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(54) **Card releasable mechanism comprising an electric motor for use in a door lock**

Kartengesteuerte Vorrichtung für ein Türschloss, die mit einem elektrischen Motor versehen ist

Mécanisme de déclenchement à carte et comportant un moteur électrique pour l'utilisation avec la serrure d'une porte

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(73) Proprietor: **TITINERO, Leon**
London NW8 6JJ (GB)

(72) Inventors:

- **FEAVER, John Lionel**
Near Reading, Berkshire RG7 3DL (GB)
- **FISHER, Stephen James**
Reading, Berkshire RG2 0AY (GB)

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Description

Field of invention

This invention concerns locks particularly although not exclusively door locks for hotel rooms.

Background to the invention

Door locks for hotel rooms have to serve a number of requirements.

In the first place they must secure the room against unauthorised access.

Secondly they need to provide the occupant with the facility of bolting the door from within yet provide the occupant with the ability to open the door from inside quickly and easily without the need for a key to enable any occupants of the room to leave quickly in an emergency.

Thirdly each lock must be unique at least within each hotel, so that a room key for one room cannot be used to open another room door. On the other hand all locks should be capable of being opened by a single master key for use by cleaning staff or hotel management personnel.

In recent years conventional locks have been replaced or modified with card releasable locks enabling the hotel to issue each guest with a card instead of a key and additional facilities can be provided with such locking systems such as terminating the door opening capability of a card after a particular time period has elapsed from the issue of the card to the guest.

Problems have been experienced in practice with such systems and it is an object of the present invention to provide an improved card released lock and card operated locking system for hotels.

Although the invention will be described exclusively in relation to hotels, it is to be understood that the invention is equally applicable albeit with minor modifications to office blocks, factories, government buildings, prisons, secure hospitals, schools and the like, indeed any building to which people have access and which contain well defined areas which are to be made secure against unauthorised entry.

GB-A-2 227 052, US-A-4 534 194 and US-A-4 125 008 all show card releasable locking mechanisms which utilise solenoids to enable the doors to be unlocked. A disadvantage of such a mechanism is that the field produced by the solenoid coils can be mimicked by an external source, which therefore could be used by an unauthorised person to unlock the mechanism.

Summary of the invention

The above-mentioned problems are solved by the present invention with a card releasable mechanism according to Claim 1.

Preferred embodiments and additional features are

defined in the dependent claims.

The invention will now be described by way of example with reference to the accompanying drawings in which:-

Figure 1 is a perspective view of part of a door on which a card operated lock release mechanism is mounted.

Figure 2 is a rear view of the same door showing the room side of the said card operated lock release mechanism.

Figure 3 illustrates an exploded view of the front plate mechanism of Figure 1.

Figure 4 contains plan and side views and scrap sections of the lock clutch device,

Figure 5 is a rear view of the front plate assembly.

Figure 6 is a illustrates a hand held communication device for use with the lock,

Figure 7 is a front view of the device shown in Figure 6,

Figure 8 illustrates an encoding device and computer for encoding cards,

Figure 9 is a block circuit diagram of the control system within the lock of Figures 1 to 5,

Figure 10 is a block circuit diagram of the communication shown in Figures 6 and 7, and

Figure 11 is a block circuit diagram of the encoder of Figure 8.

In Figure 1 a door 10 has fitted therein a conventional hotel lock 12. On the front of the door is mounted a card operated lock release mechanism 14 having a rotatable handle 16 and a card entry slot 18. In known manner, entry of an appropriate card into slot 18 enables the lock 12 to be operated by the handle 16 to retract the locking fingers 20 and thereby open the door provided the dead bolt 22 is in its retracted condition.

As shown in Figure 2, the inside of the door is fitted with a similar assembly 24 having a handle 26 and dead bolt operating button 28. Unlike the handle 16, the handle 26 will always operate the lock and retract the fingers 20 to allow an occupant of the room to leave.

In known manner rotation of the button 28 in one direction will cause the dead bolt 22 to protrude from the lock. Rotation in the opposite sense withdraws the dead bolt.

Both assemblies 14 and 24 also include a window slit 30 in the case of the front plate and 32 in the case of the rear plate, through which lights can be seen and IR signals received and transmitted as will be described later.

In Figure 3 some of the parts making up the front plate assembly of Figure 1 are shown in exploded view. The operation of the lock by the external handle 16 is achieved by ensuring that drive is transmitted from the handle 16 via the intermediate member 34 (shown in greater detail and to an enlarged scale in Figure 3a) to the lock operating shaft 36 which protrudes through the square hole in the lock assembly 12, so that rotation of 38 will cause the lock mechanism to be operated and

the fingers 20 retracted.

The shafts 34 and 36 are axially aligned when assembled but are not interconnected. Rotation of the intermediate shaft assembly 34 does not therefore transmit drive to shaft 36 directly. Instead shaft 36 is keyed by means of its square end 38 to a housing 40. Rotation of the housing will also produce rotation of the shaft 36.

The cross section of the inner end 42 of the intermediate assembly 34 which engages the housing 40 is of generally circular cross section (albeit formed with a groove 44). The outboard end of the member 34 is also formed with a square cross section shaft 46 on which the handle 16 can be secured so that rotation of the handle 16 always produces rotation of the intermediate assembly 34. However, because of the circular section of the inner end 42, the latter will simply rotate i.e. slip within the circular aperture 48 within the housing 40, and the latter will simply remain stationary.

If a pin, attached to the housing 40, is introduced into the groove 44, clearly the situation is changed. Rotation of the handle 16 will now cause the housing 40 also to rotate and with it the shaft 36 thereby operating the lock. The manner in which this is achieved will be described in relation to Figure 4.

Turning to the remaining items shown in Figure 3, the housing 40 is sandwiched between two plates 50 and 52 when assembled. Spacers such as 54, 56 and 58 keep the two plates 50 and 52 separated by a distance just greater than the thickness of the housing 40 so that the latter is free to rotate about the axis of the aligned shafts 34 and 36 between the two plates. Both plates are apertured as at 60 and 62 respectively to allow the passage of the intermediate shaft section 34 and the shaft 36.

The plates 50 and 52 are themselves mounted securely within the front plate housing 14 as by screws such as 64 and 66.

The assembly shown is one in which opening of the lock is achieved by rotating the handle 16 in a generally clockwise manner. To this end a stop to arrest anticlockwise movement of the handle 16 is provided by engagement of a radially protruding pin 68 with an undercut 70 in the front face 72 of the housing 40.

A return spring 78 for automatically rotating the handle in an anticlockwise sense is provided on the plate 50. One end 74 is secured to the plate 50 and the other end 76 is secured to the intermediate shaft assembly 34. The spring 78 is tensioned with clockwise rotation of the handle 16 so as to provide a restoring force when the handle is released.

Figures 4a and 4b show the internal detail of the housing 40. Where appropriate the same reference numerals have been used to denote the parts common to Figures 3 and 4. Thus the circular section shaft 42 having the groove 44 is shown entering the housing 40 from the left in Figure 4b whilst the end 38 of the main lock drive shaft 36 is shown entering at the right into a square sectioned aperture in the end plate 41.

The pin 68 can also be seen engaging the underside of the rebate 70 shown in dotted outline in Figures 4a and 4b.

Drive is transmitted between shaft 42 and shaft 38 by engaging a pin 80 in the groove 44. Since the pin is attached to the housing 40 (as will be described later) the engagement of the pin 80 in the groove 44 will cause the housing 40 to rotate with the shaft 42. As a consequence rotation of the latter will produce rotation of the shaft end 38 and operate the lock.

The pin 80 is formed with a hollow interior as best seen in Figure 4a into which the lower end of an upper pin 82 is a sliding fit. Both pins have enlarged heads 84 and 86 respectively which slide in and are guided by a cylindrical sleeve 88. The pin 80 is in turn guided in a circular aperture 90 in the lower end wall 92 of the sleeve 88 and the two pins are therefore guided for sliding movement within the sleeve and therefore the housing 40. A first spring 94 is located between the end wall 92 and the head of the pin 80 whilst a second spring 96 is located between the pin head 84 and the underside of the pin head 86. The springs are selected to give the desired characteristic but typically the upper spring will be stiffer than the lower spring.

The head 86 is engaged by a cam 98 which is mounted on a shaft 100 to rotate therewith. The latter has mounted thereon a toothed spur wheel 102 so that rotation of the wheel produces rotation of the cam. Spur wheel 102 meshes with a worm gear 104 which is mounted on the output shaft of an electric motor 106 which itself is also mounted within the housing 40.

Also on the shaft 100 are mounted two further cams 108 and 110 which serve to operate micro switches 112 and 114 respectively, to denote that the cam is in its maximum and minimum displaced positions relative to the head 86.

The two part pin assembly 80/82 is provided so as to ensure that should the shaft 42 be misaligned, so that the pin 80 cannot enter the groove 44, movement of the cam 98 is not prevented. Instead the cam merely pushes the pin 82 further into the interior of pin 80, the lost motion connection formed thereby accommodating full displacement of the cam 98. Whilst the rotation of the cam in this situation will not allow the door to be opened, the mechanism is nevertheless protected and by arranging that the motor will drive the cam into its rest position (as shown in Figure 4a) after a short period of time, the door has been opened, the mechanism will have a chance of being reset so that the groove 44 is in fact aligned and ready to receive the pin 80. (It will be seen for example that if the handle 16 has been rotated by even a small amount by a person trying to gain access, before the pin 80 is advanced into the groove 44 subsequent movement of the pin will of course be inhibited and the door will not be able to be unlocked. It is therefore essential that the handle 16 is left in its fully retracted position (under the influence of the restoring spring 78) whilst the card is inserted into and removed from the card receiver.

ing slot 18 to enable the mechanism to operate the pin 80 and move it into the groove 44 before any attempt is made to turn the handle 16).

Although the shaft 42 is described as having a groove 44 formed therein, it will be seen that a cut-away shaft section as at 4c or at 4d would achieve the same result. The shaft section of Figure 4c would "feel" the same as the shaft section of Figure 4a whereas that of Figure 4d might introduce an element of lost motion in the feel of the handle as the semi-circular section is rotated until it engages the side of the pin 80 thereafter causing rotation of the housing 40. It will be seen that if the shaft section is as shown in Figure 4d, a certain amount of rotation of the handle 16 could be accommodated before the pin 80 is fully protruding and would therefore make the mechanism less sensitive to imprecise operation of the handle during the lock releasing phase.

Figure 5 shows the rear view of the front plate 14 with the various internal components mounted therein. Thus the housing 40 can be seen mounted behind the plate 52 which itself is secured in position by screws such as 64 and 66. Visible in Figure 5 is a square section aperture 116 into which the square section end 38 of the main lock drive shaft 36 fits. To permit rotation of the latter relative to the plate 52, the square section hole 116 is formed in the centre of a round boss 118 which itself protrudes through the circular aperture 62 in the end plate 52.

In the upper half of the housing 40 is mounted a printed circuit board 122 which carries a card reader (not shown) adapted to read and write data from and to cards such as 124 which are entered into the card reader via the slot 18. The printed circuit board also carries logic circuits and control circuits, memories, interfaces and all other circuit connections for deriving the motor receiving signals from the micro switches such as 112 and 114, and receiving power from a battery (not shown) typically housed below the cover 24 on the inside of the door.

As previously mentioned the cover 14 includes a window 30 through which three light emitting diodes are visible and which also enables infrared radiation to be projected into and received from infrared detectors and transmitters located in line with the light emitting diodes aligned with the slit 30. A similar array is situated behind the slit 32 in the plate 24 on the rear of the door. The printed circuit board provides control signals for the light emitting diodes and circuit connections for conveying signals to and from the infrared transmitters and detectors and a multiway cable 126 with socket connector 128 extends from the circuit board through an aperture in the door for connection to an appropriate edge connector or the like on a printed circuit board (not shown) within the cover 24 on the rear of the door. In this way signals can be conveyed to the light emitting diodes and to and from the infrared detectors and transmitters on the other side of the door.

The three light emitting diodes are seen at 130, 132 and 134 through slit 30 in Figure 1 and an infrared transmitting device is shown at 136 and receiving device at 138. A similar array will be seen through the slit 32.

Communication with the logic and memory circuits on the printed circuit board 122 may be effected by means of a hand held unit 140 shown in Figure 6. This device includes a card receiving slot 142 for receiving a card such as 144, a viewing window 146 through which an LED or liquid crystal display can be seen, a keyboard generally designated 148 for entering digital data and at its front end (as shown in Figure 7) a window containing infrared transmitter 150 and receiver 152.

The device is adapted to generate digital signals for modulating infrared transmissions from the unit (and to decode infrared transmissions received by the unit) to (and from) the infrared devices 136 and 138 in the door release mechanism. Thus for example real time can be entered using the 24 hour clock notation via the keyboard 148 and using for example the bottom left-hand key 154, the data transmitted, so as to enter the accurate time into memory means within the housing 14.

Perhaps most importantly, the memory means within the housing 14 can be interrogated by the unit 140 and a list of details obtained relating to the card(s) which have been used and times at which access has been gained to the room. The unit 140 may include a printer for printing data out, or the data can be scrolled on the screen behind the window 146 or the data can be simply stored in a memory within the device for transmission to a printer or display at a central location to allow the data to be printed or scrolled out as a list.

The hand held unit can also be used to interrogate sensors within a room to determine temperature, whether lighting is on or off, and can also be used to transmit data via the external infrared link and via the infrared transmitter device on the inside of the door, to infrared sensing devices within the room, to for example, turn off or on heating, turn off or on lighting and the like.

A security system as described is completed by means of an encoding device 156 as shown in Figure 8 which may incorporate or be adapted to operate in conjunction with a computing device 158.

The encoder 156 includes a slot 160 into which a card such as 162 can be inserted and further includes a display 164 typically a liquid crystal display or the like to enable data to be displayed to the user prior to its being written to the card for verification. The computer 158 is programmed to interface with and drive the encoder unit 156 to enable room data, guest data, date and time of arrival and departure and authorised zones to be entered in digital format on the card and typically this is done by writing to a magnetic stripe on the card and storing therein data as a magnetic pattern all in known manner. However, it is to be understood that the invention is not limited to the use of magnetic stripe cards but punched cards and printed cards which can be read by optical character recognition may also be

employed. However, it is believed that magnetic cards represent the most secure form since they are least able to be reproduced for unauthorised use.

Various modifications and extensions to the system are envisaged. Thus for example a microswitch may be associated with the dead bolt operating mechanism to close the switch when the dead bolt is operated and thereby create a logic condition which the processing and logic circuit means within the housing 14 can detect and act on. Thus for example when the dead bolt is across, the insertion of a card for example by a maid might cause two light emitting diodes to flash in the display panel 30 (for example both a red and an amber light emitting diode).

In addition drive means may be provided between the shaft 36 and the dead bolt operating mechanism which is operated by a square shaft 37 visible in Figure 3. By providing a clutch which is electrically operable from a disengaged to an engaged mode so operation of the handle 16 will not only rotate the shaft 36 but also the shaft 37 to thereby retract both the fingers 20 and the dead bolt. Since the cards can be programmed by the encoding device 156 in any convenient manner, one card may be programmed for emergency use so as to be capable of not only operating the motor 106 (after it has been inserted and withdrawn) but also a clutch (not shown) associated with the drive between the shaft 36 and the shaft 37, so that subsequent rotation of the handle 16 will gain access to the room even if the door had previously been dead bolted. Such a card would clearly only be available for emergency use where for example a hotel guest has retired to his room, dead bolted the door and then been taken ill.

Since the mechanism within the housing 14 is possibly required to not only receive data but also transmit data and also interpret different cards, simple logic circuits may not be sufficient and a microprocessor together with associated support circuits, memories and the like is preferably included on the printed circuit board 122 to enable the many functions required to be performed. Typically each card will include numerical data identifying the person to whom it has been issued (e.g. a guest, a maid, an engineer, manager etc.) digital data indicating the time and date of issue, digital data indicating the time and date when the card will cease to be authorised for use, digital data indicating which of a plurality of different zones the card can be accepted to give access and further digital data which when encoded enables the processor and or memories on the printed circuit board 122 to be accessed for either entering information or receiving information from a subsequently introduced card, or transmitting from the hand held unit such as shown in Figure 6. Where it is possible to operate the dead lock using the handle 16 through a further clutch, further digital data must be included which when decoded enables the second clutch, so that both the ordinary lock and the dead bolt can be withdrawn by rotation of the handle 16.

Although the LED and IR transmitter and receiver array in the lock shown in the drawings is indicated as being viewable through an elongate slit or window, more preferably the LED's and IR devices are located in separate compartments viewable through individual ports or apertures in the face plate of the lock housing. Not only does this ensure no cross talk between LED's and the IR sensor, but it also prevents someone thinking the slit as shown in the drawings comprises the card viewing aperture.

According to another preferred feature the viewing ports may be angled upwards at approximately 45° to make them easier to see.

The essential parts of the control system of the lock of Figures 1 to 5 are shown in Figure 9.

The heart of the system is a microprocessor 166. A preferred device is a Hitachi Series H8 device, typically Type 320. The device is powered by a battery 168 via a power switch 170 and power conditioner 172 which regulates the supply voltage as seen by the processor 166 and monitors the voltage and generates a warning signal either directly or via the processor when the battery voltage falls to a predetermined value.

The power switch can be operated to allow power to the processor 166 by operation of one of four microswitches 174 located in the lock but not all shown in the drawings.

Microswitch A is closed by the insertion of a card.

Microswitch B is closed by rotating the handle 16 on the outside of the door (see Figure 1).

Microswitch C is closed by rotating the handle 26 in the inside of the door.

Microswitch D is closed by operation of the deadbolt 28 on the inside of the door.

The processor 166 receives data or input signals from various circuit elements.

Machine readable data stored on a card such as 124 (see Figure 5) typically in a magnetic stripe on the card, is converted into electrical pulses in response to relative movement of the card as it is inserted in or removed from (or both), a card reader 176. The electrical pulses are amplified and shaped by an amplifier 178 before being supplied to a data input, typically a serial input, 180 of the CPU 166.

Date and time data from a crystal controlled real time clock 182 is supplied to another data input 184 of CPU 166. Although not shown, a permanent connection is provided between the clock 182 and the battery 168 (or a separate battery (not shown) is provided) for powering the clock 182, so that the clock continues to operate even in sleep mode, and a real time signal can be obtained from the clock at all times. Control of the clock data can be gained by appropriate signals from the CPU 166, to enable the date and time data stored in the clock to be changed, for setting the clock on installation, or changing the time (for example at the beginning and ending of British Summer Time), or merely to allow the local clock time to be synchronised to an external time

source.

Electrical pulses obtained from the infra red sensor 138 (see Figure 1) provide a third input to the processor at 186, whereby data from the infra red transmitting element 150 of the hand held transceiver 140 (Figure 6) can be transmitted to the processor 166.

Electrical pulses generated by the LED infra red transmitter 136 (see Figure 1) in response to control signals from the processor 166 and LED driver 188 can be received by the infra red receiver 152 of the hand held unit 140 (Figure 6).

The LED driver 188 can additionally provide power for light emitting LED's 130, 132 and 134 (Figure 1) on the lock, which when actuated reveal the condition of the lock circuit, as hitherto described.

Data can be written to or read from an EPROM 190 by the processor via data path 192. Thus for example date, time and card identity data may be linked and stored to enable a history of access to the room.

Lastly the condition of microswitches 112, 114 (see Figure 4b) associated with the cams 108, 110 on the shaft 100, and driven in response to rotation of the motor 106 as hitherto describe, is conveyed to the CPU 166 via signal path 194.

Except when a card is inserted or the handle on the inside of the door is turned, the bulk of the circuit of Figure 9 is powered down into a so-called "sleep mode". Inserting a card 124 or turning the handle 26 activates CPU 166 via 170, 172. If the battery voltage is below a given threshold, power conditioner 172 generates an audible signal to warn the user that the battery should be replaced. The processor 166 may be programmed to only enable the audible alarm signal if a certain type of card is inserted (eg a maid's card) and not if a guest card has been inserted.

Insertion and removal of a card causes data on the card to be read by the card reader 176. This is decrypted by the CPU 166 and compared with data stored (typically during installation) in the EPROM 190, and with data and time data from the clock 182. If the CPU is able to validate the data from the card (eg the card is a guest card which has been encoded for use on the day and at the time concerned), the motor 106 is powered by a signal from CPU 166 along line 198 until switch 114 has been actuated by cam 110, indicating that cam 98 has been rotated to a position causing maximum downward displacement of pin section 82. As previously described with reference to Figures 4a and 4b, provided the outer handle 16 occupies its rest position so that shaft 42 occupies the position shown in Figure 4a, the lower pin 80 will thereby have entered the groove 44 in the shaft 42, so that subsequent rotation of handle 16 in an appropriate manner will rotate the housing 40 and therefore shaft 36 thereby withdrawing fingers 20 and allowing the door to be opened.

A microswitch (not shown) responsive to rotation of the outside door handle 16 and shaft 46 provides a further logic input from the CPU 166, causing power once

again to be supplied to the motor 106 to continue to rotate the cams 108, 110 until microswitch 112 is actuated by cam 98, denoting a complete 360° of rotation of cam 102 from its initial position when the card was first inserted. The pin 82 follows the surface of cam 98 and rises, leaving the way open for pin 80 to rise to its original position, in which it is disengaged from the groove 44 in the shaft 42, thereby disabling the outside handle and enabling the fingers 20 to spring out and cause the door to latch when it is closed.

If the data read from the card 124 cannot be validated (eg the date and/or time encoded on the card does not include the present date/time as read by the CPU 166 from the clock 182) then no power is supplied to the motor 106 and the pin 80 is not moved by cam 98 into driving engagement with the groove 44 in shaft 42, so that rotation of the handle 16 and shaft 42 is not transmitted to shaft 36 to thereby unlock 12. The door therefore remains locked.

Validation data causes CPU 166 to generate signals for 188 to activate the Green LED 130 to indicate that the door can be opened.

Deriving timing pulses from an on board clock or from the clock 182, CPU 166 also generates a second signal on line 198 (to simulate closing of microswitch 112) after a given period of time has elapsed from the actuation of the Green LED 130. The generation of the second signal by the CPU 166 also causes LED driver 188 to turn off the Green LED 130 and turn on Red LED 134, indicating that the door is once again locked and cannot be opened merely by rotating the handle 16. Typically the time out is of the order of a few seconds.

If the deadbolt has been engaged and the associated microswitch activated by rotating deadbolt knob 28 on the inside of the door, insertion of a card containing valid data will produce a different set of control signals from the CPU 166, so as to cause the Green LED 130 and the Red LED 134 to flash, thereby indicating that the deadbolt is across and the occupant(s) do not wish to be disturbed.

A second motor (not shown) or a solenoid (not shown) may be provided for releasing the deadbolt (not shown). In this event CPU 166 is programmed to generate a further control signal in the event that a further card (an emergency card) is subsequently inserted after the first, validated card, has been withdrawn. The purpose and function of the further control signal is such as to activate the deadbolt withdrawal motor/solenoid (not shown), to permit access to be gained to the room even though the occupant(s) had secured the door by means of the deadbolt.

A second set of LED's behind window 32 mimic the states of the LED's visible through window 30 on the front of the door.

The CPU 166 actuates the Red LED 134 as soon as it is powered up, indicating that access is desired. As soon as data is validated following insertion and removal of a card, the Red LED is extinguished and a second

LED signal is generated by CPU 166 and driver 188 to power the Green LED 184. This is extinguished after satisfactory operation of the lock. If time out occurs, the Green LED is extinguished and the Red is illuminated.

In order to conserve power, the LED's are powered by intermittent signals generated by the CPU 166 (or the driver 188) so that the LED's are caused to flash.

When a communicator, such as hand held unit 140 (Figure 6) is employed, data from the unit can be transmitted to or received from the CPU 166, and in particular control signals may be generated by the CPU 166 so as to power an infra red (IR) transmitter or an IR receiver on the inside of the door. By providing an IR sensor or IR transmitter at an appropriate position within the room to which the door gives access, the IR transmitter can transmit data to the IR detector on the inside of the door and thereby via the processor 166 to an IR transmitter on the outside of the door, to permit the signal to be transmitted "through the door" to a hand held unit, and vice versa. Thus lighting and temperature in the room and data relating thereto or controls affecting them be monitored and/or controlled, without opening the door, as previously described.

Figure 10 shows the essential circuit elements of the hand held communicator 140 (Figure 6) by which inter alia data can be inserted into the EPROM 190 (Figure 9) and/or the memory of processor 166, and by which data stored in the EPROM and/or processor can be retrieved.

As with the lock control system of Figure 9, the heart of the system is a microprocessor 198 and again a preferred type is a Hitachi Series H8 device, Type 320. Power is derived from an on-board battery 200 which may be a rechargeable type. Battery condition is monitored and supply voltage is regulated by conditioner 202 which supplies power to the CPU 198. A real-time clock 204 (which includes date and time and is similar to 182 in Figure 9) provides clock pulses and date and time data for the CPU 198.

The CPU 198 and the related circuitry is normally maintained in a powered-down or sleep mode. An on-off switch (not shown) may be provided to convert to operational mode, but more preferably the sleep mode is exited either as soon as a card is inserted into the slot 142 of a card reader 206 in the unit 140 (so actuating a microswitch 208), or whenever any one of the keys of the keypad 148 is depressed.

As with the card reader 176 (Figure 9) when a card is inserted and removed, the card data is read and decrypted by the CPU 198 and can be displayed in the LCD (or similar) display 146 (Figure 6) by entering appropriate instructions via the keypad 148 (shown diagrammatically in Figure 10).

The CPU 198 provides control signals for a display driver 210 for driving the LCD display 146 and additionally receives pulses from an infra red detector 152 and provides transmit pulses to the infra red transmitting device 150 (shown in Figure 7).

An EPROM memory 212 supplements any memory on the CPU 198.

By pointing the unit 140 towards a door lock such as shown in Figure 1, so that infra red light pulses transmitted by the transmitter 136 on the lock can be received by the detector/receiver 152 on the unit 140, so communication can be established between the unit and the lock. In this way the date and time information generated by the clock 182 in the lock system can be updated using the date and time data produced by the clock 204 on the unit 140. Likewise, data stored in the EPROM 190 can be read out and inserted on the EPROM 212 (or retained in the memory on board the CPU 198) of the unit 140.

When the encoder 156 (Figure 8) includes an infra red communication channel (as by an IR receiver and transmitter means on its front panel) the unit 140 can also communicate with the encoder 156, and thereby with the computer 158 associated therewith. Thus for example the clock 204 of unit 140 can itself be synchronised from a master clock in the encoder/computer 156/158, before being used to correct the date and time data of a lock system clock such as 182. Likewise data transferred from an EPROM in a lock (such as 190) to the EPROM 212 of the unit 140 can be transferred to the encoder 156 and/or computer 158 to enable a permanent record of a room access listing to be obtained as by printing out using a printer (not shown) linked to the computer 158.

The essential parts of the electrical circuits of the encoder unit 156 are shown in Figure 11. As with the lock system of Figure 9, the heart of the encoder is a microprocessor 214 and again a Hitachi Series H8 device Type 320 is preferred. A crystal controlled real-time clock 216 provides date and time data for CPU 214. This clock can serve as the master clock for the whole system since its date and time can be accessed by a hand held device 140 (as previously described) and the synchronised clock 204 on the hand held unit can be used to synchronise the clocks such as 182 in the locks.

Power for the encoder is typically derived from the electricity supply mains via an ON/OFF switch and filter 218. The alternating current is converted to an appropriate regulated DC supply by a PSU 220.

As well as supplying power to the CPU 214, PSU 220 also supplies power to a motor driven card reader/writer 222 the entrance slot to which is shown at 160 in Figure 8.

An EPROM memory 224 retains inter alia encrypting ciphers for encrypting data to be written to each card such as 162 (Figure 8) inserted into the slot 160. It may also retain data to provide screen prompts to the user for display on the screen of the computer 158, if not stored within the computer 158.

Data communication between the CPU 214 and the computer 158 is by way of a serial RS232 link 226.

Data communication with a hand held unit 140 is achieved by an IR link by means of an IR transmitter unit 228 and IR receiver 130 connected to the CPU 214 via

path 132. Signals for driving the IR LED in the transmitter 228 are obtained from an LED driver 234 which derives its control signals from the CPU 214 and also serves to power status indicating LED's 236, 238, on the front panel of the encoder but not shown in Figure 8. LED 236 indicates when power is ON and LED 238 when a card is being coded.

Card data to be written to a card is most conveniently stored and/or generated within the host computer 158 (Figure 8) and transmitted to the CPU 214 via the RS232 link 226. The data from 226 is encrypted by CPU 214 using data from EPROM 224. The encrypted data may be buffered by the CPU memory before being transmitted to the card writer 222.

Data received from a hand held unit 140 relating for example to the access listing of one or more locks in a system, may be transferred via CPU 214 to the computer 158 for display on the computer screen or printing out by a printer (not shown).

Claims

1. A card releasable mechanism (14) for use in combination with a mortice lock (12) associated with a door (10) which lock (12) is openable by rotating a drive shaft (36) which extends therethrough, the mechanism comprising a second shaft (34) separate from but aligned axially with the lock drive shaft (36), which second shaft (34) protrudes through a front plate (50) on the outside of the door (10) to enable a handle (16) to be mounted thereon, rotation of which will if authorised release the lock (12) and allow the door (10) to be opened; clutch means (40) which, when engaged, transmits drive between the said second shaft (34) and the drive shaft (36) but when disengaged prevents rotation of the second shaft (34) from being transmitted to the drive shaft (36); a card reader (176), adapted to derive information from coded data carried by a card (124) inserted therein; decoding logic circuit means (122) for generating control signals if data received by the card reader satisfies pre-programmed conditions; and a clutch actuator (98, 100, 106) for operating said clutch means (40) in response to appropriately generated control signals to enable the lock (12) to be unlocked and the door (10) opened after the insertion of an appropriate card (124) into the card reader (176); characterised in that the clutch actuator (40) comprises an electric motor (106) and a drive transmission member (80) which is moveable relative to the second shaft (34), the electric motor (106) being adapted to rotate a cam (98) between a first position and a second position, movement of the cam from the first to the second said position effecting movement of the drive transmission member (80) from a rest position in which the clutch means (40) is disengaged into a drive transmitting position in which said drive transmission member (80) engages the second shaft (34) so as to enable drive to be transmitted between the two shafts and in that the cam (98) is mechanically connected to the drive transmission member (80) via a lost motion connection (82, 96) which is adapted to accommodate sufficient relative motion between the cam (98) and the drive transmission member (80) to enable the cam (98) to be moved from said first to said second position even if the drive transmission member (80) is misaligned and thereby prevented from moving into its drive transmitting position.
2. A mechanism as claimed in claim 1, wherein the clutch means (40) provides a positive drive between the two shafts so that when the clutch is engaged no slip can occur.
3. A mechanism as claimed in claim 2, wherein spring means is provided to retract the drive transmission member (80) when the clutch actuator (98, 100, 106) is deactivated.
4. A mechanism as claimed in claim 3, wherein the clutch actuator (106) is adapted to operate and move the drive transmission member (80) into the drive transmitting position in response to a short duration pulse of electrical energy from the circuit means (122) and mechanical means is included which maintains the drive transmission member (80) in the drive transmitting position until a second short duration pulse of electrical energy is applied to the clutch actuator (98, 100, 106) to enable the member (80) to be retracted.
5. A mechanism as claimed in claim 4, wherein the period of time between the generation of the first pulse and the second pulse is controllable.
6. A mechanism as claimed in claim 5, wherein the circuit means is arranged to receive data regarding said control from a card (124) to be inserted into the card reader (176), whereby the door lock (12) can be left enabled so that the door can be opened, without the need to insert a card, for a period of time.
7. A mechanism as claimed in any of claims 4 to 6 wherein switch means is provided which is arranged to be actuated only when the lock (12) has been fully retracted to permit the door to be opened, which switch means causes a said second pulse to be generated thereby to enable the drive transmission member (80) to revert to its rest position, and thus to disengage the clutch means (40) so that when the door (10) has been shut, the lock (12) is once again incapable of being operated from outside the room.

8. A mechanism as claimed in claim 7, wherein timing means (160) is included which is operable to generate a second pulse a short period of time after the first pulse has been generated in the event that the said switch means has not been actuated. 5
9. A mechanism as claimed in claim 8, wherein the said short period of time is chosen as being the period of time which will normally be required to turn the handle and open the door (10). 10
10. A mechanism as claimed in claim 1, wherein the circuit means (122) for generating the electrical signals for operating the clutch actuator (98, 100, 106) is adapted not to produce the clutch actuating signals until after the card (124) has been removed from the card reader (174). 15
11. A mechanism as claimed in any of claims 1 to 10, wherein the drive transmission member (80) is formed from non-magnetic material so that it is not possible for the latter to be moved under the influence of an external magnetic field. 20
12. A mechanism as claimed in any of claims 1 to 11, wherein the cam (98) is rotatable through approximately 180° so as to push the transmission member, by camming action, into its drive transmitting position, and the transmission member comprises a pin (80) which, when in its drive transmitting position, engages a slot in the second shaft (34) so as to provide driving engagement between the shaft and the pin; and the cam is rotatable through a further angle of 180° so as to enable the clutch means (40) to be disengaged. 25 30 35
13. A mechanism as claimed in claim 12, wherein spring means (94) acts on the pin (80) in a direction to maintain contact with the cam (98) and the lost motion connection (82, 96) is arranged to accommodate the whole of the axial movement of the cam (98) relative to the pin (80). 40
14. A mechanism as claimed in any of the preceding claims, wherein the cam (98) is non-symmetrical and is so shaped that the part of the cam which is operable to produce the movement of the pin (80) into the drive transmitting position corresponds to an inclined plane which subtends a small angle and that part which enables the pin (80) to return to its rest position corresponds to a very steeply inclined plane which subtends an angle approaching 90° whereby the time required to move the pin (80) from the drive transmitting to the rest position is much less than that required to move the pin (80) into the drive transmitting position from the rest position. 45 50 55
15. A mechanism as claimed in any of claims 12 to 14, wherein the electric motor (106) is connected to the cam via transmission means comprising a worm and spur gear (102, 104) with the worm (104) driven directly by the electric motor (106) so as to exclude movement of the cam when the motor is stopped.
16. A mechanism as claimed in any of claims 1 to 15, wherein the release mechanism (14) includes a display containing differently coloured lamps such as light emitting diodes and the circuit means (122) is adapted to generate further control signals which cause the lamps to be illuminated depending on the state of the mechanism.
17. A mechanism as claimed in claim 16, wherein one of the lamps is green, and the circuit means is operable to cause the green lamp to flash after a card has been inserted and read and removed and the lock released and to cause said flashing to continue either for a pre-determined short time or until such time as the door has been opened.
18. A mechanism as claimed in claim 17, wherein the lamps include a red lamp, and the circuit means (122) is operable to cause the red lamp to flash if the door (10) has not been opened within a prescribed period of time after the card has been removed.
19. A mechanism as claimed in any of claims 16 to 18, wherein the circuit means (122) which is supplied with signals from the card reader (176) is programmed so as to distinguish between a plurality of different cards and following the insertion (and removal) of one type of card is adapted to cause the green light emitting diode to flash at least on the inside of the door (10) but to inhibit at that time the generation of a signal for engaging the clutch, and the card reader is programmed to generate a clutch engaging signal after the same card has been inserted and removed a second time.
20. A mechanism as claimed in any of claims 16 to 19, wherein the circuit means is operable to activate a buzzer or other warning device when generating said further control signals so an occupant of a room to which the door is fitted can be alerted to the fact that somebody wishes to gain entry.
21. A mechanism (14) as claimed in claim 19 or 20 wherein said associated door (10) is provided with a dead bolt (22) and electrically powered drive means for advancing and retracting the said dead bolt (22), the signal which causes the green lamp to flash is also used to enable the drive to the dead bolt so as to cause the latter to engage and thereby secure the door (10) against entry.

22. A mechanism as claimed in claim 21, wherein a further clutch is provided between the external handle (16) and the deadbolt (22), which when actuated enables the deadbolt (22) to be retracted on rotation of the handle.

Patentansprüche

1. Per Karte auslösbarer Mechanismus (14) zur Benutzung in Verbindung mit Einstemmschloß (12) mit zugehöriger Tür (10), welches sich durch Drehen einer durch das Schloß verlaufenden Antriebswelle (36) öffnen läßt, wobei der Mechanismus eine zweite Welle (34) umfaßt, die zwar von der Schloßantriebswelle (36) getrennt jedoch axial mit ihr ausgerichtet ist und aus einer Frontplatte (50) an der Außenseite der Tür (10) vortritt, so daß ein Griff (16) daran montiert werden kann, der durch Drehung - falls bewilligt - das Schloß (12) öffnet und das Öffnen der Tür (10) gestattet; Kupplungsvorrichtung (40), welche in eingerücktem Zustand die Antriebskraft zwischen besagter zweiter Welle (34) und Antriebswelle (36) überträgt, hingegen in ausgerücktem Zustand die Übertragung der Drehung der zweiten Welle (34) auf die Antriebswelle (36) verhindert; ein Kartenleser (176), entsprechend adaptiert, um Informationen aus codierten Daten abzuleiten, die sich auf einer in ihn eingesteckten Karte (124) befinden; Vorrichtung mit Decodierlogikschaltung (122) zur Erzeugung von Steuersignalen, wenn die vom Kartenleser empfangenen Daten die vorprogrammierten Bedingungen erfüllen; außerdem ein Kupplungsstellglied (98, 100, 106) zur Bedienung besagter Kupplungsvorrichtung (40) bei Empfang entsprechend erzeugter Steuersignale, um das Schloß (12) und die Tür (10) nach Einstecken einer passenden Karte (124) in den Kartenleser (176) öffnen zu können; kennzeichnet sich dadurch, daß das Kupplungsstellglied (40) einen Elektromotor (106) und ein Antriebskraftübertragungsglied umfaßt (80), das im Verhältnis zur zweiten Welle (34) beweglich ist, wobei der Elektromotor (106) adaptiert ist, um einen Nocken (98) zwischen einer ersten und einer zweiten Position hin- und herzubewegen und die Bewegung des Nockens von der ersten auf die zweite besagte Position die Bewegung des Antriebskraftübertragungsglieds (80) von einer Ruheposition, bei der die Kupplungsvorrichtung (40) ausgerückt ist, auf eine antriebskraftübertragende Position, bei der besagtes Antriebskraftübertragungsglied (80) die zweite Welle (34) einrückt, bewirkt, so daß die Übertragung des Antriebs zwischen den beiden Wellen ermöglicht wird; kennzeichnet sich ferner dadurch, daß der Nocken (98) über eine Leerlaufverbindung (82, 96) mechanisch mit dem Antriebskraftübertragungsglied (80) verbunden ist, die adaptiert ist, um ein ausreichendes

Maß an relativer Bewegung zwischen dem Nocken (98) und dem Antriebskraftübertragungsglied (80) zuzulassen, damit der Nocken (98) von besagter erster auf besagte zweite Position bewegt werden kann, selbst dann, wenn das Antriebskraftübertragungsglied (80) schlecht ausgerichtet ist und dadurch daran gehindert wird, sich auf seine antriebskraftübertragende Position zu bewegen.

2. Mechanismus wie unter Patentanspruch 1, worin die Kupplungsvorrichtung (40) für einen positiven Antrieb zwischen den beiden Wellen sorgt, so daß bei eingerückter Kupplung kein Schlupf auftreten kann.
3. Mechanismus wie unter Patentanspruch 2, worin Federvorrichtung eingebaut ist, um Antriebskraftübertragungsglied (80) einzufahren, wenn das Kupplungsstellglied (98, 100, 106) ausgeschaltet wird.
4. Mechanismus wie unter Patentanspruch 3, worin das Kupplungsstellglied (106) adaptiert ist, um das Antriebskraftübertragungsglied (80) zu bedienen und auf die antriebskraftübertragende Position zu bewegen, wenn ein kurzer Stromimpuls von der Schaltungsvorrichtung (122) empfangen wird; worin außerdem eine mechanische Vorrichtung eingeschlossen ist, die das Antriebskraftübertragungsglied (80) auf der antriebskraftübertragenden Position hält, bis ein weiterer kurzer Stromimpuls an das Kupplungsstellglied (98, 100, 106) angelegt wird, um das Einfahren des Kraftübertragungsglieds (80) zu ermöglichen.
5. Mechanismus wie unter Patentanspruch 4, worin der Zeitraum zwischen der Erzeugung des ersten Impulses und des zweiten Impulses steuerbar ist.
6. Mechanismus wie unter Patentanspruch 5, worin die Schaltungsvorrichtung so eingerichtet ist, daß die Daten in bezug auf besagte Steuerung von einer Karte (124) empfangen werden können, die in den Kartenleser (176) einzustecken ist, wodurch das Türschloß (12) im Freigabezustand belassen werden kann, so daß die Tür sich eine bestimmte Zeit lang öffnen läßt, ohne eine Karte einstecken zu müssen.
7. Mechanismus wie unter jedem beliebigen der Patentansprüche 4 bis 6, worin Schaltervorrichtung vorhanden ist, die so eingerichtet ist, daß sie nur dann betätigt werden kann, wenn das Schloß (12) ganz eingefahren ist, um die Tür öffnen zu können. Die Schaltervorrichtung verursacht die Erzeugung besagten zweiten Impulses, wodurch es dem Antriebskraftübertragungsglied (80) ermöglicht wird, auf seine Ruhestellung zurückzukehren und somit

die Kupplungsvorrichtung (40) auszurücken, so daß das Schloß (12), nachdem die Tür (10) geschlossen worden ist, wiederum nicht von außerhalb des Zimmers betätigt werden kann.

8. Mechanismus wie unter Patentanspruch 7, worin Zeitschaltvorrichtung (160) eingeschlossen ist, die sich einsetzen läßt, um einen zweiten Impuls kurze Zeit nach der Erzeugung des ersten Impulses zu erzeugen, für den Fall, daß besagte Schaltervorrichtung nicht betätigt worden ist.

9. Mechanismus wie unter Patentanspruch 8, worin besagte kurze Zeit als die normalerweise zum Drehen des Griffes und Öffnen der Tür (10) benötigte Zeit gewählt wird.

10. Mechanismus wie unter Patentanspruch 1, worin die Schaltungsvorrichtung (122) zur Erzeugung des elektrischen Signals für die Bedienung des Kupplungsstellglieds (98, 100, 106) adaptiert ist, um die Signale zur Kupplungsbetätigung erst zu erzeugen, nachdem die Karte (124) aus dem Kartenleser (174) herausgezogen worden ist.

11. Mechanismus wie unter jedem beliebigen der Patentansprüche 1 bis 10, worin das Antriebskraftübertragungsglied (80) aus einem unmagnetischen Material besteht, so daß letzteres nicht durch Einwirkung eines äußeren magnetischen Feldes bewegt werden kann.

12. Mechanismus wie unter jedem beliebigen der Patentansprüche 1 bis 11, worin der Nocken (98) um ca. 180° drehbar ist, um das Kraftübertragungsglied durch Nockenwirkungsweise auf seine antriebskraftübertragende Position zu schieben; worin ferner das Kraftübertragungsglied einen Stift (80) umfaßt, der, wenn er sich auf seiner antriebskraftübertragenden Position befindet, in einen Schlitz in der zweiten Welle (34) einrückt, um für den Antriebseingriff zwischen Welle und Stift zu sorgen; worin der Nocken außerdem um weitere 180° drehbar ist, so daß ein Ausrücken der Kupplungsvorrichtung ermöglicht wird.

13. Mechanismus wie unter Patentanspruch 12, worin Federvorrichtung (94) auf den Stift (80) in eine Richtung wirkt, um den Kontakt mit dem Nocken (98) aufrechtzuerhalten, und worin die Leerlaufverbindung (82, 96) so angeordnet ist, daß sie die gesamte Axialbewegung des Nockens (98) im Verhältnis zum Stift (80) zuläßt.

14. Mechanismus wie unter jedem beliebigen der vorherigen Patentansprüche, worin der Nocken (98) unsymmetrisch ist und so geformt ist, daß der Teil des Nockens, der so bedienbar ist, daß die Bewe-

gung des Stiftes (80) auf die antriebskraftübertragende Position erzeugt werden kann, einer einem kleinen Winkel gegenüberliegenden geneigten Ebene entspricht, und der Teil, der es dem Stift (80) erlaubt, auf seine Ruheposition zurückzukehren, einer sehr stark geneigten Ebene entspricht, die einem an 90° angrenzenden Winkel gegenüberliegt, wodurch bewirkt wird, daß die zur Bewegung des Stiftes (80) von der antriebskraftübertragenden Position auf die Ruheposition benötigte Zeit viel kürzer ist als die, die zur Bewegung des Stiftes (80) von der Ruheposition auf die antriebskraftübertragende Position benötigt wird.

15. Mechanismus wie unter jedem beliebigen der Patentansprüche 12 bis 14, worin der Elektromotor (106) über eine Kraftübertragungsvorrichtung mit dem Nocken verbunden ist, die aus einem Schnecken- und Stirnrädergetriebe (102, 104) besteht, wobei die Schnecke (104) direkt durch den Elektromotor (106) angetrieben wird, um eine Bewegung des Nockens bei ausgeschaltetem Motor auszuschließen.

16. Mechanismus wie unter jedem beliebigen der Patentansprüche 1 bis 15, worin der Freigabemechanismus (14) eine Anzeige umfaßt, die verschiedenfarbige Lämpchen, zum Beispiel LED-Dioden, enthält, worin die Schaltungsvorrichtung (122) außerdem adaptiert ist, um zusätzliche Steuersignale zu erzeugen, die ein Aufleuchten der Lämpchen je nach Zustand des Mechanismus verursachen.

17. Mechanismus wie unter Patentanspruch 16, worin eines der Lämpchen grün ist und sich die Schaltungsvorrichtung so bedienen läßt, daß ein Blinken des grünen Lämpchens nach Einstecken, Lesen und Herausziehen einer Karte sowie nach Freigabe des Schlosses verursacht wird, und außerdem bewirkt wird, daß besagtes Blinken entweder eine festgelegte kurze Zeit oder bis zu dem Augenblick, in dem die Tür geöffnet wird, andauert.

18. Mechanismus wie unter Patentanspruch 17, worin eines der Lämpchen rot ist und sich die Schaltungsvorrichtung (122) so bedienen läßt, daß ein Blinken des roten Lämpchens verursacht wird, wenn die Tür (10) nicht innerhalb einer vorgeschriebenen Zeit nach Herausziehen der Karte geöffnet worden ist.

19. Mechanismus wie unter jedem beliebigen der Patentansprüche 16 bis 18, worin die Schaltungsvorrichtung (122), die mit Signalen vom Kartenleser (176) versorgt wird, so programmiert ist, daß sie zwischen einer Vielfalt verschiedener Karten unterscheidet; worin sie außerdem nach Einstecken (und Registrierung) eines bestimmten Kartentyps adaptiert wird, um ein Blinken der grünen LED-Diode

mindestens auf der Innenseite der Tür (10) zu bewirken, jedoch in diesem Augenblick die Erzeugung eines Signals zum Einrücken der Kupplung zu verzögern; und worin der Kartenleser schließlich programmiert ist, um ein Signal zum Einrücken der Kupplung zu erzeugen, nachdem dieselbe Karte ein zweites Mal eingesteckt und herausgezogen worden ist.

20. Mechanismus wie unter jedem beliebigen der Patentansprüche 16 bis 19, worin sich die Schaltungsvorrichtung so bedienen läßt, daß ein Summer oder sonstiges Warngerät betätigt wird, wenn besagte Zusatzsteuersignale erzeugt werden, so daß die Person, die sich im Zimmer befindet, zu dem die Tür führt, gewarnt werden kann, daß jemand einzutreten sucht.

21. Mechanismus (14) wie unter Patentanspruch 19 oder 20, worin besagte zugehörige Tür (10) mit einem stehenden Riegel (22) und elektrisch gespeister Antriebsvorrichtung zum Vorschieben und Einfahren besagten stehenden Riegels (22) ausgestattet ist; worin das Signal, das ein Blinken des grünen Lämpchens verursacht, außerdem auch eingesetzt wird, um den Antrieb für den stehenden Riegel freizugeben, so daß letzterer einfällt und die Tür (10) dadurch gegen den Zutritt sichert.

22. Mechanismus wie unter Patentanspruch 21, worin eine weitere Kupplung zwischen dem äußeren Griff (16) und dem stehenden Riegel (22) eingebaut ist, die bei ihrer Betätigung das Einziehen des stehenden Riegels (22) durch Drehung des Griffes ermöglicht.

Revendications

1. Un mécanisme déclenché par carte (14) à utiliser en combinaison avec une serrure encastrée (12) associée à une porte (10) dont la serrure (12) s'ouvre par rotation d'un arbre de transmission (36), le mécanisme comportant un deuxième arbre (34) séparé, mais aligné dans l'axe de l'arbre de transmission de la serrure (36), ce deuxième arbre (34) faisant saillie sur une plaque avant (50) à l'extérieur de la porte (10) afin de permettre à une poignée (16) d'être montée dessus et dont la rotation, lorsqu'elle est autorisée, déclenche la serrure (12) et permet à la porte (10) de s'ouvrir; un système d'embrayage (40) qui, lorsqu'il est embrayé, transmet l'entraînement entre ledit deuxième arbre (34) et l'arbre de transmission (36) mais qui, lorsqu'il est désembrayé, empêche la rotation du deuxième arbre (34) d'être transmise à l'arbre de transmission (36); un lecteur de carte (176) pouvant lire l'information des données codées portées par une carte (124) intro-

duite dans le mécanisme; un dispositif de décodage de circuit logique (122) pour la production de signaux de contrôle lorsque les données reçues par le lecteur de carte remplissent de conditions programmées à l'avance; et un servomoteur d'embrayage (98, 100, 106) pour faire fonctionner le système d'embrayage (40) en réponse à des signaux de contrôle produits de façon appropriée afin de permettre le déclenchement de la serrure (12) et l'ouverture de la porte (10) après l'introduction de la carte (124) appropriée dans le lecteur de carte (176); caractérisé par le fait que le système d'embrayage (40) comporte un moteur électrique (106) et une pièce de transmission de commande (80) qui est mobile par rapport au deuxième arbre (34), le moteur électrique (106) étant conçu de manière à tourner une came d'une première à une deuxième position, entraînant le mouvement de la pièce de transmission de commande (80) d'une position de repos dans laquelle le système d'embrayage (40) est désembrayé à une position de transmission de commande dans laquelle la pièce de transmission de commande (80) s'embraye dans le deuxième arbre (34) de manière à permettre à l'entraînement d'être transmis entre les deux arbres et par le fait que la came (98) est mécaniquement raccordée à la pièce de transmission de commande (80) par une connexion à mouvement à vide (82, 96) qui peut recevoir un mouvement relatif entre la came (98) et la pièce de transmission de commande (80) suffisant pour permettre à la came (98) d'être déplacée de la première à la deuxième position, même si la pièce de transmission de commande (80) n'est pas alignée, et donc incapable de se déplacer dans sa position de transmission de commande.

2. Un mécanisme tel que décrit dans la revendication 1, dans lequel le système d'embrayage (40) produit un entraînement positif entre les deux arbres, de manière à éviter tout glissement lors de l'embrayage.

3. Un mécanisme tel que décrit dans la revendication 2, dans lequel un ressort permet de rétracter la pièce de transmission de commande (80) lorsque le servomoteur d'embrayage (98, 100, 106) est désactivé.

4. Un mécanisme tel que décrit dans la revendication 3, dans lequel le servomoteur d'embrayage (106) déplace la pièce de transmission de commande (80) en position de transmission de commande en réponse à une impulsion électrique de courte durée en provenance du circuit (122) et dans lequel se trouve un dispositif mécanique qui maintient la pièce de transmission de commande (80) en position de transmission de commande jusqu'à l'application d'une seconde impulsion électrique de courte durée

sur le servomoteur d'embrayage (98, 100, 106) afin de rétracter la pièce de transmission de commande (80).

5. Un mécanisme tel que décrit dans la revendication 4, dans lequel le laps de temps entre la première impulsion et la deuxième impulsion est contrôlable. 5
6. Un mécanisme tel que décrit dans la revendication 5, dans lequel le circuit reçoit des instructions de contrôle d'une carte (124) à introduire dans le lecteur de carte (176), selon lesquelles la serrure de la porte (12) peut être désenclenchée de manière à permettre l'ouverture de la porte, sans avoir besoin d'introduire de carte, pendant un laps de temps déterminé. 10
7. Un mécanisme tel que décrit dans les revendications 4 à 6, dans lequel est fourni un commutateur pouvant être actionné uniquement lorsque la serrure (12) a été entièrement rétractée afin de permettre l'ouverture la porte, ce commutateur provoquant une deuxième impulsion permettant à la pièce de transmission de commande (80) de retourner en position de repos et donc de désempayer le système d'embrayage (40) de manière à ce que, une fois que la porte (10) est fermée, la serrure (12) ne puisse à nouveau être ouverte de l'extérieur. 20
8. Un mécanisme tel que décrit dans la revendication 7, dans lequel une minuterie (160) produit une deuxième impulsion peu de temps après la première impulsion au cas où le système d'embrayage n'ait pas été embrayé. 25
9. Un mécanisme tel que décrit dans la revendication 8, dans lequel ledit court laps de temps est sélectionné comme le laps de temps qui sera généralement requis pour tourner la poignée et ouvrir la porte (10). 30
10. Un mécanisme tel que décrit dans la revendication 1, dans lequel le circuit (122) produisant les signaux électriques pour le fonctionnement du servomoteur d'embrayage (98, 100, 106) est adapté de manière à ne produire les signaux d'entraînement d'embrayage qu'une fois que la carte (124) a été retirée du lecteur de carte (174). 35
11. Un mécanisme tel que décrit dans les revendications 1 à 10, dans lequel la pièce de transmission de commande (80) est non-magnétique afin d'éviter qu'elle soit déplacée sous l'influence d'un champ magnétique extérieur. 40
12. Un mécanisme tel que décrit dans les revendications 1 à 11, dans lequel la came (98) subit une rotation d'environ 180° pour pousser la pièce de 45

transmission, par l'action de la came, en position de transmission de commande, et la pièce de transmission comporte une broche (80) qui, lorsqu'elle est en position de transmission de commande, s'engrène dans le deuxième arbre (34) de manière à fournir une prise entre l'arbre et la broche; et la came peut subir une rotation supplémentaire de 180° afin de permettre le désempayer du système d'embrayage (40).

13. Un mécanisme tel que décrit dans la revendication 12, dans lequel le ressort (94) agit sur la broche (80) dans une direction afin de maintenir le contact avec la came (98) et la connexion à mouvement à vide (82, 96) peut recevoir la totalité du mouvement axial de la came (98) par rapport à la broche (80).
14. Un mécanisme tel que décrit dans les revendications précédentes, dans lequel la came (98) est asymétrique et d'une forme telle que la partie de la came produisant le déplacement de la broche (80) en position de transmission de commande correspond à un plan incliné sous-tendant un petit angle et que la partie permettant à la broche (80) de retourner en position de repos correspond à un plan très incliné sous-tendant un angle de presque 90°, de manière à ce que le temps requis pour déplacer la broche (80) de la position de transmission de commande à la position de repos soit bien inférieur à celui requis pour déplacer la broche (80) en position de transmission de commande à partir de la position de repos.
15. Un mécanisme tel que décrit dans les revendications 12 à 14, dans lequel le moteur électrique (106) est relié à la came par un mécanisme de transmission comportant une transmission à vis sans fin et engrenage droit (102, 104) dont la vis sans fin (104) est entraînée directement par le moteur électrique (106), de manière à exclure le mouvement de la came lorsque le moteur est arrêté.
16. Un mécanisme tel que décrit dans les revendications 1 à 15, dans lequel le mécanisme de déclenchement (14) comporte un affichage contenant des voyants de diverses couleurs, tels que des DEL, et le circuit (122) peut produire des signaux de commande supplémentaires qui font s'allumer les voyants en fonction de l'état du mécanisme.
17. Un mécanisme tel que décrit dans la revendication 16, dans lequel l'un des voyants est vert et le circuit (122) fait clignoter le voyant vert après que la carte ait été introduite, lue et retirée et que la serrure ait été déclenchée, et fait continuer ledit clignotement pendant un laps de temps déterminé à l'avance ou jusqu'à ce que la porte soit ouverte.

18. Un mécanisme tel que décrit dans la revendication 17, dans lequel l'un des voyants est rouge et le circuit (122) fait clignoter le voyant rouge si la porte n'a pas été ouverte au bout d'un laps de temps donné après le retrait de la carte. 5
19. Un mécanisme tel que décrit dans les revendications 16 à 18, dans lequel le circuit (122) alimenté par les signaux du lecteur de carte (176) est programmé de manière à faire la distinction entre une pluralité de cartes différentes et, à la suite de l'introduction (et de la lecture) d'un type de carte, fait clignoter la DEL verte au moins à l'intérieur de la porte (10) mais empêche dans le même temps la production d'un signal d'embrayage, et le lecteur de carte est programmé de manière à produire un signal d'embrayage après que la même carte ait été introduite et retirée une deuxième fois. 10 15
20. Un mécanisme tel que décrit dans les revendications 16 à 19, dans lequel le circuit peut activer un signal sonore ou tout autre dispositif d'avertissement lorsqu'il produit lesdits signaux de contrôle supplémentaires, afin d'alerter l'occupant de la chambre équipée de la porte que quelqu'un essaye de rentrer. 20 25
21. Un mécanisme (14) tel que décrit dans les revendications 19 ou 20, dans lequel ladite porte associée (10) est livrée avec un pêne dormant (22) et un système de transmission électrique pour l'enclenchement et le désenclenchement dudit pêne dormant (22), le signal faisant clignoter le voyant vert permettant également d'actionner le pêne dormant de manière à le faire s'enclencher, et donc à empêcher l'ouverture de la porte (10). 30 35
22. Un mécanisme tel que décrit dans la revendication 21, dans lequel un embrayage supplémentaire est fourni entre la poignée extérieure (16) et le pêne dormant (22) qui, lorsqu'il est embrayé, permet au pêne dormant (22) de se rétracter lors de la rotation de la poignée. 40

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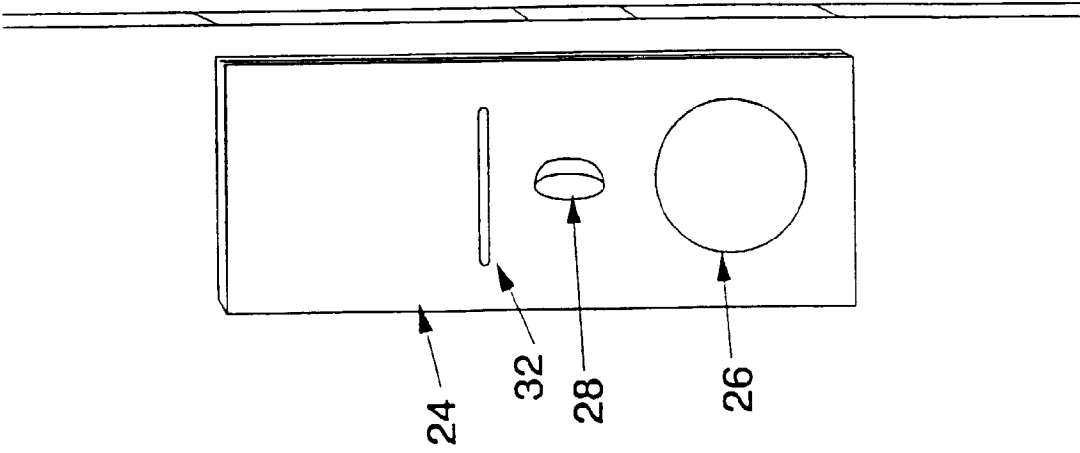


Figure 2

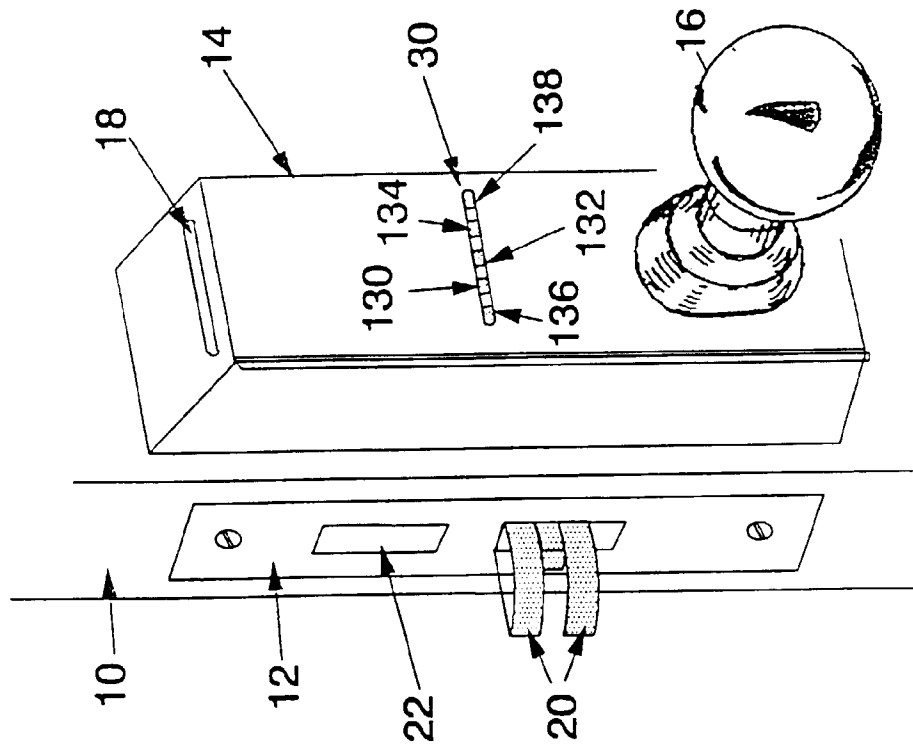


Figure 1

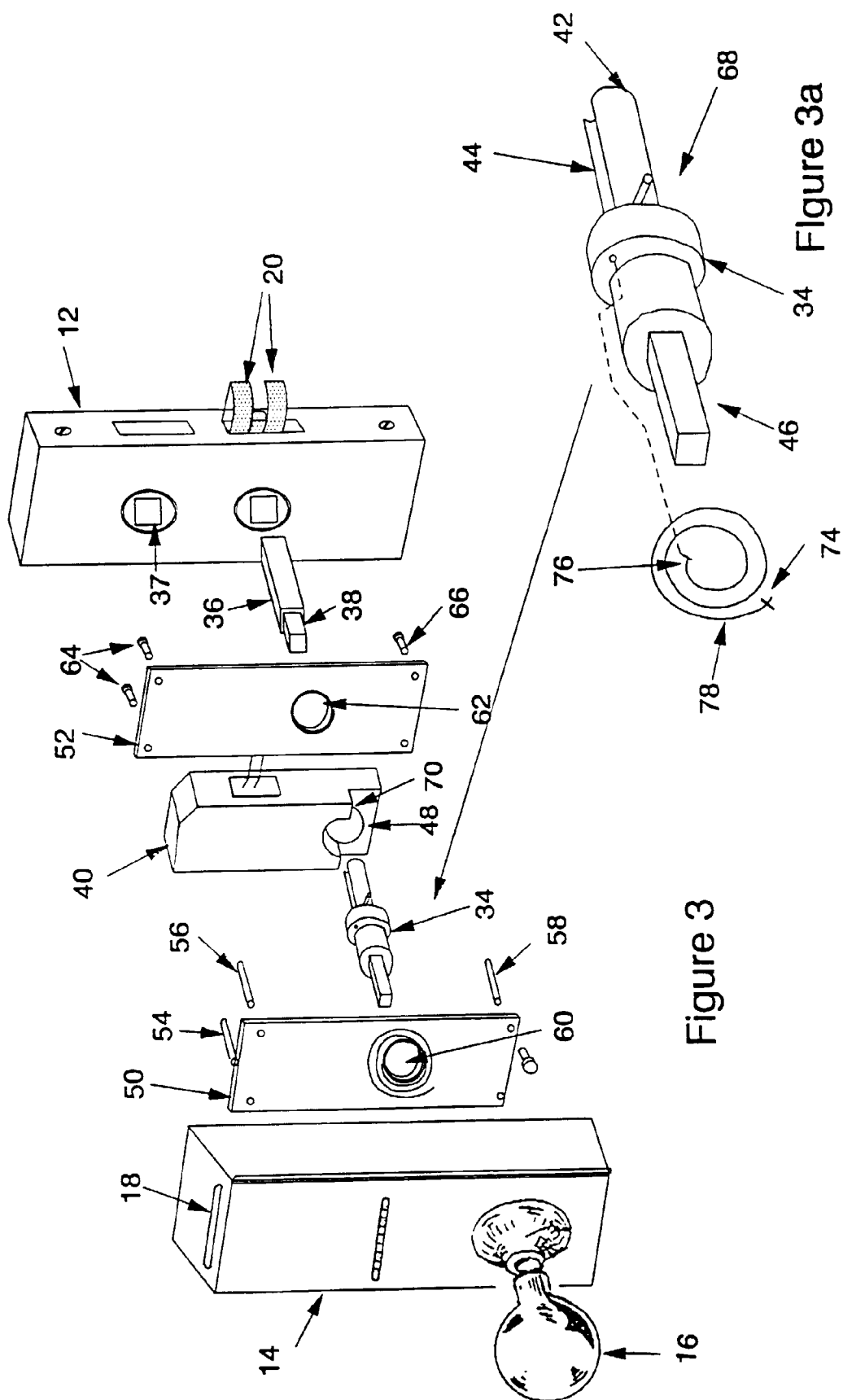


Figure 3

Figure 3a

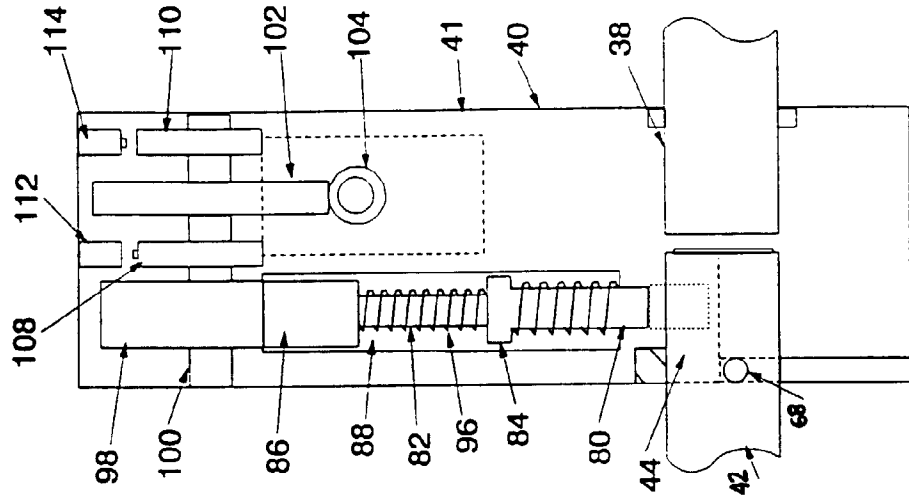


Figure 4b

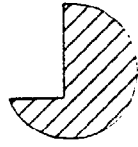


Figure 4c



Figure 4d

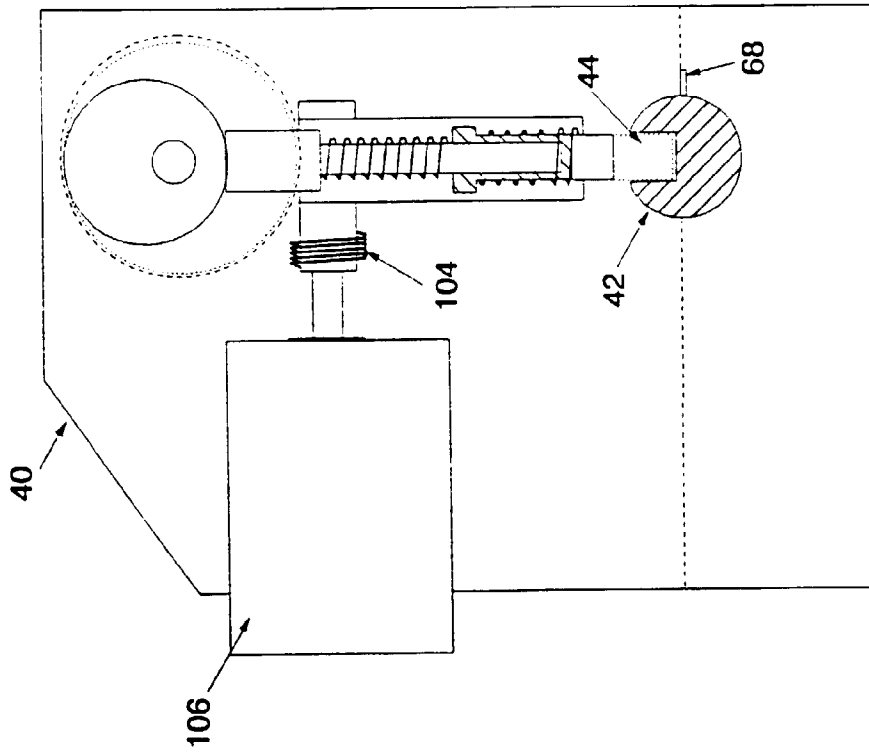


Figure 4a

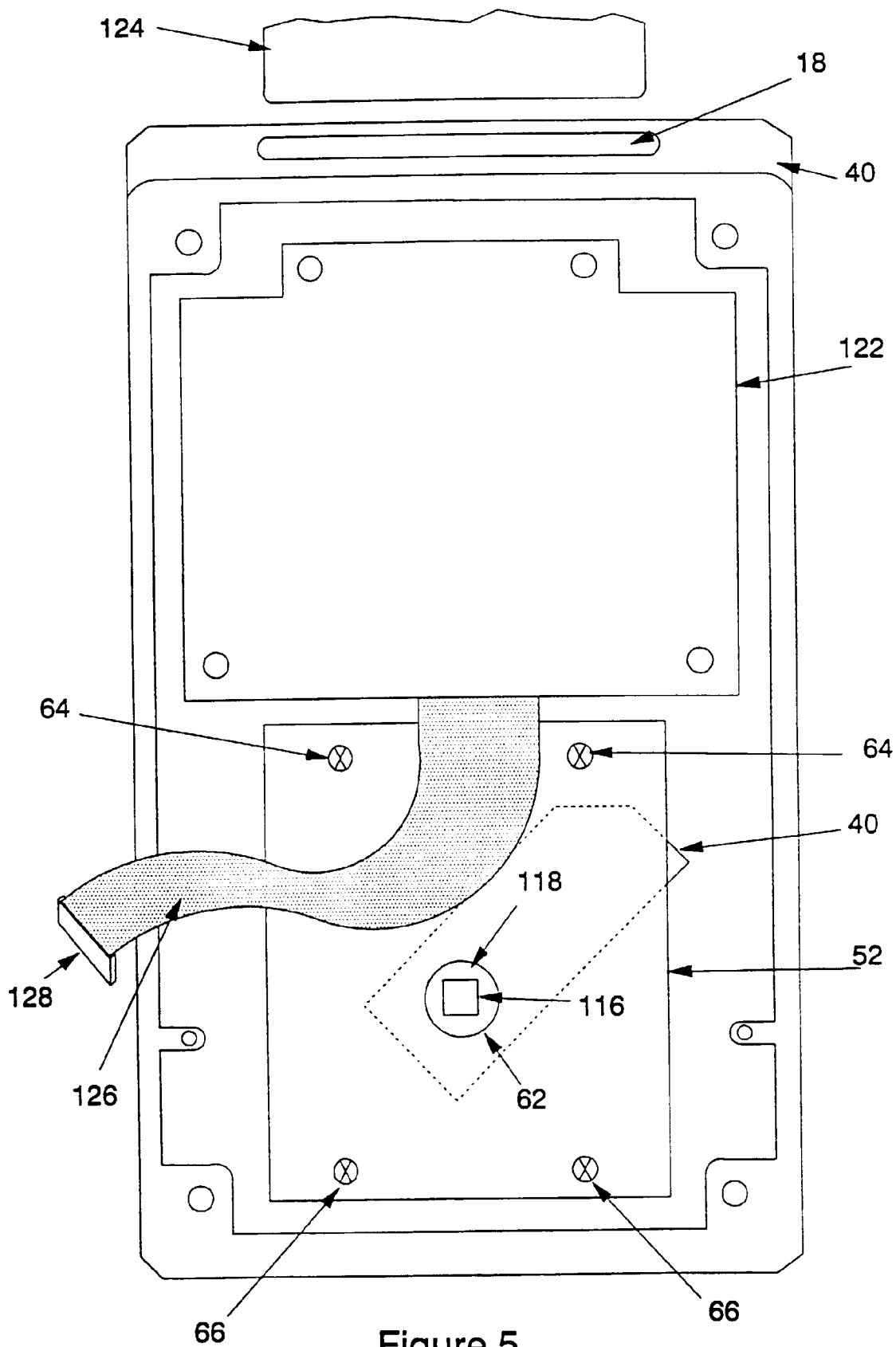


Figure 5

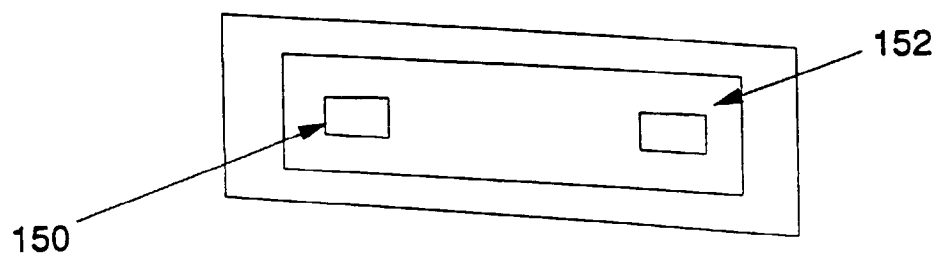


Figure 7

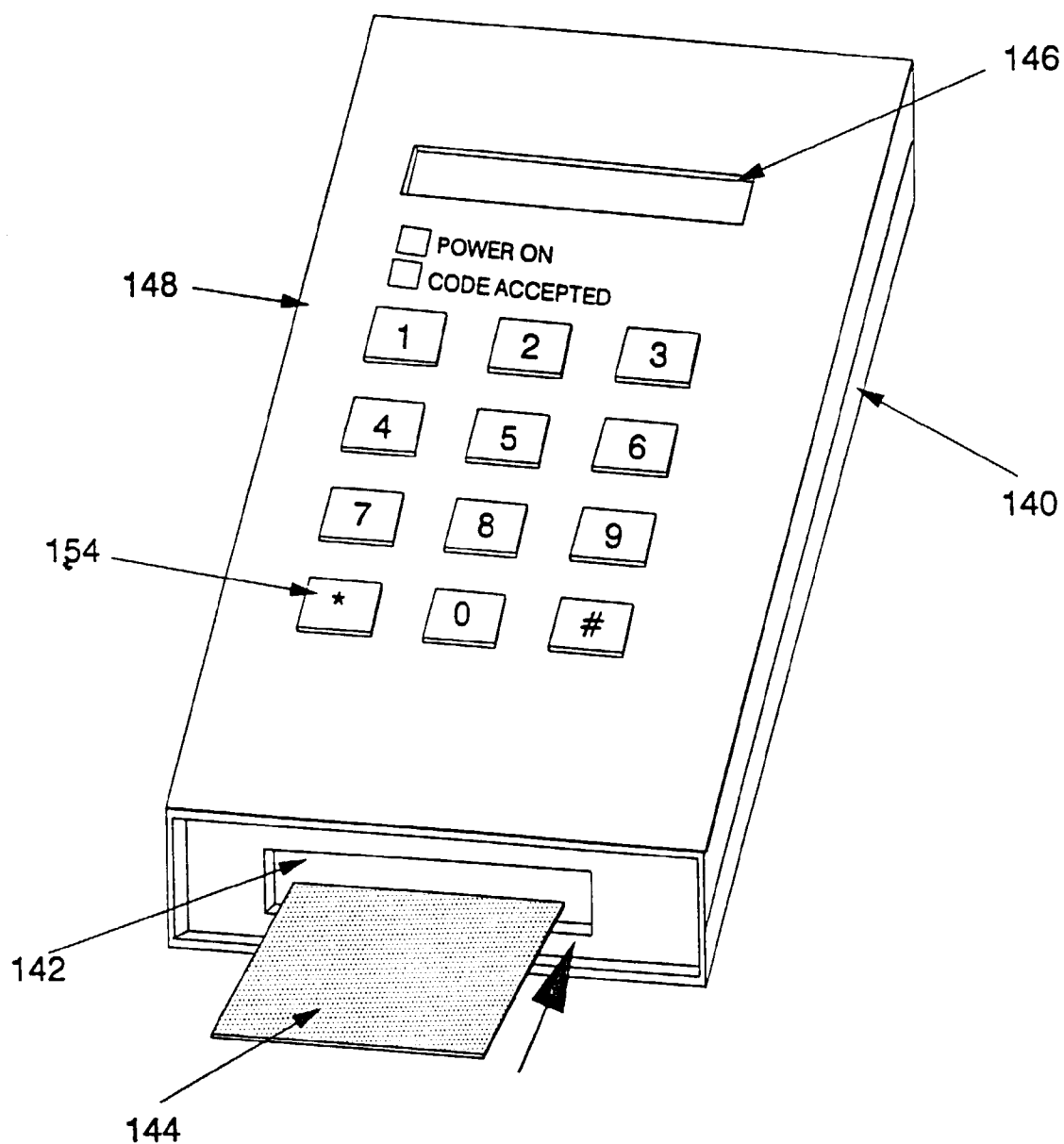


Figure 6

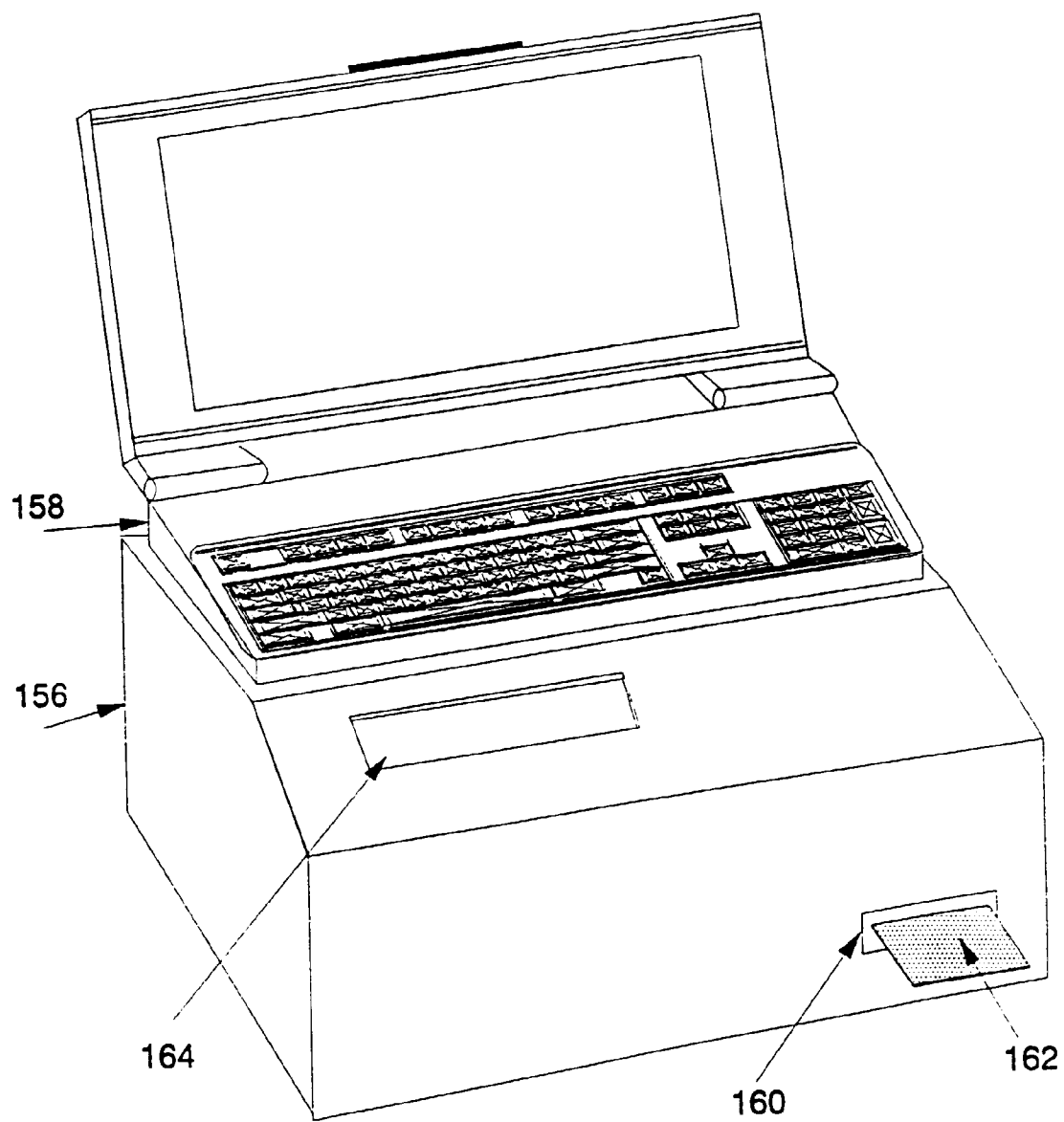


Figure 8

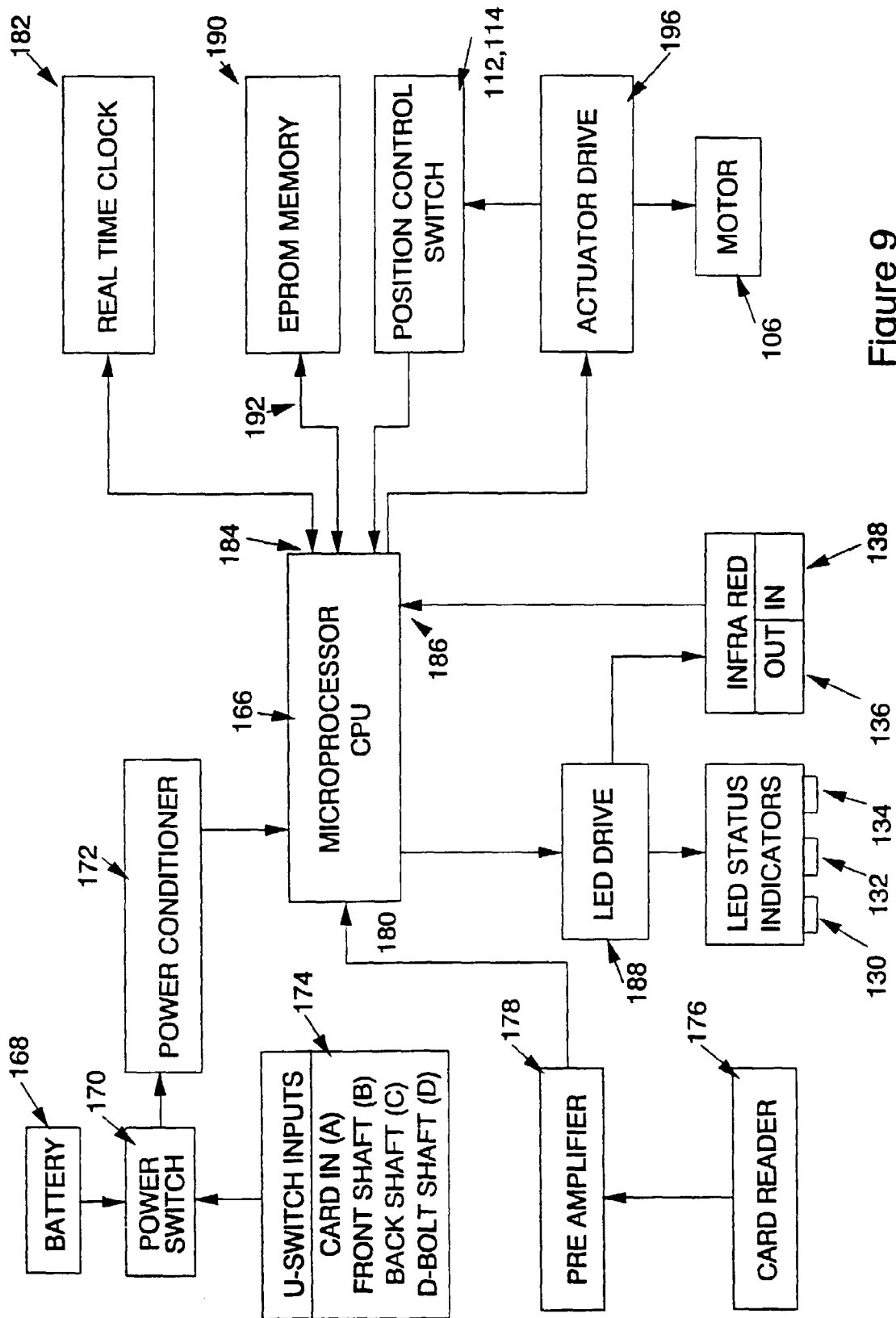


Figure 9

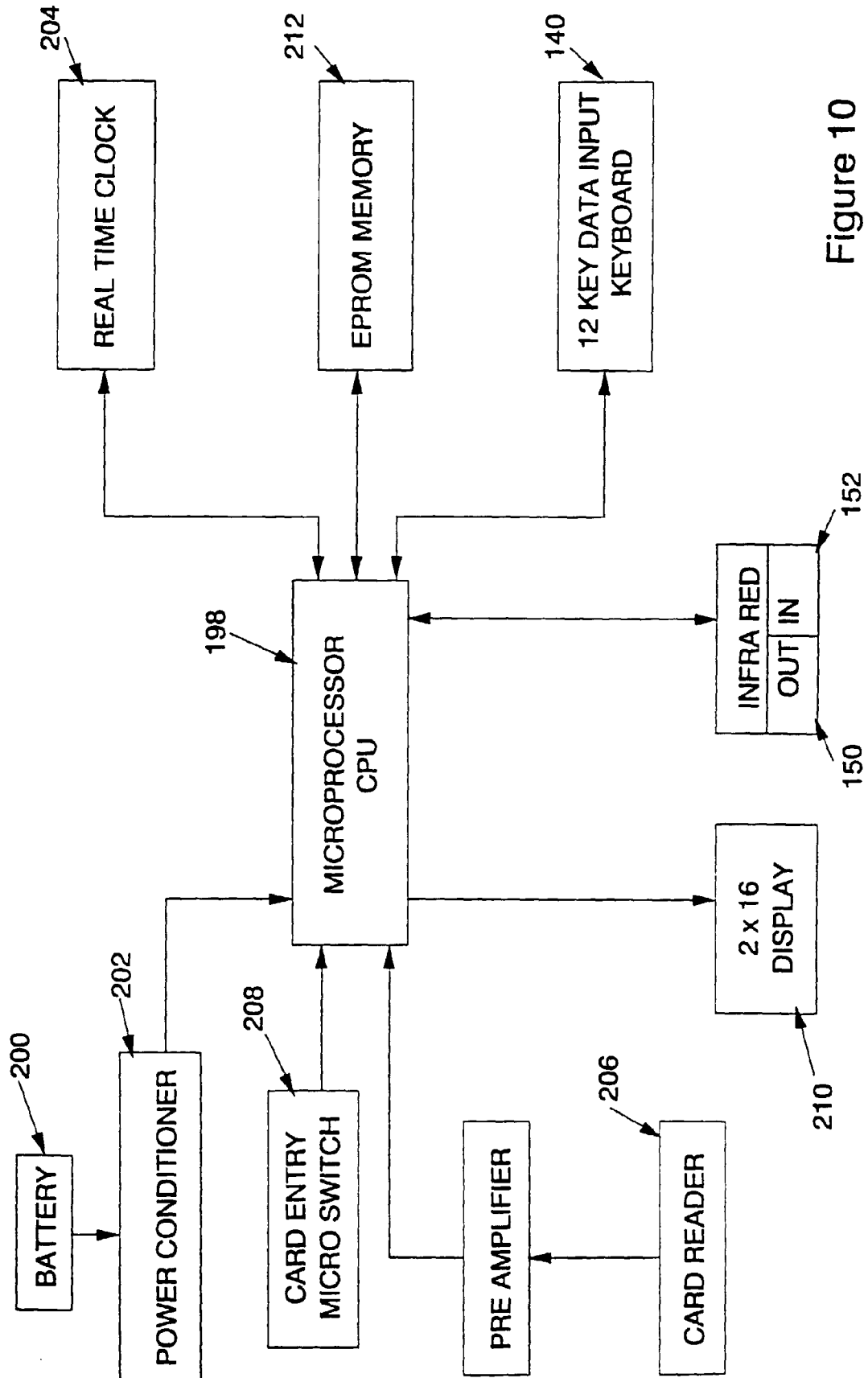


Figure 10

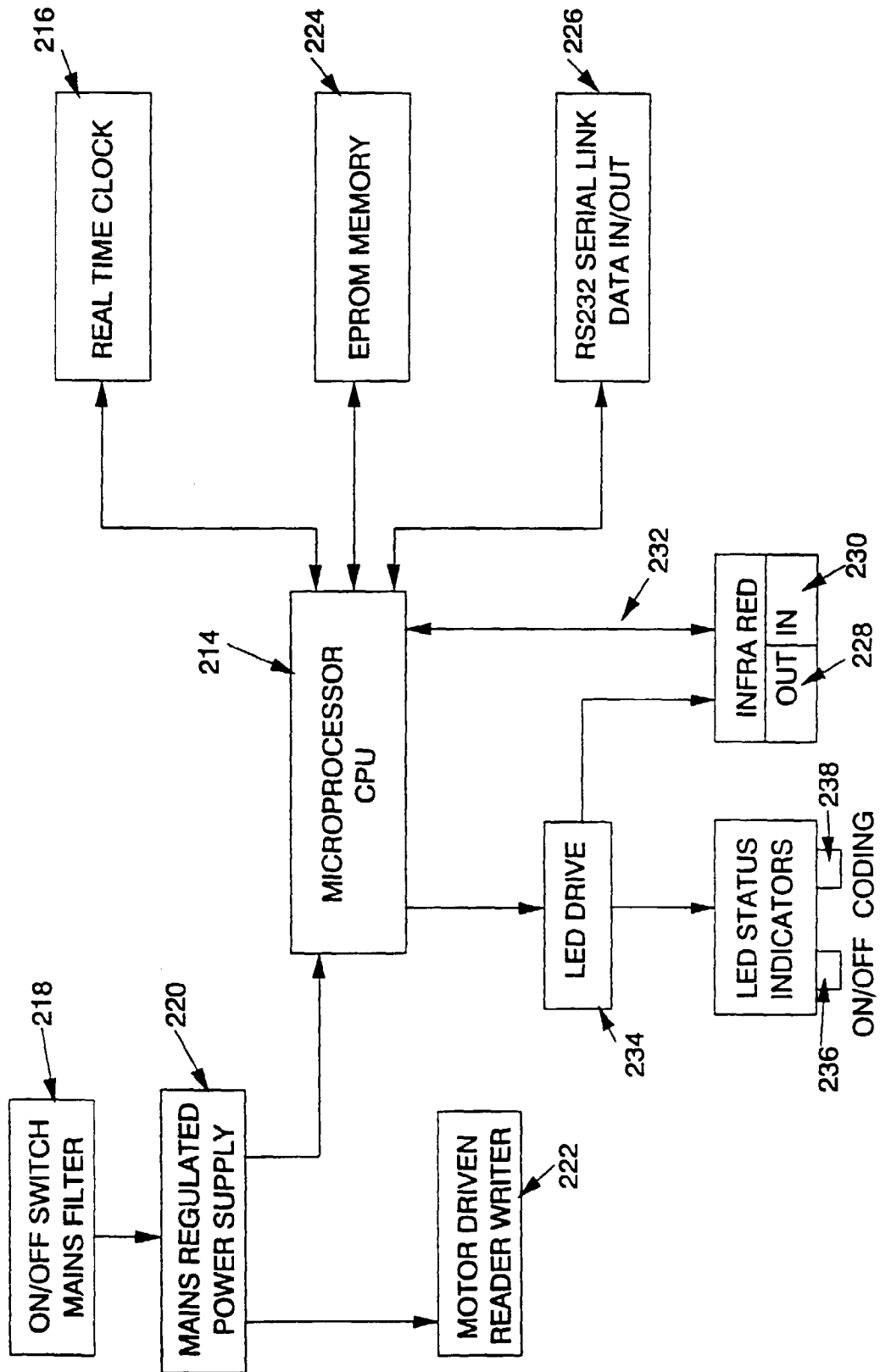


Figure 11