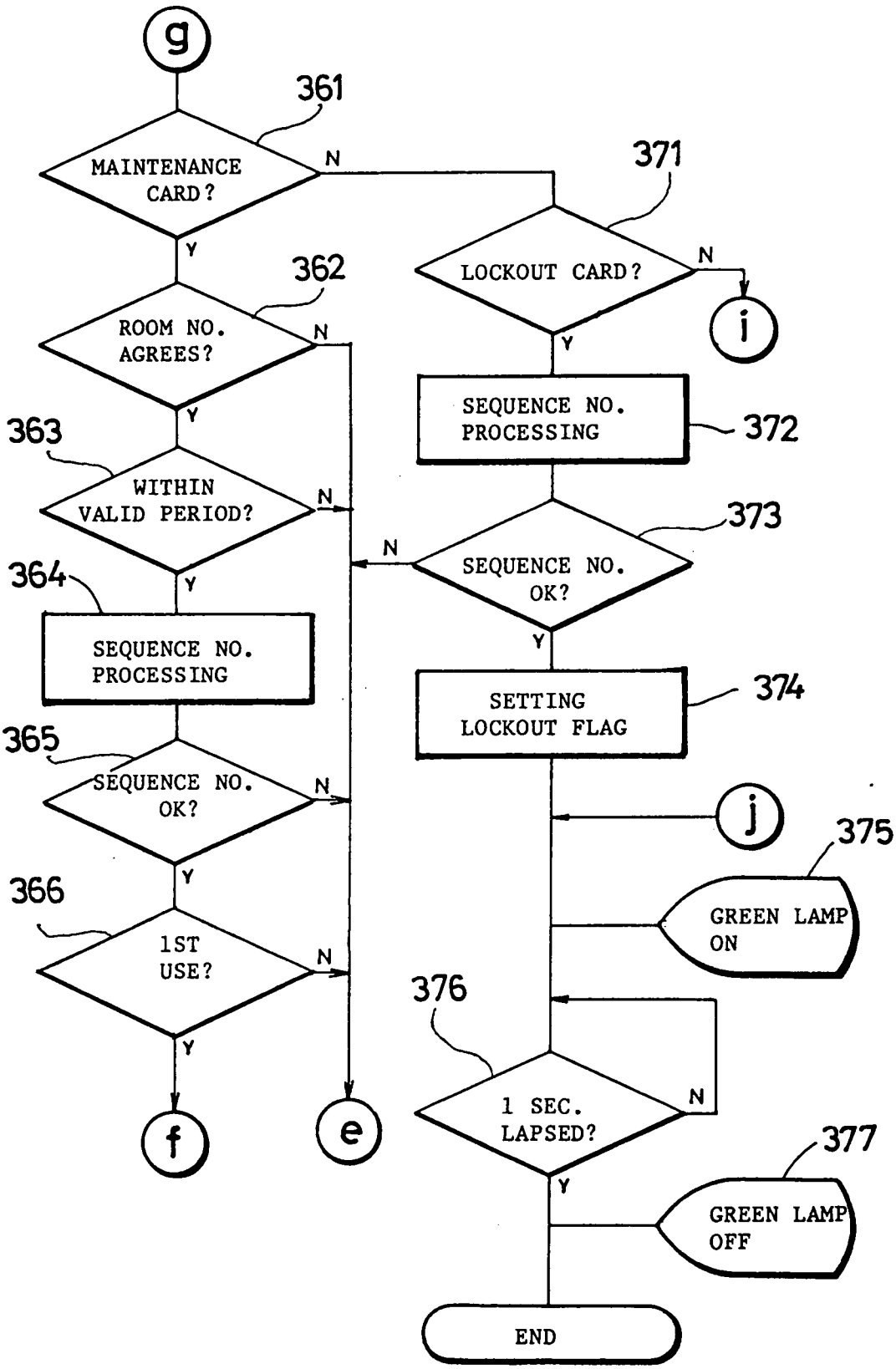
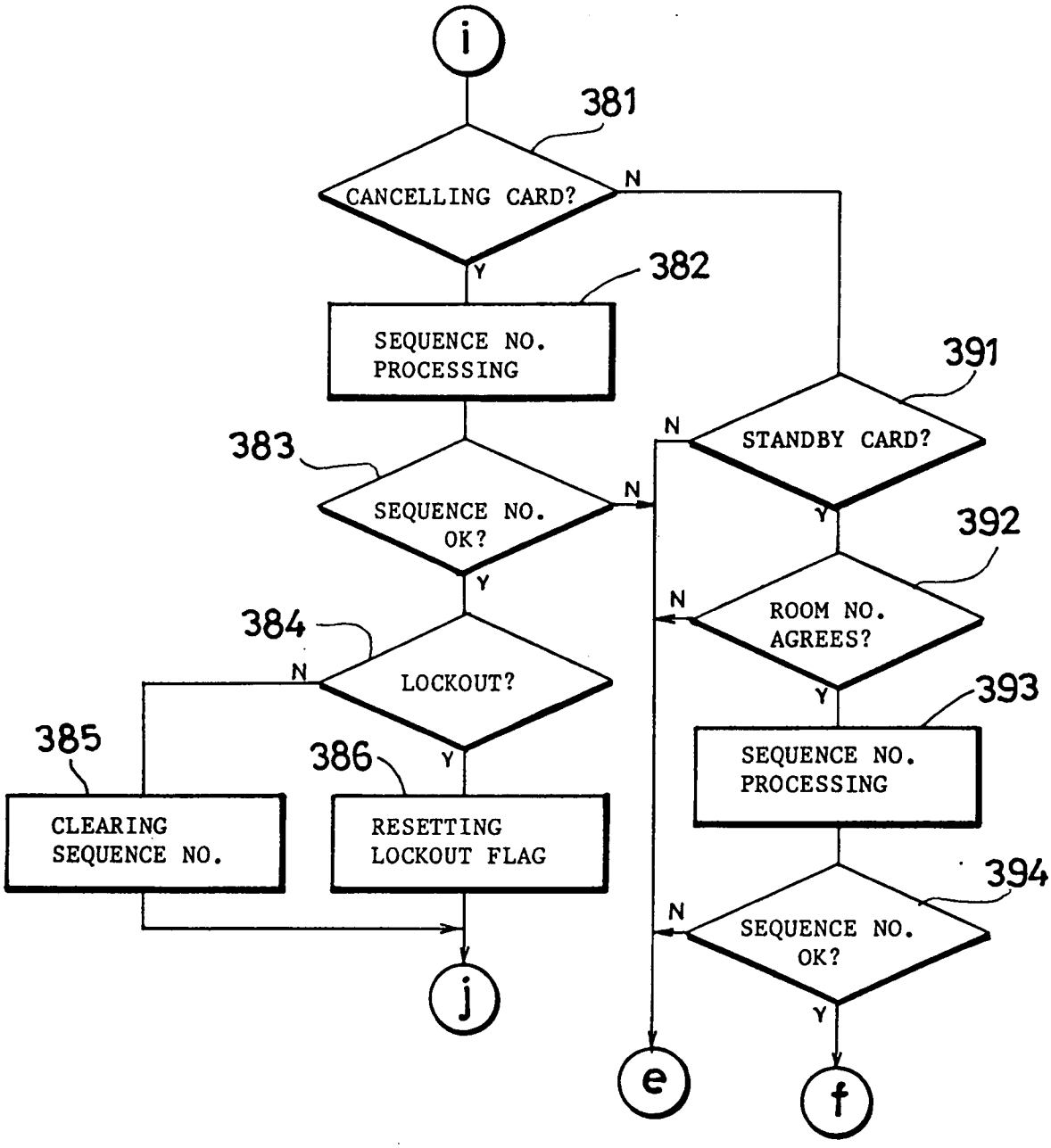

g
361
MAINTENANCE CARD?
N
Y
362
ROOM NO. AGREES?
N
Y
363
WITHIN VALID PERIOD?
N
Y
364
SEQUENCE NO. PROCESSING
365
SEQUENCE NO. OK?
N
Y
366
1ST USE?
N
Y
f
e
371
LOCKOUT CARD?
N
Y
i
SEQUENCE NO. PROCESSING
372
373
SEQUENCE NO. OK?
N
Y
374
SETTING LOCKOUT FLAG
j
375
GREEN LAMP ON
376
1 SEC. LAPSED?
N
Y
377
GREEN LAMP OFF
END

FIG.19e


i
381
CANCELLING CARD?
N
Y
382
SEQUENCE NO. PROCESSING
383
SEQUENCE NO. OK?
N
Y
384
LOCKOUT?
N
Y
385
CLEARING SEQUENCE NO.
386
RESETTING LOCKOUT FLAG
j
391
STANDBY CARD?
N
Y
392
ROOM NO. AGREES?
N
Y
393
SEQUENCE NO. PROCESSING
394
SEQUENCE NO. OK?
N
Y
e
f

REGISTER ENTRY FOR EP0417474

European Application No EP90115247.0 filing date 04.11.1985

Priority claimed:
05.11.1984 in Japan - doc: 59233491

Earlier Application Under Art. 76: EP85113991.5 Pubn. No EP0180948 filed on 04.11.1985

Designated States BE CH DE FR GB IT LI LU NL SE AT

Title DATA INPUT DEVICE IN A CARD LOCK SYSTEM.

Applicant/Proprietor
OMRON CORPORATION, 10, Tsuchido-cho Hanazono Ukyo-ku, Kyoto 616, Japan
[ADP No. 57402851001]

Inventors
YOSHITAKA UEMURA, OMRON Corporation Intellectual Property Center, 20, Igadera, Shimo-Kaiinji, Nagaokakyo-shi, Kyoto 617, Japan
[ADP No. 58370750001]

HIROYUKI ITO, OMRON Corporation Intellectual Property Center, 20, Igadera, Shimo-Kaiinji, Nagaokakyo-shi, Kyoto 617, Japan [ADP No. 58370768001]

KATSUHIRO TSUCHIDA, OMRON Corporation Intellectual Property Center, 20, Igadera, Shimo-Kaiinji, Nagaokakyo-shi, Kyoto 617, Japan
[ADP No. 58370776001]

HISATO TAKAHASHI, OMRON Corporation Intellectual Property Center, 20, Igadera, Shimo-Kaiinji, Nagaokakyo-shi, Kyoto 617, Japan
[ADP No. 58370784001]

Classified to
G07F

Address for Service
MEWBURN ELLIS, York House, 23 Kingsway, LONDON, WC2B 6HP, United Kingdom
[ADP No. 00000109006]

EPO Representative
WILHELMS, KILIAN & PARTNER PATENTANWÄLTE, Eduard-Schmid-Strasse 2, W-8000 München 90, Federal Republic of Germany [ADP No. 50431709001]

Publication No EP0417474 dated 20.03.1991
Publication in English

Examination requested 03.09.1990

Patent Granted with effect from 01.02.1995 (Section 25(1)) with title DATA INPUT DEVICE IN A CARD LOCK SYSTEM.

29.12.1994 Notification from EPO of change of EPO Representative details from
WILHELMS, KILIAN & PARTNER PATENTANWÄLTE, Eduard-Schmid-Strasse 2,
W-8000 München 90, Federal Republic of Germany
[ADP No. 50431709001]

to
WILHELMS, KILIAN & PARTNER PATENTANWÄLTE, Eduard-Schmid-Strasse 2,
D-81541 München, Federal Republic of Germany [ADP No. 50431709001]
Entry Type 25.14 Staff ID. RD06 Auth ID. EPT

**** END OF REGISTER ENTRY ****

RENEWAL DETAILS

PUBLICATION NUMBER EP0417474

PROPRIETOR(S)

OMRON CORPORATION, 10, Tsuchido-cho Hanazono Ukyo-ku, Kyoto 616, Japan

DATE FILED 04.11.1985

DATE GRANTED 01.02.1995

DATE NEXT RENEWAL DUE 04.11.1995

DATE NOT IN FORCE

DATE OF LAST RENEWAL

YEAR OF LAST RENEWAL 00

STATUS PATENT IN FORCE

**** END OF REPORT ****