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(54) **A security lock for a closure member.**

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Description

The present invention relates generally to a security lock for a closure member, which latter term will be understood to refer to a door, window, drawer or other openable member which can be secured in a closure position, according to the preamble of claim 1 and to a security lock system according to the preamble of claim 12.

In many environments it is required to provide closure members with highly-secure locking means; for example, high-security locks may be required on cash drawers, safes, building doors, windows or drawers within buildings such as financial institutions, cash deposit centres, or outside buildings in vehicles such as cash carrying vehicles. One of the requirements for high-security in a lock is that it should be releasable only when actuated by authorised personnel. Traditionally this has been achieved by the use of complex locks having many levers and complicated wards in order to introduce the appropriate degree of complexity to allow a large number of unique keys to be produced so that each lock is different from all others. In the production of purely mechanical locks the available range of alternative configurations is, of course, limited and very often, especially for reasons of economy, it is found to be impossible to provide individual unique locks. The security of such mechanical locks is therefore open to question.

It is also known to provide locks which are activated by electrical signals which can be generated and coded, for example by means of a key pad fitted to the closure member or a frame defining the opening closed by the closure member. By appropriately programming the electronic control devices it is possible to allocate each lock a unique code which must be entered into the key pad in order to cause energisation of the lock release mechanism. Such electronic lock systems are employed, for example, in highly-secure environments where intruders are unwanted. They have the disadvantage, however, that the code for each lock must be known by all personnel authorised to use the premises and consequently, an increase in the number of people having access to the information gives rise to an increase in the risk that the information will be leaked to unauthorised personnel. Such locks are not suitable for use in other situations where a lower level of security is required, such as domestic front doors or windows because of the need to supply such devices with electrical power, which is inconvenient in a domestic environment.

Another security lock system is known from DE-3628525, which describes a lock which can be released using a key card on which an ID code is stored. Cards having two ID codes, one at each end are described.

The present invention seeks to provide a novel security lock which will overcome the disadvantages of known mechanical and electrical lock systems.

According to one aspect of the present invention, therefore, there is provided a security lock for a closure member, having a memory for storing a release code, electronic signal receiving means, for receiving a code signal from a portable lock releasing device; and electronic signal processing means including means for comparing the code signal received by the said electronic signal receiving means with the release code stored in the memory, characterised in that the said portable lock releasing device includes a signal generating device having a key which can be operated by the user selectively to generate an input information signal determined solely by the operation of the key of the device by the user, and signal input means for transferring the signal generated by the signal generating device to the signal receiving means for comparison with the release code stored in the memory, the signal generating device being operable selectively to generate other input information signals for application to other such locks for comparison with their respective release codes for enabling release thereof.

The security lock of the present invention may be one of a plurality of such locks fitted to a plurality of closure members which may be opened by a single lock releasing device operable to generate a number of different signals each of which may act to release one of the locks having a matching release code. It is a particular feature of the present invention that the identification code which will effect release of a lock may be changed by the user from time to time, as often as considered necessary, in order to obtain a high level of security against unauthorised access.

One embodiment of the present invention comprises a security lock for a closure member, having a mechanical bolt movable between a locking and a release position, a bolt-operating mechanism for displacing the bolt between its locking and release positions, and selectively controllable interconnection means for controlling the interconnection between the bolt and the bolt-operating mechanism whereby selectively to enable or disable the bolt-operating mechanism, in which the selectively controllable interconnection means includes a signal sensor and acts to enable or disable the bolt-operating mechanism in response to coded electrical signals transmitted thereto by an operator via a selectively operable signal input device in dependence on whether or not the coded electrical signals correspond to a stored code in a memory.

The lock releasing device may be releasably connectable to the closure member for operation to release or secure the lock, or may be operable remotely from the closure member and/or the lock and transmit signals either by means of radiated signals or by the transmission of signals along a signal line. In each case the lock releasing device may be capable of actuating any one of a plurality of locks on a plurality of different closure members.

The lock releasing device may be connected for operation to the lock by a plug and socket connector. The lock releasing device may be provided with a key pad either having a plurality of numeric or alphanumeric keys by means of which an operator may identify a specific code for release or locking of the lock, or having a single key operable to generate different codes, for example by the length of time for which it is depressed or by the temporal pattern of depressions.

In another embodiment of the invention there are provided signal generating means remote from the lock and operable to transmit signals to a sensor in or on the lock whereby selectively to control enablement or disablement of the bolt-operating mechanism from a distance away from the closure member. Such remote signal generating means may include an infra-red signal radiation transmitter, an ultrasonic signal radiation transmitter or other such means for remote control of the lock. Alternatively, or additionally, there may be provided remote signal generating means connected to the lock by a signal transmission line for the transmission of control signals to the said electrical signal processing means. This latter configuration lends itself particularly to circumstances where a plurality of closure members are intended to be controlled from a central control station.

The said electrical signal processing means preferably includes a memory storing data representing the coded electrical signals required for activation of the means for enabling the operation of the bolt-operating mechanism. In operation, the coded electrical signal generated by the signal input device, either directly by operation of a key pad or other signal generator mounted on the closure member, or indirectly by reception of transmitted signals from a remote signal generator, is compared with the stored data to cause activation of the interconnection means when coincidence is detected and to prevent such activation if signals which do not represent the stored code are detected. Indeed, the reception of signals differing from the stored code may indicate an unauthorised attempt at entry and may, therefore, be detected by the lock of the present invention to generate an alarm indication either locally in order to deter the intrusion or remotely, for example in a control or supervision room or at a nearby police station.

The said electrical signal processing means also preferably included programme control means operable to change the stored data in the memory in response to signals from the signal input device, whereby to change the signal code operative to enable the said selectively controllable interconnection means. As will be described in more detail below, this feature enables the operator to store a different release code from time to time whereby to increase the security of the lock.

The lock releasing device preferably includes means for storing and/or delivering electrical power for the lock for energisation of the said electrical signal processing means. Typically the lock releasing device may include a battery connected to the electrical signal processing means upon completion of a plug and socket connection. In embodiments having a radiated or transmitted signal the power may also be radiated, eg by microwaves.

The present invention comprehends a security lock system comprising a plurality of locks as hereinabove defined, each having a different stored release code in its respective memory, and at least one portable lock releasing device operable selectively to generate a plurality of different input information signals for comparison with the release code of respective locks.

The portable lock releasing device may have a single key or push button operable in a temporal pattern to generate the said coded signal. Alternatively the coded signal generator may have a single push button or key operable upon depression for a predetermined lengths of time to generate the said coded signal. A time delay may be provided, for example, a period of three to five seconds, to form an operating "window" within which the lock must be operated. If it is not operated in the window a further time delay may elapse before the lock can be operated again.

Various embodiments of the present invention will now be more particularly described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a schematic perspective view of a door fitted with a lock formed as a first embodiment of the present invention;

Figure 2 is a schematic perspective view of the door of Figure 1 illustrated from the reverse side;

Figure 3 is a schematic perspective view of a door incorporating an alternative embodiment;

Figure 4 is a block schematic diagram illustrating the major components of the lock system of the present invention;

Figure 5 is a schematic electrical diagram illustrating the electrical signal processing components of a lock formed as an embodiment of the invention; and

Figure 6 is a schematic electrical diagram of a cooperating signal input device for use with the lock of Figure 5.

Referring now to Figures 1 and 2 there is shown a safe door generally indicated 11 which has fitted on the inside a high security mechanical safe lock generally indicated 12 including a retractable latch bolt 13 which is shown extended in Figures 1 and 2 to illustrate it more clearly. Retraction of the latch bolt 13 is effected by operation of a handle 14 on the outside of the door, which is connected to the latch bolt by a drive disengagement mechanism (not shown) linked to a spindle 15. The drive disengagement mechanism interconnects the spindle 15 and the latch bolt 13 in a selectively disconnectable manner as will be described below and is not permanently interconnected between the spindle 15 and the latch bolt 13.

In other embodiments, of course, the handle 14 may itself be removable so that the face of the door 11 presents only a socket or spigot which cannot be turned without a suitable tool such as an Allen key. Within the lock 12 there may also be provided an optional safety locking device which acts to lock the bolt if an attack is made on the spindle 15 connecting the handle 14 to the bolt retraction mechanism.

On the outside of the door 11 there is a socket 10 to which a key pad 16 having a plurality of numerical or alpha numerical keys 17 can be connected by means of a jack plug 9 connecting the key pad 16 by a cable 8. In the illustrated embodiment there are ten numerical keys bearing the numbers 0 to 9 and two additional keys appropriately indicated, for example with an *, and a #. The key pad 16 also incorporates a small LCD or LED screen 18 on which a code entered on the keys 17 can be displayed. Within the key pad 16 there is provided an audible indicator (not shown) which produces an audible tone whenever a key 17 is depressed. In this embodiment the key pad 16 is also provided with a battery for energisation not only of the key pad but also of the lock as will be described, although direct connection of the key pad to the mains supply may alternatively be employed. As will be appreciated, the provision of twelve separately indicated keys 17 gives the possibility of up to 10^{12} different combinations which can be generated thereby, offering the possibility of this number of different unique codes for release of corresponding number of different door locks. When the plug 9 is withdrawn from the socket 10 the lock 12 has no power supply and becomes quiescent.

Figure 3 illustrates a similar, alternative embodiment in which the door 11 is fitted with a rectangular socket 19 in place of the round jack plug socket 10, and a removable key pad 20 having an integral plug 21 can be fitted thereto for generation of signals to operate the lock as will be described below.

In either the Figure 1 or the Figure 3 embodiment the door 11 is fitted with an electronic control unit 22 connectable to the key pad 16 via the socket (10 or 19) by flat or round multi-core wiring loom (not shown) passing through a hole in the door between the socket 10 or 19 and the control unit 22. The control unit 22 is attached to the inside of the door 11 and connected to the bolt disengagement mechanism of the lock 12 by a permanent wiring connection generally indicated by the link 23. In alternative embodiments the control unit 22 may be directly fitted to or to the rear of the lock 12.

Although described here in relation to its application to a safe door, it will be appreciated that the lock of the present invention may equally well be fitted to a domestic door, drawer, window or other closure member which can be secured by a lock, and does not require its own power supply.

Turning now to Figure 4 the block diagram shown represents the major components of the lock mechanism, namely a signal input device 24 releasably connected to a processor 26 by an interface unit 25. The processor 26 is connected to a memory 27 for two-way data communication, and also to an actuator 28 for operation of a suitable interconnection control device 29 which mechanically interconnects the handle 14 and the bolt 13 when energised, and disconnects the handle 14 from the bolt 13 when de-energised. The device 29 may, for example, be a spring-loaded clutch or other mechanical interconnection means operating in such a way that when it is de-energised the handle 14 can turn the spindle 15 without causing displacement of the release bolt 13 or, alternatively, may be a blocking member which prevents rotation of the handle 14 to cause displacement of the bolt 13 except when energised, in which case it allows the handle 14 to be turned. The processor 26 is also programmed to energise the actuator 28 only on a "one-shot" basis so that upon release of the handle 14 after having turned to retract the lock bolt 13, it is immediately disabled so that the required code for actuation must be reentered into the key pad 16 or 20. Although shown as a deadlock the bolt 13 may, in fact, be a spring-loaded latch bolt which will engage a keeper automatically upon closure of the door 11.

The memory 27 is loaded upon manufacture of the system with an initial code, which may be a common code for all locks produced, or may be a unique code identified to the purchaser in a secure manner, for example, by separate communication after purchase. Entry of the code to the processor

26 via the signal input device 24 will result in comparison with the code stored in the memory 27 and actuation of the interconnection control means 29 via the actuator 28 to allow the lock to be released. The processor 26 may also include a timer which will maintain actuation of the actuator 28 only for a specific limited time after the correct code has been entered. This will be termed an opening "window".

Referring now to Figures 5 and 6, the circuit shown in Figure 5 is based on an integrated circuit processor 26 of the type sold by Microchip Technology Inc of Chandler, Arizona, under the reference PIC1655. The PIC 1655 processor 26 is supplied with power between a positive line 30 and a ground line 31 each leading from one contact 32, 33 respectively of a socket such as the socket 10 in Figure 1 or socket 19 in Figure 3. In this embodiment, the socket is a simple three contact socket for connecting the ground line 31, the positive supply line 30 and a signal line 34 via a contact 35. The positive supply line 30 and the signal line 34 each have respective fuses 36, 37. A Zener diode 38 is connected between the signal line 34 and the ground line 31 to act as a transient suppressor. Similarly, a Zener diode 39 and parallel capacitor 40 are connected between the positive supply line 30 and the ground line 31, the former to act as a transient suppressor and the latter to act as a noise suppressor.

The signal applied on line 34 passes first to a buffer (corresponding to the interface unit 25 of Figure 4) which is a bi-directional integrated circuit allowing two-way communication along the line 34 to the processor 26 along a data line 41 under the control of two direction control signal lines 42, 43.

The oscillator input to the processor 26, identified with the reference numeral 44 is supplied by an RC circuit comprising a resistor 45 and capacitor 46 and the CLEAR input 47 is supplied by an RC circuit 48 comprising a resistor 48 and a capacitor 49 which latter RC circuit acts to provide a power-up delay to the CLEAR input 47 so as to ensure that the buffer 25 is always set to direct signals from the terminal 35 towards the processor 26 when the circuit is switched on, namely when a signal input unit such as the unit 20 in Figure 3 is plugged into the socket comprising the contacts 32, 33, 35.

The memory for the lock is contained in an electrically erasable programmable read only memory (EEPROM) 27 connected to the processor 26 by lines 52. Finally, the output from the processor 26 is supplied via a resistor 53 to the base of a switching transistor 54 which controls a solenoid 28, corresponding to the actuator of Figure 4, protected by a diode 55 against inadvertent polarity inversions. The resistor 56 in series with the solenoid coil 28 is an optional ballast resistor to determine the current through the solenoid.

In Figure 6, the signal input unit illustrated comprises a PIC 1655 processor 57 the signal input to which is supplied by a key pad 58 which may be a multiple key device, such as the key pad 16 or 20, illustrated in Figure 1 and 3, or may alternatively be a single key device (not shown) operating by multiple depression or timed depression of the single key to generate in the processor 57 the appropriate output signals which are supplied on a signal line 59 to a bidirectional buffer 60 similar to the buffer 27 forming the interface unit of the lock. The bi-directional buffer is controlled by two direction lines 61, 62 the signals on which are supplied by the processor 57.

Power for the signal input unit is supplied by a removable storage battery 63 across which are connected plug terminals 64, 65 which cooperate with the plug terminals 32, 33 of the lock. Also connected across the battery 63 are a ZENER diode 66 and reverse polarity protection diode 67. The terminals of the battery 63 are connected by power lines 68, 69 to the power input terminals of the processor 57, and the bi-directional buffer 60, and to a voltage comparator 70 and an LCD driver circuit 83. The voltage comparator 70 is provided to detect a low battery voltage and provides an output signal on line 71 to the processor 57 for generation of an appropriate warning signal to be supplied, through display lines 72, to the LCD driver 71 which is a standard scanning and driving circuit for an LCD display 73. Also connected across the voltage comparator is an RC circuit comprising resistor 74 and capacitor 75 the junction between which is connected to the oscillator input 76 of the processor 57 to determine the timing for the clock circuit, and a further RC circuit comprising resistor 77 and capacitor 78 which serves to provide a delay to the CLEAR input 79 of the processor to ensure that this is in the correct state upon power-up. Finally, a transient suppression Zener diode 80 is connected to the input/output signal line 81 at a point between the bi-directional buffer 60 and a terminal 82 of the plug.

In use of the lock described, the plug comprising the power terminal 64, 65 and the signal terminal 82 is inserted into the socket comprising the power terminals 32, 33 and the signal terminal 35 to energise the lock circuit. Power, now supplied between the power lines 30, 31, is now supplied to the processor 26. The action of the RC circuit 48, 49 ensures that the voltage rise at the CLEAR input 47 is delayed thereby ensuring that the buffer 25 is set to communicate in the appropriate direction.

A known selected code is then entered into the key pad 58. This causes generation, via the processor 57, of an appropriate output information

signal on the communication line 59 which is transmitted via the bi-directional buffer 60, to the plug and socket connection 35/82, and via the bidirectional buffer 25 to the data input of the processor 26. This compares the received information signal with the release code stored in the memory 27 and, if the correct code is entered, generates an output signal on line 53 to turn on the switching transistor 54 allowing current to flow through the solenoid 28 from the positive supply line 30 to the ground line 31 thereby causing displacement of the lock-enabling member so that the handle 14 (Figure 1) is physically inter-connected to the bolt 13 (Figure 1) to allow the lock to be released. If the code entered on the key pad 58 is in error, this will be detected by the processor 26 in the lock and appropriate communication via the data line 41, with the direction of the buffers 25 and 60 being reversed, will advise the user via the screen 73.

The software in the processor 57 and the software in the processor 26 comprise two separate components so arranged that the key pad acts as a master and the lock as a slave. With the exception of non command driven operations such as "reset lock to factory default settings" which are performed by shorting two pads on the lock electronics, the required operation is achieved via a series of software commands and corresponding status responses. The bi-directional buffers 25, 60 allow half duplex asynchronous communications requiring auto baud. This method allows for up to 100% speed difference between the two processors which are not crystal speed controlled. The transfer rate in practice is approximately 1500 baud. A fixed message length is used and the quiescent state of the line is logic low to save power. When the user wishes to send a message to the lock via the key pad, the first key depression raises the line for one bit length (128 programme cycles) as an attention bit. This is followed by a low auto baud gap for the receiver to detect the transmission speed. The following start bit is half size to simplify the receive code and this is followed by four command bits, four data bits and a four bit check code. The check code is calculated as the exclusive OR of the command and data. By using a high stop bit framing errors can be detected.

In order to change the code from the factory setting the lock is first released by entering the stored code and turning the handle 14 to open the lock. Then, holding the lock in the open position the release code stored in the memory 27 is entered again followed by a unique identification code, such as the button pressed twice.

The new code of up to twelve digits may then be entered on the key pad, followed by a verification code which, again, may be depression of the key one or more times. Confirmation of the new code may be required, followed by re-entry of the confirmation code whereupon the new code will be transmitted by the processor 26 to the memory 27 and the old code deleted. In this way the unique identification code for the lock can be changed at any time so that a high level of security is achieved.

A number of alternative options utilising the system described above can be provided by suitable programming of the processor 26. First, the "window" time from reception of the correct release code by the signal input device 24 during which the actuator 28 is energised by the processor 26 to allow the bolt 13 to be retracted by turning the handle 14 may be pre-set to any required time dependent on the intended circumstances of use, for example from five seconds to ninety nine seconds. The processor 26 may also be programmed to energise the audible indicator upon depression of each key 17, with a different tone being generated uniquely for each key. When the correct combination is detected by the processor 26 it may also cause a recognition signal to be transmitted to the audible indicator, for example a short double tone. The audible tones may, however, be eliminated if required.

The system of the present invention may also be fitted with a duress alarm. This may, for example, be energised by a code one digit different from the correct code so that if an operator is forced to release the lock unwillingly he may open the door 11 by entering a code differing from the correct code by this one digit. The processor 26 will recognise the duress code, energise the actuator 28 to open the door 11 but at the same time transmit an alarm signal to a remote monitoring station, for example a local police station, to indicate that the lock is being opened under duress.

The processor 26 may also include a real time clock which will control opening of the lock so that it can only be opened during a predetermined time during each period of 24 hours. The available release times can be programmed by appropriate key strokes on the key pad 16 or 20. A time delay may also be programmed into the system so that, after entering a correct combination, there is nevertheless a predetermined time delay before the lock can be opened. Such a time delay may be of value in preventing unauthorised access by an attempt to cycle sequentially through all the available codes since the immediate response, even to a correct code, is for the door to remain locked. Other means for preventing cyclic or sequential attempts to open the lock may include a blocking facility which will disable the signal input device 24, at least for a minimum period (for example fifteen minutes) after three incorrect attempts to enter the release code, that is after three sequential incorrect

release codes have been entered.

The memory 27 may, if required, store a plurality of different codes which will be recognised by the processor 26 as correct release codes making it possible to generate an audit trail indicating which of a plurality of authorised users has released the lock. The processor 26 may act to store such an audit trail in the memory 27 for a predetermined period, for example seven days, and appropriate means (not illustrated) for reading the contents of the memory 27, or for down-loading the information to a printer of a computer may be provided.

The signal input device 24 may further be connected by means not shown to a central control station, perhaps provided with a monitoring closed-circuit television, so that an additional level of security can be introduced.

Claims

1. A security lock (12) for a closure member (11), having a memory (27) for storing a release code, electronic signal receiving means (10, 19), for receiving a code signal from a portable lock releasing device (16, 20); and electronic signal processing means (26, 57) including means for comparing the code signal received by the said electronic signal receiving means (10, 19) with the release code stored in the memory (27), characterised in that the said portable lock releasing device (16, 20) includes a signal generating device (58) having a key (17) which can be operated by the user selectively to generate an input information signal determined solely by the operation of the key (17) of the device (16, 20) by the user, and signal input means (9, 64, 65) for transferring the signal generated by the signal generating device (16, 20) to the signal receiving means (10, 19) for comparison with the release code stored in the memory (27), the signal generating device (16, 20) being operable selectively to generate other input information signals for application to other such locks for comparison with their respective release codes for enabling release thereof.

2. A security lock according to Claim 1 characterised in that the lock releasing device (16, 20) and the electronic signal processing means (26, 57) are releasably connectable by a plug and socket connection.

3. A security lock according to Claim 1 or Claim 2 characterised in that the said signal generating device includes a key pad (58) having a plurality of keys (17) for generation of the said input information signal.

4. A security lock according to Claim 1, characterised in that the said portable lock releasing device (16, 20) includes signal generating means remote from the lock operable to transmit signals to a signal sensor in or on the lock whereby selectively to enable release of the lock from a distance.

5. A security lock according to Claim 4, characterised in that the signal sensor comprises at least one photosensitive detector operating in the infra-red region of the spectrum for detecting electromagnetic radiation signals transmitted from the portable lock releasing device.

6. A security lock according to Claim 4 characterised in that the portable lock releasing device (16, 20) is connected to the lock (12) by a signal transmission line (8) for the transmission of input information control signals generated thereby.

7. A security lock according to any preceding Claim, characterised in that the said portable lock releasing device (16, 20) also includes means (63, 64, 65) for storing and/or delivering electrical power for the lock (12) for energisation of the electronic signal processing means (26).

8. A security lock according to any preceding Claim, characterised in that the said electronic signal processing means (26) includes programme control means operable to change the stored data in the memory (27) in response to signals from the signal input device, whereby to change the said release code stored in the memory (27).

9. A security lock according to any preceding claim characterised in that it has a mechanical bolt (13) movable between a locking and a release position, a bolt-operating mechanism (14, 15) for displacing the bolt (13) between its locking and release positions, and selectively controllable interconnection means for controlling the interconnection between the bolt (13) and the bolt-operating mechanism (14, 15) whereby selectively to enable or disable the bolt-operating mechanism (14, 15) and in that the selectively controllable interconnection means acts to enable or disable the bolt-operating mechanism (14, 15) in response to input information signals transmitted thereto from the portable lock releasing device (16, 20) in dependence on whether or not the electrical

input information signals correspond to the stored release code in the memory (27).

10. A security lock according to any of Claims 2 to 10, characterised in that the removable connection of the portable lock releasing device (16, 20) to the lock (12) includes separable connection of three lines (30, 31, 34; 68, 69, 81) for transmission of signals and electrical power to the lock (12).

11. A security lock according to any preceding claim, characterised in that the said signal processing means (26) includes a timing device operable to inhibit release of the lock (12) a predetermined time after the detection of an input information signal from the or a lock releasing device (16, 20) whereby to prevent generation of a signal matching the release code by trial and error.

12. A security lock system characterised by comprising a plurality of locks (11) according to any preceding Claim each having a different stored release code in its respective memory (27), and at least one portable lock releasing device (16, 20) operable selectively to generate a plurality of different input information signals for comparison with the release code of respective locks (11).

Patentansprüche

1. Sicherheitsschloß (12) für ein Schließelement (11) mit einem Speicher (27) zum Speichern eines Freigabe-Codes, elektronischen Signalempfangsmitteln (10, 19) zum Empfangen eines Code-Signals von einer tragbaren Schloßfreigabevorrichtung (16, 20); und elektronischen Signalverarbeitungsmitteln (26, 57) einschließlich Mitteln zum Vergleichen des von den genannten elektronischen Signalempfangsmittel (10, 19) empfangenen Code-Signals mit dem im Speicher (27) gespeicherten Freigabe-Code,
dadurch gekennzeichnet,
daß die genannte tragbare Schloßfreigabevorrichtung (16, 20) eine Signalerzeugungsvorrichtung (58) mit einer Taste (17) beinhaltet, die vom Anwender selektiv betätigt werden kann, um ein Eingabeinformationssignal zu erzeugen, daß allein durch die Betätigung der Taste (17) der Vorrichtung (58) durch den Anwender bestimmt wird, und Signaleingabemittel (9, 64, 65) zum Übertragen des von der Signalerzeugungsvorrichtung (58) erzeugten Signals an die Signalempfangsmittel (10, 19) zum Vergleichen mit dem im Speicher (27) gespeicherten Freigabe-Code, wobei die Signalerzeugungsvorrichtung (58) selektiv betätigt werden kann, um andere Eingabeinformationssignale zu erzeugen, die für andere solche Schlösser zum Vergleichen mit deren jeweiligen Freigabe-Codes verwendet werden, um die Freigabe dieser Schlösser zu ermöglichen.

2. Sicherheitsschloß gemäß Anspruch 1,
dadurch gekennzeichnet,
daß die Schloßfreigabevorrichtung (16, 20) und die elektronischen Signalverarbeitungsmittel (26, 57) lösbar mit einer Steckverbindung verbindbar sind.

3. Sicherheitsschloß gemäß Anspruch 1 oder Anspruch 2,
dadurch gekennzeichnet,
daß die genannte Signalerzeugungsvorrichtung ein Tastenfeld (58) mit einer Mehrzahl von Tasten (17) zur Erzeugung des genannten Eingabeinformationssignals beinhaltet.

4. Sicherheitsschloß gemäß Anspruch 1,
dadurch gekennzeichnet,
daß die genannte tragbare Schloßfreigabevorrichtung (16, 20) vom Schloß entfernte Signalerzeugungsmittel beinhaltet, um Signale an einen Signalsensor im oder am Schloß zu übertragen, wodurch selektiv die Freigabe des Schlosses aus der Ferne ermöglicht wird.

5. Sicherheitsschloß gemäß Anspruch 4,
dadurch gekennzeichnet,
daß der Signalsensor mindestens einen im Infrarotbereich des Spektrums arbeitenden lichtempfindlichen Detektor zum Aufspüren elektromagnetischer Strahlungssignale, die von der tragbaren Schloßfreigabevorrichtung übertragen werden, enthält.

6. Sicherheitsschloß gemäß Anspruch 4,
dadurch gekennzeichnet,
daß die tragbare Schloßfreigabevorrichtung (16, 20) durch eine Signalübertragungsleitung (8) zur Übertragung der von der Vorrichtung erzeugten Eingabeinformationssteuersignale mit dem Schloß (12) verbunden ist.

7. Sicherheitsschloß gemäß einem der vorangehenden Ansprüche,
dadurch gekennzeichnet,
daß die genannte tragbare Schloßfreigabevorrichtung (16, 20) ferner Mittel (63, 64, 65) zur Speicherung und/oder Übergabe elektrischer Energie für das Schloß (12) beinhaltet, um die elektronischen Signalverarbeitungsmittel (26) zu erregen.

8. Sicherheitsschloß gemäß einem der vorangehenden Ansprüche,
dadurch gekennzeichnet,
daß die genannten elektronischen Signalverarbeitungsmittel (26) Programmsteuermittel beinhalten, die so betätigt werden können, daß sie die im Speicher (27) gespeicherten Daten als Antwort auf Signale von der Signaleingabevorrichtung ändern, wodurch der im Speicher (27) gespeicherte Freigabe-Code geändert wird.

9. Sicherheitsschloß gemäß einem der vorangehenden Ansprüche,
dadurch gekennzeichnet,
daß es einen zwischen einer Schließ- und einer Freigabeposition beweglichen mechanischen Schieber (13), einen Schieberbetätigungsmechanismus (14, 15) zum Verschieben des Schiebers (13) zwischen seiner Schlleß- und seiner Freigabeposition und selektiv steuerbare Koppelmittel zum Steuern der Kopplung zwischen dem Schieber (13) und dem Schieberbetätigungsmechanismus (14, 15) hat, wodurch der Schieberbetätigungsmechanismus (14, 15) selektiv freigegeben oder gesperrt werden kann, und dadurch gekennzeichnet, daß die selektiv steuerbaren Koppelmittel die Freigabe oder Sperrung das Schieberbetätigungsmechanismus (14, 15) als Antwort auf Eingabeinformationssignale bewirken, die von der tragbaren Schloßfreigabevorrichtung (16, 20) dorthin übertragen werden, abhängig davon, ob die elektrischen Eingabeinformationssignale dem im Speicher (27) gespeicherten Freigabe-Code entsprechen oder nicht.

10. Sicherheitsschloß gemäß einem der Ansprüche 2 bis 10,
dadurch gekennzeichnet,
daß die entfernbare Verbindung der tragbaren Schloßfreigabevorrichtung (16, 20) zum Schloß (12) eine trennbare Verbindung von drei Leitungen (30, 31, 34; 68, 69, 81) für die Übertragung von Signalen und elektrischer Energie an das Schloß (12) beinhaltet.

11. Sicherheitsschloß gemäß einem der vorangehenden Ansprüche,
dadurch gekennzeichnet,
daß die genannten Signalverarbeitungsmittel (26) eine Zeitsteuervorrichtung beinhalten, die betätigt werden kann, um die Freigabe des Schlosses (12) eine vorgegebene Zeit nach der Erkennung eines Eingabeinformationssignals von der oder von einer Schloßfreigabevorrichtung (16, 20) zu unterbinden, wodurch die versuchsweise und irrtümliche Erzeugung eines zum Freigabe-Code passenden Signals verhindert wird.

12. Sicherheitsschloßsystem,
dadurch gekennzeichnet,
daß es aus einer Mehrzahl von Schlössern (11) gemäß einem der vorangehenden Ansprüche besteht, die alle in ihrem jeweiligen Speicher (27) einen unterschiedlichen Freigabe-Code gespeichert haben, und mindestens einer tragbaren Schloßfreigabevorrichtung (16, 20), die selektiv betätigt werden kann, um eine Mehrzahl unterschiedlicher Eingabeinformationssignale zum Vergleichen mit dem Freigabe-Code der jeweiligen Schlösser (11) zu erzeugen.

Revendications

1. Un verrou de sécurité (12) pour un organe de fermeture (11), comprenant une mémoire (27) pour stocker un code d'accès, un moyen (10, 19) de réception d'un signal électronique, pour recevoir un signal codé à partir d'un dispositif (16, 20) portable de libération de verrou ; et un moyen de traitement de signal électronique (26, 57) comprenant un moyen pour comparer le signal codé reçu par ledit moyen de réception de signal électronique (10, 19) avec le code d'accès emmagasiné dans la mémoire (27), caractérisé en ce que ledit dispositif de libération (16, 20) portable de verrou comprend un dispositif (58) générateur de signal comprenant une clé (17) qui peut être actionnée par l'utilisateur de façon sélective pour engendrer un signal d'information d'entrée déterminé seulement par l'actionnement de la clé (17) du dispositif (16, 20) par l'utilisateur, et un moyen d'entrée de signal (9, 64, 65) pour transférer le signal engendré par le dispositif générateur de signal (16, 20) au moyen de réception du signal (10, 19), en vue d'une comparaison avec le code d'accès stocké dans la mémoire (27), le dispositif générateur de signal (16, 20) étant actionnable sélectivement de façon à engendrer d'autres signaux d'information d'entrée pour les appliquer à d'autres tels verrous en vue d'une comparaison avec leurs codes d'accès respectifs pour assurer la libération de ces verrous.

2. Un verrou de sécurité selon la revendication 1 caractérisé en ce que le dispositif (16, 20) de libération de verrou et le moyen (26, 57) de traitement du signal électronique sont reliés de façon amovible par une connexion à douille et fiche.

3. Un verrou de sécurité selon la revendication 1 ou la revendication 2 caractérisé en ce que ledit dispositif générateur de signal comprend un support (58) de clé ayant une pluralité de clés (17) pour la génération dudit signal d'information d'entrée.

4. Un verrou de sécurité selon la revendication 1, caractérisé en ce que ledit dispositif (16, 20) de libération portable de verrou comprend un moyen générateur de signal éloigné du verrou pouvant être actionné de façon à transmettre les signaux à un capteur de signal positionné dans ou sur le verrou grâce à quoi il est possible de sélectivement libérer le verrou à distance.

5. Un verrou de sécurité selon la revendication 4, caractérisé en ce que le capteur de signal comprend au moins un détecteur photosensible travaillant dans la région infra-rouge du spectre pour détecter des signaux de rayonnement électromagnétiques transmis à partir du dispositif portable de libération du verrou.

6. Un verrou de sécurité selon la revendication 4, caractérisé en ce que le dispositif (16, 20) de libération portable de verrou est relié au verrou (12) par une ligne de transmission (8) du signal pour la transmission de signaux de commande d'information d'entrée engendrés par lui.

7. Un verrou de sécurité selon l'une quelconque des revendications précédentes, caractérisé en ce que ledit dispositif de libération portable de verrou comprend également un moyen (63, 64, 65) pour emmagasiner et/ou délivrer une puissance électrique pour le verrou (12), pour l'alimentation du moyen (26) de traitement du signal électronique.

8. Un verrou de sécurité selon l'une quelconque des revendications précédentes, caractérisé en ce que ledit moyen de traitement de signal électronique (26) comprend un moyen de commande programmable, actionnable, de façon à modififer les données emmagasinées dans la mémoire (27) en réponse à des signaux provenant du dispositif d'entrée de signal, grâce à quoi, il est possible de modifier ledit code d'accès emmagasiné dans la mémoire (27).

9. Un verrou de sécurité selon l'une quelconque des revendications précédentes, caractérisé en ce qu'il comprend un pêne mécanique (13) déplaçable entre une position de verrouillage et une position de libération, un mécanisme (14, 15) d'actionnement du pêne pour déplacer le pêne (13) entre sa position de verrouillage et sa position de libération, et un moyen d'interconnexion pouvant être commandé sélectivement pour commander l'interconnexion entre le pêne (13) et le mécanisme (14, 15) d'actionnement du pêne, grâce à quoi, il est possible d'activer ou de désactiver sélectivement le mécanisme d'actionnement du pêne (14, 15), le moyen d'inteconnexion commandable sélectivement agissant de façon à activer ou désactiver le mécanisme d'actionnement (14, 15) du pêne en réponse à des signaux d'entrée qui lui sont transmis à partir du dispositif (16, 20) portable de libération du verrou, selon que les signaux d'information d'entrée électriques correspondent ou ne correspondent pas au code de libération stocké dans la mémoire (27).

10. Un verrou de sécurité selon l'une quelconque des revendications 2 à 10, caractérisé en ce que la connexion amovible du dispositif (16, 20) de libération portable du verrou avec le verrou (12) comprend une connexion séparable de trois conducteurs (30, 31, 34 ; 68, 69, 81) pour la transmission des signaux et de la puissance électrique au verrou (12).

11. Un verrou de sécurité selon l'une quelconque des revendications précédentcs caractérisé en que ledit moyen de traitement de signal (26) comprend un dispositif temporisé actionnable de façon à inhiber la libération du verrou (12), après une durée prédéterminée suivant la détection d'un signal d'information d'entrée provenant du dispositif (16, 20) de libération de verrou, de façon à empêcher l'émission d'un signal correspondant au code d'accès, en cas de tentative ou d'erreur.

12. Un système de verrou de sécurité caractérisé en ce qu'il comprend une pluralité de verrous (11) selon l'une quelconque des revendications précédentes, comportant chacun un code d'accès stocké différent dans leur mémoire respective (27), et au moins un dispositif (16, 20) de libération portable de verrou pouvant être actionné sélectivement de façon à engendrer une pluralité de signaux d'information d'entrée différents destinés à être comparés avec les codes de libération des verrous respectifs (11).

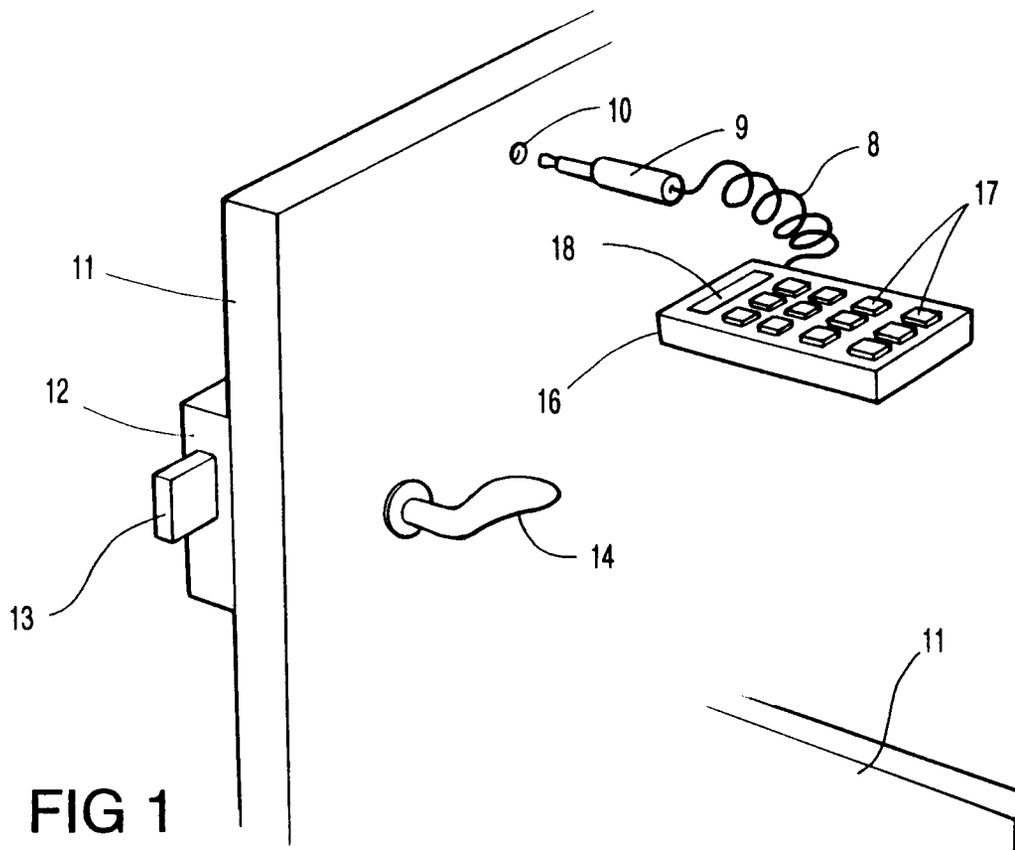

FIG 1

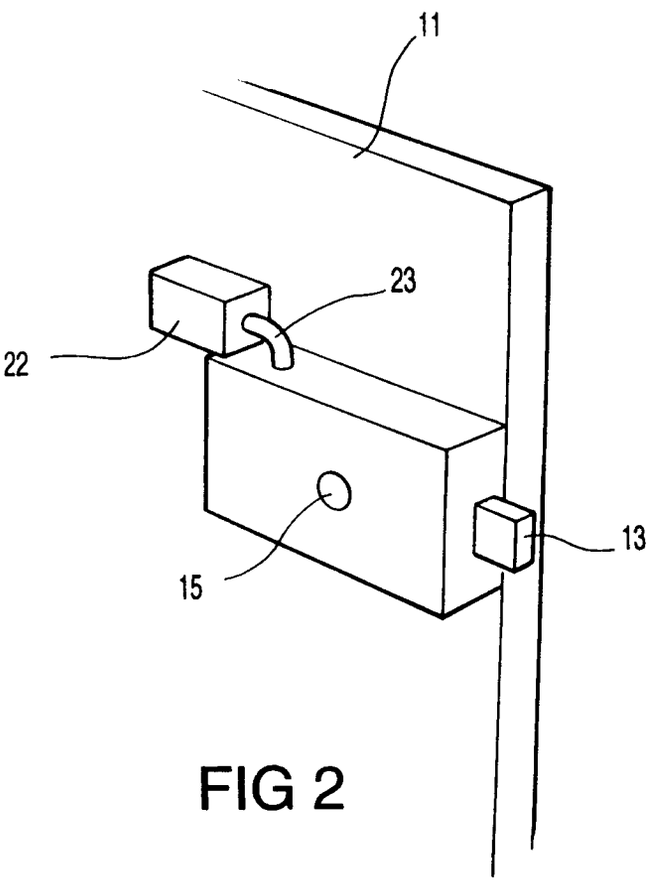

FIG 2

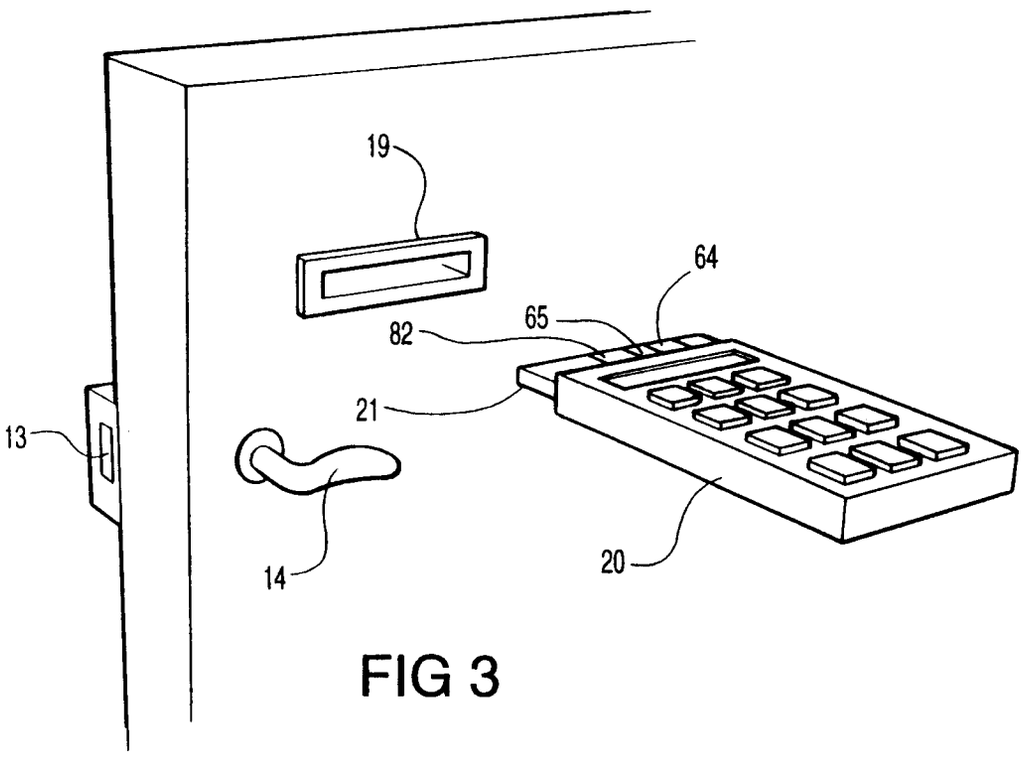

FIG 3

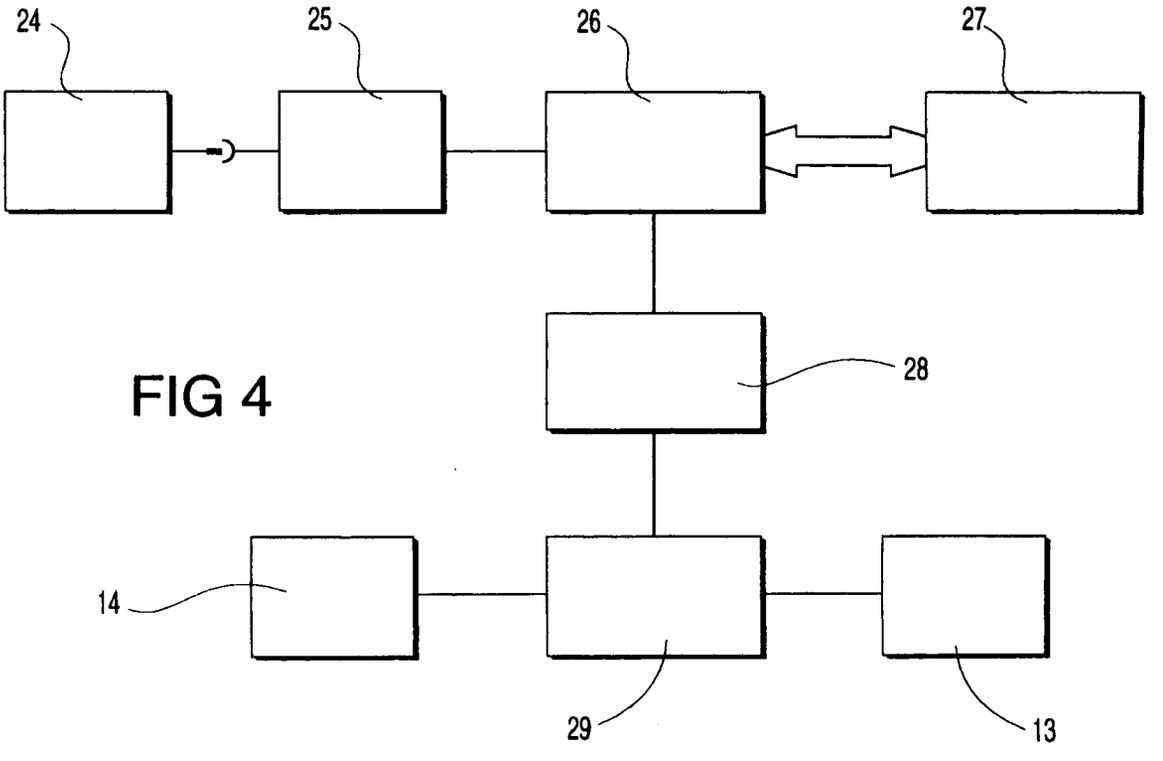

FIG 4

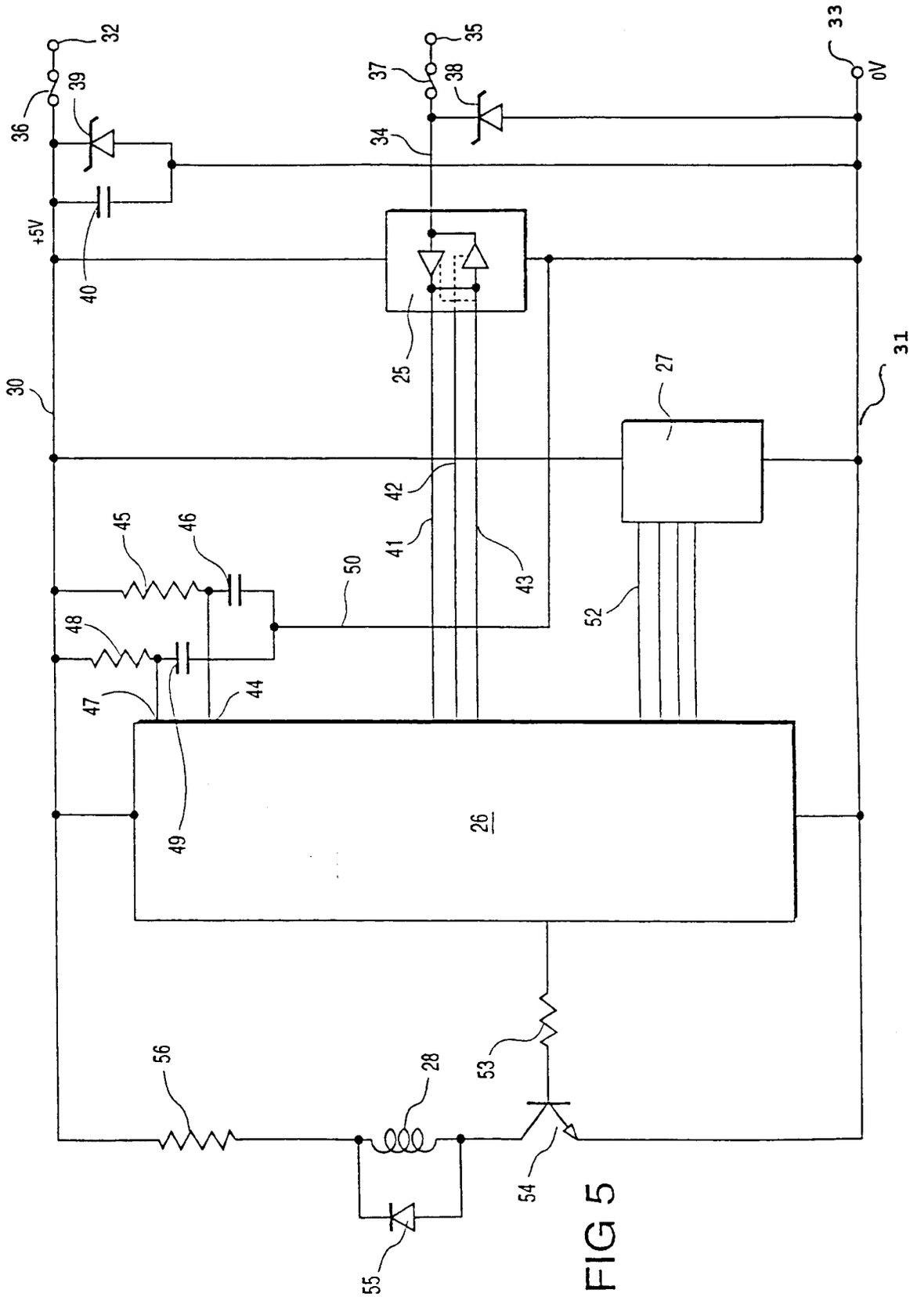
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FIG 5

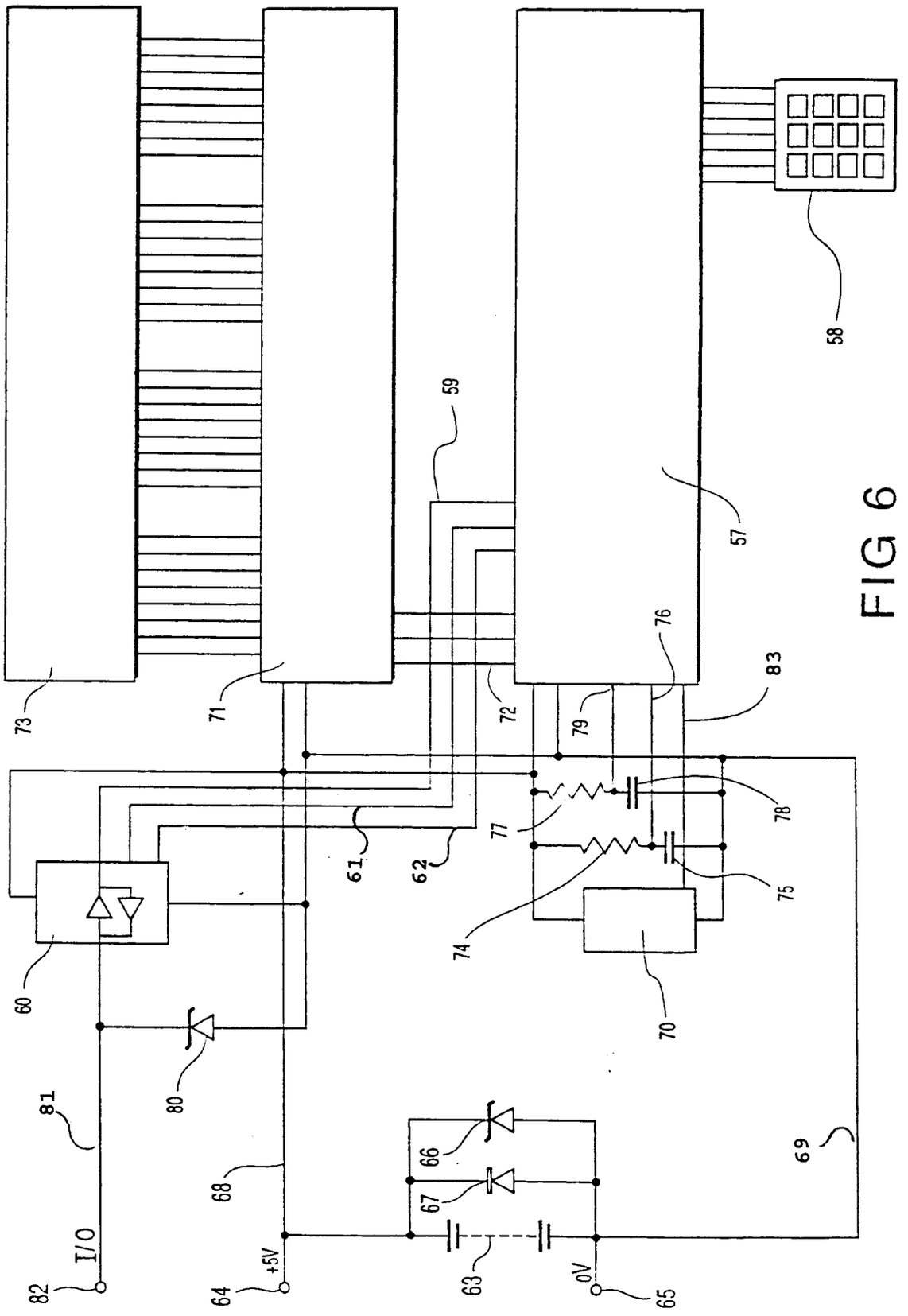
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FIG 6