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⑤④ ELECTRIC LOCK SYSTEM.

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Description

The present invention relates to an electric lock system in which the locking operation and the unlocking operation are controlled by an electric signal.

5 In the past, in order to control an electric lock device, it has been necessary to provide a detector which detects states such as the opening and closing of a door and the locking and unlocking of the lock device, the detector being connected with a control panel by lead wires, and the provision of lead wires for driving a solenoid of the electric lock device also being necessary. Therefore, in the case of the installation of a plurality of electric lock devices, there are disadvantages that a plurality of lead wires and much time for the
10 construction thereof are required.

For the purpose of saving on wiring materials and simplifying the installation and maintenance, we have already proposed an electric lock system in which only two wires are required per electric device and states such as the opening and closing of a door and locking and unlocking operations can be monitored (U.S. Patent 4,053,939). However, since the functions of the proposed electric lock system are simple, the
15 functions thereof are not sufficient for incorporating it into a complex security system nor does monitoring provide all desirable indications. The present invention is intended to improve the preceding invention.

One object of the present invention is to provide an electric lock system in which the monitoring of the state of the locking and unlocking operation of the lock device and the state of the opening and closing of a door is carried out through two lead wires and it is possible automatically to monitor the open circuit or dis-
20 connected state or a short-circuit state of these two lead wires to improve the reliability of the system.

A further object is to provide an electric lock system in which, in an electric lock device arranged so as to be able to be unlocked by electrical remote operation and to be manually unlocked by the use of a key, the manual unlocking operation can be prevented by an electrical control.

A still further object is to provide an embodiment of an electric lock system which is of the so-called
25 hotel lock type, in which a lock of a door can be arranged to automatically lock when the door is closed again after the door has been opened once.

According to one aspect of the present invention, there is provided an electric lock system having an electric lock device for a door and a monitoring/controlling device for, over two lead wires, controlling the operation of said electric lock device and for monitoring the locked and unlocked state of the electric lock
30 device and the open or shut state of the door; the electric lock device comprising a locking latch, a solenoid for operating the latch, two diodes, and a change-over switch interlocking with the operation of said solenoid and connected in circuit with an exciting coil of the solenoid, with the diodes and with the leads, the change-over switch, and the diodes being arranged such that in one switch position current is able to flow in one direction through the coil and one of the diodes and in the other switch position current is able
35 to flow in the opposite direction through the coil and the other diode; there being a door switch connected in circuit with the electric lock device components such that the level of current flowing in one direction through the leads depends upon the open or closed state of the switch; and the monitoring/controlling device having a power source circuit connected to feed current to said leads and a monitoring device for monitoring the state of said lock device by monitoring current flowing through leads, the power source cir-
40 cuit having a switching arrangement to feed current to the coil via leads in one direction to effect opening of the latch, in the other direction to effect closing of the latch and via a current reducing resistance for monitoring the state of the electric lock system; characterised in that said door switch either has a door switch resistance connected in parallel therewith and this parallel combination is connected in series in one of the power supply leads to coil or has a door switch resistor connected in series therewith and this series
45 combination is connected across the supply leads in parallel with said coil and diode arrangement; and in that for monitoring purposes, said power supply feeds an alternating polarity voltage via said current reducing resistor to said leads, and the monitoring device comprises level indicating means for producing state signals indicating the level state of the current flowing through the circuit and an indicating device fed with signals representing the polarity of the monitoring alternating voltage and with said state signals and
50 which determines from these signals if the door is open, the door is closed and locked, the door is closed and unlocked, there is a short-circuit or there is a disconnection in the circuit.

According to a second aspect of the present invention there is provided an electric lock system having an electric lock device for a door and a monitoring/controlling device for, over two lead wires, controlling the operation of said electric lock device and for monitoring the locked and unlocked state of the electric
55 lock device and the open or shut state of the door; the electric lock device comprising a locking latch, a solenoid for operating the latch, two diodes and a change-over switch interlocking with the operation of said solenoid and connected in circuit with an exciting coil of the solenoid, with the diodes and with the leads, the change-over switch and the diodes being arranged such that in one switch position current is able to flow in one direction through the coil and one of the diodes and in the other switch position current
60 is able to flow in the opposite direction through the coil and the other diode; there being a door switch connected in circuit with the electric lock device components such that the level of current flowing in one direction through the leads depends upon the open or closed state of the switch; and the monitoring/controlling device having a power source circuit connected to feed current to said leads and a monitoring device for monitoring the state of said lock device by monitoring current flowing through leads, the power source
65 circuit having a switching arrangement to feed current to the coil via leads in one direction to effect opening

of the latch, in the other direction to effect closing of the latch and via a current reducing resistance for monitoring the state of the electric lock system; characterised in that a second electric lock device is provided, similar to said electric lock device and comprising a locking latch, a solenoid, diodes, and exciting coil, the second lock device being connected in parallel with said electric lock device to receive locking and
 5 unlocking operating current from said monitoring/controlling device; in that said first lock device is lock-able and unlockable by means of a key; in that unlocking signal generating means are provided for causing said monitoring/controlling device to supply unlocking current signals to said second electric lock device after said electric lock device is unlocked with a key; in that locking signal generating means are provided for causing said monitoring/controlling device to supply an unlocking current signal for said second electric
 10 lock device after said electric lock device is locked with a key; and in that an input portion of said unlocking signal generating means is provided selectively to prevent production of unlocking signals by the unlocking signal generator solely as a result of the use of the key to unlock the lock device.

Further general features of the invention are disclosed in claims 2, 3 and 5 to 8. For a better understanding of the present invention reference will now be made, by way of example, to the accompanying
 15 drawings in which;

Fig. 1 is a sectional view of one example of an electric lock device;

Fig. 2 is a circuit diagram of the electric lock device for explaining the operation of the electric lock device shown in Fig. 1;

Fig. 3 is a circuit diagram of a modification of a known electric lock system;

20 Fig. 4 is a circuit diagram of an embodiment of an electric lock system of the present invention;

Fig. 5 is a circuit diagram illustrating one example of an indicating device for the system of Fig. 4;

Fig. 6 is a circuit diagram illustrating another example of an indicating device for the system of Fig. 4;

Fig. 7 is a circuit diagram of another embodiment of the present invention;

Figs. 8A to 8I are timing charts for explaining the operation of the circuit shown in Fig. 7;

25 Fig. 9 is a circuit diagram of an additional circuit for use in the circuit of Fig. 7; and

Fig. 10 is a circuit diagram of an alternative to the additional circuit of Fig. 9.

The aspects of the present invention will be described hereinafter in conjunction with the attached drawings.

Fig. 1 shows an arrangement of an electric lock device used in an embodiment of the system of the
 30 present invention. A latch 3 inserted into a seat 2 and a self-sustaining solenoid 4 for maintaining the latch 3 in a locked state are incorporated into a casing 1 mounted on a door not shown. A movable iron core 5 of the solenoid 4 is mechanically connected with a change-over switch 6 by a connecting rod 7. One end of each of diodes 8 and 9 is connected to the change-over switch 6 and the other end of each of the diodes 8 and 9 is connected to a door switch 10 which is turned ON/OFF depending upon whether the door (not
 35 shown) is in an open or a closed state. The lock device of the constitution shown in Fig. 1 can be locked or unlocked by an electric signal applied to the solenoid 4 and, moreover, the arrangement enables it to be locked and unlocked by a key similarly to the conventionally known lock devices.

The operation of the electric lock device will be described with reference to Fig. 2. An exciting coil of the solenoid 4 is designated by reference numeral 11 in Fig. 2, and when the direction of flow of the exciting
 40 current through the exciting coil 11 is inverted, depending upon the direction of the exciting current, the movable iron core 5 moves from the position shown by the dotted line of Fig. 1 into the position shown by the solid line or from the position shown by the solid line into the position shown by the dotted line. After the movement, it remains at the position it has moved to even if the exciting current is cut off. In the example shown in this figure, the latch 3 is prevented from moving in the axial direction when it is
 45 sustained at the position shown by the solid line in Fig. 1 so that the lock device is in a locked state, whereas the lock device is in an unlocked state when the movable iron core 5 is sustained in the state shown by the dotted line.

In Fig. 2, when the current flows in the direction shown by the solid arrows when switch 6 is changed over to the position shown by the solid line, the current flows through the diode 8, the exciting current of an
 50 exciting coil 11 flows through the diode 8 and the movable iron core 5 is moved into the position shown by the solid line in Fig. 1 so that the lock device is locked.

In addition, during this operation, since the switch 6 is moved together with the movable iron core 5, when the movable iron core 5 is positioned at the position shown by the solid line, the switch 6 is changed over to be positioned at the position shown by the dotted line in Fig. 2. Therefore, in this case the diode 9
 55 prevents the current from flowing in the direction shown by the solid arrows, and there is only a slight flow of leak current in the diode 9.

That is, the electric lock device shown in Fig. 1 is arranged in such a way that the change-over state of the switch 6 is reversed when the operation of the self-sustaining solenoid 4 finishes and the current is rapidly reduced due to the action of the diodes 8 or 9 so as to prevent the consumption of superfluous
 60 current.

In addition, the solenoid 4 is not limited to a self-sustaining solenoid; a conventional non-self-sustaining solenoid may be used for the arrangement if it is given function equivalent to that of the solenoid 4. That is, on arrangement of two conventional solenoid exciting coils to each of which a diode is
 65 connected inversely to the other, and the two sets of exciting coils and the set of diodes connected in parallel may be inserted in place of the exciting coil 11 of Fig. 2. In accordance with such an arrangement,

just one of the two solenoids would be selectively operated by the action of the diodes, depending upon the direction of current flow in this circuit. Therefore, if each operation of these solenoids is interlocked with the well-known mechanical type latch mechanism, the two operations of locking and unlocking can be carried out.

5 Fig. 3 illustrates the circuit diagram of a modification of the electric lock system of U.S. Patent 4,053,939 for remote-controlling and monitoring the electric lock device arranged as described above by employing two lead wires. A control circuit 60 is connected to an electric lock device 61 by two lead wires 12. A control switch 13 is a switch which can be changed over to any one of positions A, B and C, but is normally at rest in the position B, and the switch is made so as to be able to be positioned at A or C manually. The control circuit 60 includes a resistor 14 and an a.c. power source 15, and diodes 16 and 17 enable the selection of the polarity of a voltage applied to the lead wires 12 by the power source 15 on the basis the switch 13 is changed-over to position A or position C. Reference numerals 18 and 19 designate indicators having polarity for carrying out the current monitoring/indicating, and for example, light emitting diodes or lamps connected in series with a diode may be employed. These indicators have characteristics whereby they 15 emit light when the voltage has been applied thereto in a forward direction and current flows, whereas there is barely any flow of current when the voltage is applied thereto in a reverse direction so that the indicator does not emit a light.

Assuming that the door is closed, the door switch 10 is closed. The control switch 13 is in the B position and an electric lock device 61 is in the locked state. At this time, the switch 6 is in the state shown by the 20 dotted line, as described above.

Therefore, in the condition described above, the current from the power source 15 flows through the switch 10, the diode 9, the switch 6, the exciting coil 11, the switch 13, the resistor 14 and the indicator 19, the said current never flowing in the reverse direction.

The resistance value of the resistor 14 is selected to be a sufficiently large value compared with the 25 resistance of the exciting coil 11 and of a value moreover necessary for lighting the indicator 19. Therefore, in the locked state, the self-sustaining solenoid 4 is not operated and the indicator 19 is lighted by the current flowing through the lead wires.

If the movable iron core 5 is pushed down by the use of the key of the door so that the electric lock device 61 is unlocked, since the switch 6 is linked with the movable iron core 5, the switch 6 reverses to 30 change over from the position shown by the dotted line to the position shown by the solid line. As a result, the current flows from the power source 15 to the indicator 18, through the resistor 14, the switch 13, the exciting coil 11, the switch 6, the diode 8 and the switch 10 lighting the indicator 18.

That is, whether the door is locked or not is distinguishable on the basis of the state of light emittance of the indicators 18 and 19.

35 Since the switch 10 is opened when the door is opened, the current in the lead wires does not flow in either direction, becoming zero, and neither of the indicators 18 and 19 light.

Next, the locking and unlocking operations for the electric lock device effected by remote operation, from the side of the drive device, will be described.

At first, the operation for locking the unlocked lock device will be described.

40 Since the switch 6 is switched over as shown by the solid line when the door is not locked by the electric lock device 61, when in this state the switch 13 is switched over manually into the position A, the resistor 14 is by-passed by the switch 13 so that the current from the power source 15 flows into a low impedance circuit. Consequently, sufficient current for driving the self-sustaining solenoid 4 flows into the driving coil 11, and the movable iron core 5 moves upwards so that the electric lock device locks. At the 45 same time, the switch 6 is switched over as shown by the dotted line, and because of the diodes 9 and 16, almost no current flows from the power source 15. In this condition, the self-sustaining solenoid 4 is maintained in the state at that time, so that the locked state can be confirmed by means of the indicator 19 if the switch 13 is switched back to the position B.

Moreover, at this time, since no current flows to the indicators 18 and 19 as long as the switch 13 is at 50 the position A, it is impossible to confirm the locked state of the electric lock device even when the electric lock device is in the locked state. Confirmation of the locked state can normally start to be done only after the switch 13 is switched back to position B.

However, since the time required to lock the lock device depends upon the operating time of the solenoid 4, and is not more than 1/10 of a second, the time is sufficiently short when the switch 13 is at 55 position A, so that there is no problem in practical use.

Next, to change from the locked state to the unlocked state by remote operation, the switch 13 is switched over to position C.

When this is done, a heavy current flows from the power source 15 to the exciting coil 11 through the diode 9 to actuate the self-sustaining solenoid 4, moving the movable iron core 5 to unlock the electronic 60 lock device.

Simultaneously, the switch 6 is switched to the state shown by the solid line so that the current flowing through the diode 9 is cut off.

Then, the unlocked state can be confirmed by the indicator 18 when the switch 13 is switched back to the position B.

65 Fig. 4 is a circuit diagram illustrating an embodiment of one aspect of the present invention. In the

system shown in Fig. 4, a resistor 20 is connected in parallel with the door switch 10 so that the system is able to distinguish between a break in the circuit and when the door has been opened.

Reference numeral 21 designates an interlocking switch wherein two movable contacts 21a and 21b are interlockedly switched to any one of the switching positions A', B' and C'. These movable contacts 21a and 21b are normally at rest in position B', but they can be changed manually to position A' or C'. The values of the resistors 22 and 23 can be decided in a similar way to that of the resistor 14 of Fig. 3. To the output of an oscillator 24 whose output signal C₁ alternates between "L" and "H" is connected an inverter 25 for obtaining an inverted output signal C₂ of the output signal C₁.

A relay 26 closes contact portions 26a and 26b when the above-mentioned output signal C₁ becomes "H". In the same way, a relay 27 closes contact portions 27a and 27b when the reverse output signal C₂ becomes "H". Since the signal C₁ and the signal C₂ are mutually opposite states, the relays 26 and 27 operate alternatively and a voltage with an alternating polarity is applied to the lead wires 12 in response to this.

A d.c. power source 28 acts as an a.c. power source for lead wires 12 when the movable contacts 21a and 21b are at the position B' through the operation of the relays 26 and 27. When the switch 21 is switched over to the position B', a current monitoring device 29 which measures the magnitude of the current flowing through the lead wires 12 and outputs a signal M₁ or M₂ in response to the magnitude of the current flowing therethrough. The signal M₁ is output when the current is not more than a low value and the signal M₂ is output when the current is more than a higher determined value. This device 29 may be arranged, for example, by employing a circuit combining a zener diode and a transistor, exciting coil and reed relay, a meter-relay or the like.

The current monitoring device 29 is arranged so as to send a signal for discriminating whether the current flowing therethrough is heavy, light or zero. The magnitude of the current mainly depends upon the resistance values of the resistors 20, 22 and 23, heavy current flowing when the resistor 20 is circumvented by the switch 10. The current value becomes low when the switch 10 is open.

The explanation will now be made of an example wherein the current monitoring device 29 is arranged by employing two meter-relays and the signal is sent in response to each current level state, high, low, or zero. However, one of the meter-relays produces a signal only when the current level is high and the other meter-relay produces a signal when the current level is more than a low level and, therefore, also at the high level.

An indicating device 30 indicates the state on the basis of the combination of the signal from the current monitoring device 29 and H level states of the signals C₁ and C₂ from the oscillator 24.

How to automatically monitor each state of normal, disconnected or short circuit of the lead wires, the locked state of the lock device and the opened/closed state of the door in such an arrangement, will be described.

If the door is closed and the lock device is in a locked state under the monitoring condition in which the switch 21 is switched to the B' position, since the switch 6 is switched over as shown by the dotted line, the current from the power source 28 flows through the current monitoring device 29, the contact portion 26a, the resistor 22, the switch 21, the switch 10, the diode 9, the switch 6, the exciting coil 11, the switch 21 and the contact portion 26b when the output signal C₁ of the oscillator 24 is "H", that is, when the contact portions 26a and 26b of the relay 26 are closed. The resistor 20 is bypassed by the switch 10, so that the value of the current flowing through the current monitoring device 29 at this time is large. When the signal C₂ becomes "H" level under this locked state, the contact portions 26a and 26b are opened and the contact portions 27a and 27b are closed. Therefore, although an opposite polarity of voltage is applied to the electric lock device, the current is prevented from flowing by the diode 9.

Since the switch 6 is switched over at the position shown by the solid line in the unlocked state, in contrast with the locked state, the current is prevented from flowing when the signal C₁ is "H" level and the current flows in the circuit when the signal C₂ is "H" level. The current flowing through the current monitoring device 29 at this time is also large. The current flowing through the current monitoring device 29 is large when the lead wires 12 are shorted mid-way, when both the signals C₁ and C₂ are "H" level, and there is no current in the circuit when the lead wires 12 are disconnected mid-way, even if the signals C₁ and C₂ are "H" level.

Since when the door is opened, the switch 10 is opened to insert the resistor 20 into the circuit, the current flowing through the current monitoring device 29 is reduced by that amount and becomes small.

Thus, the combination of the states of signals M₁ and M₂ which are sent from the current monitoring device 29 in accordance with the state of the door or the lock device and the states of signals C₁ and C₂ produced from the oscillator 24, are shown in Table 1. As shown in Table 1, each of the combination of states of the opened/closed door and locked/unlocked lock device, disconnection, and circuit short state is shown by the signal combinations which are different from each other. Therefore, each state can automatically be discriminated by the use of a simple logic circuit. In Table 1, "1" shows that the signal M₁ or M₂ is "H" level, and "0"

TABLE 1

5

STATE	DOOR CLOSED				DOOR OPEN		DISCON- NECTION		CIRCUIT SHORT		
	LOCKED		UNLOCKED								
10		C ₁ =H	C ₂ =H	C ₁ =H	C ₂ =H	C ₁ =H	C ₂ =H	C ₁ =H	C ₂ =H	C ₁ =H	C ₂ =H
15	M ₂	1	0	0	1	0	0	0	0	1	1
20	M ₁	1	0	0	1	0	1	0	0	1	1

shows that the signal M₁ or M₂ is "L" level.

Fig. 5 shows an example of the indicating device 30. The indicating device 30 comprises D type flip-flops 62 to 65, AND circuits 66 to 70, driving transistors 71 to 75 and indicating lamps 77 to 81 inserted between a power source 76 and each transistor. The output signal C₁ is input into the clock terminal CK of the D type flip-flop 62, the inverted output signal C₂ into clock terminals CK of the D type flip-flops 63, 64 and 65, and the signals M₁ and M₂ into input terminal D of each D type flip-flop as shown in the figure. Each of the D type flip-flops 62 to 65 latches the level state of the signal M₂ when the signal C₁ is at "H" level and the level state of the signal M₁ when the signal C₂ is at "H" level, and the output signals from these D type flip-flops are input into a logic circuit composed of AND circuits 66 to 70 and arranged in accordance with Table 1. As a result, the outputs from the AND circuits 66 to 70 represent the states of short circuit, locked, unlocked, door opened and disconnection, respectively. The result is indicated by the lamps.

In Fig. 4, a series circuit of a resistor 20' and the switch 10 may be arranged as shown by the dotted line in the figure instead of the parallel circuit of the resistor 20 and the switch 10. Since the resistor 20' is inserted into or disconnected from the electric lock device circuit in response to the opening/closing of the door switch 10 even when such a circuit arrangement is employed, it is possible to change the value of the current flowing through the current monitoring device 29.

In this case, the combination of the level states of the signals M₁ and M₂ and the "H" level state of the signals C₁ and C₂ are as shown in Table 2. As will be understood from Table 2, each state can be discriminated on the basis of the signals M₁, M₂, C₁ and C₂.

TABLE 2

45

STATE	DOOR CLOSED				DOOR OPEN		DISCON- NECTION		CIRCUIT SHORT	
	LOCKED		UNLOCKED							
	C ₁ =H	C ₂ =H	C ₁ =H	C ₂ =H	C ₁ =H	C ₂ =H	C ₁ =H	C ₂ =H	C ₁ =H	C ₂ =H
M ₂	1	0	0	1	0	1	0	0	1	1
M ₁	1	1	1	1	0	1	0	0	1	1

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Fig. 6 shows another embodiment of an indicating device arranged on the basis of Table 2. This indicating device is composed of D type flip-flops 82 to 87, AND circuits 88 to 92, transistors 93 to 97, lamps

98 to 102 and a power source 103. The basic operation of this circuit is the same as that of the circuit shown in Fig. 5, and the outputs of the AND circuits 88 to 92 represent the states of short circuit, locked, unlocked, door opened and disconnection respectively.

Fig. 7 shows a circuit of an embodiment of another aspect of the present invention. Figs. 8A to 8I are timing charts showing the operation of the circuit.

In Fig. 7, two electric lock devices 31 and 32 are connected in parallel by means of the lead wires 12. Although the electric lock device 31 is provided with a mechanism which enables the lock device to be opened by a key as mentioned above, the electric lock device 32 does not have such a mechanism so that the device 32 can be locked or unlocked only by the electrical control. Since the lock device 32 is so arranged that the bolt is directly driven by the iron core of the solenoid to move in or out, there is not provided a keyhole. These two lock devices are mounted on one door which can be opened only when both lock devices have become unlocked. The circuits in the electric lock devices 31 and 32 are designated by adding suffixes -1, -2 to the reference numeral of Fig. 3.

Numerals 33 and 34 designated photo-couplers employing light-emitting diodes and the output circuit becomes low in impedance when the voltage is applied to input circuit in a forward direction. The output signals 33a and 34a from photo-couplers 33 and 34 are derived as output signals S_1 and S_2 through inverters 35 and 36.

37 is a clock oscillator for generating a clock signal S_3 synchronizing with the period of the power source 15. The waveform of the power source voltage is shown in Fig. 8A and the waveform of the clock signal is shown in Fig. 8B.

38 is an inverter, 39 and 40 are D type positive edge flip-flops. The output signal is applied to the D terminal and the clock signal S_3 and its inverted signal $\bar{S}_3$ are applied to each clock terminal ϕ . These flip-flops will be referred to as FF_1 and FF_2 hereinafter.

41, 42 and 43 are AND circuits, 44 and 45 are transistors, and 46 is a relay whose exciting coil and contact point are designated by references RA and ra. 47 is also a relay whose exciting coil and contact point are designated by references RB and rb.

48 and 49 are manual operating switches, 50 is an outer contact point which is closed by reception of a signal from a fire alarm box to automatically unlock the lock device in an emergency, 51 is an input portion actuated by an outer signal which will be described hereinafter, and 52-1, 52-2 and 52-3 are pull-up resistors one end of each of which is connected to a d.c. power source for the inverters and the AND circuits.

In this circuit arrangement, when the transistor 44, the switch 48 or the outer contact point 50 is made, the relay 46 operates to switch over the contact point ra as shown by the dotted line, and the signal for unlocking is sent to the exciting coils 11-1 and 11-2 of the two electric lock devices 31 and 32 like in the circuit shown in Fig. 3 through diode 17 to unlock the electric lock devices 31 and 32.

Also, as well as the operation is described above, the relay 47 operates to switch over the contact point rb as shown by the dotted line when the transistor 45 or the switch 49 is closed, and the current for locking the lock device is sent to the exciting coils 11-1 and 11-2 of the electric lock devices 31 and 32 through diode 16 to lock the electric lock device.

The operation in this arrangement is different from that in the foregoing arrangement in the locking/unlocking operation effected by the key. The switches 6-1 and 6-2 are switched over as shown by the dotted lines when the two electric lock devices 31 and 32 are in the locked state, so that the circuit current is prevented from flowing by diodes 9-1 and 9-2. Therefore, the photo-coupler 33 is rendered inoperative, and the input terminal of the inverter 35 is at "H" level so that the signal S_1 is maintained at "L" level. On the other hand, the level of the output signal 34a from the photo-coupler 34 is alternately changed to "H" level or "L" level in response to the current flowing through the contact point 6-1 and the diode 9-1. Therefore, the Q output of FF_1 is maintained at "L" level, and FF_2 detects "H" level state of the signal S_2 by the fall of the signal S_3 so that the Q output thereof is maintained at "H" level (Fig. 8E and Fig. 8G).

When the electric lock device 31 is unlocked by the use of the key under such a state, the switch 6-1 is changed over to the state shown by the solid line at the time Z of Fig. 8C, so that the signal S_1 becomes "H" as shown in Fig. 8D. The signal S_1 makes the Q output of the FF_1 "H" at the time of the rise of the clock signal. Therefore, when the input portion 51 is "H" level state, the output of the AND circuit 41 becomes "H" level at the time X of Fig. 8 so that the transistor 44 is turned ON, and the relay is operated so that the unlocking command signal D_1 is sent to the electronic lock devices 31 and 32 through the lead wires 12 in the waveform shown in Fig. 8H.

That is, if the input portion 51 is "H" level, the electric lock device 32 also unlocks if the electric lock device 31 is unlocked by the use of a key, however, when the input portion 51 is "L" level, even if the electric lock device 31 is unlocked, the electric lock device 32 remains locked so that it is impossible to open the door. Therefore, so-called interlock function in which the unlocking of a door is prevented by the unlocked state of another door, can be realized by making the input portion 51 "L" level by the use of the unlocked state signal of another door. When it is required to restrict even a person possessing the key from entering the room within a certain time, it can be realized by maintaining the input portion 51 at "L" level during that time. As described above, it is possible to prevent the door from being opened by the use of the key only, if the specific unlock prevention signal is provided.

Next, the operation wherein the electric lock device 31 is locked by the use of the key at the time W in Fig. 8C when the electric lock devices 31 and 32 are in the unlocked state. At this time, the signal S_2

becomes "H" level as shown in the latter half of Fig. 8F, the Q output of FF₂ becomes "H" level at the fall time of the clock signal, a locking command signal D₂ which is the output signal of the AND circuit 41 becomes "H" level at the time Y in the figure and the transistor 45 is turned ON (Fig. 8I). In this case, the relay 47 is operated to send the locking command signal through the lead wires 12, so that the electric lock device 32 is also locked.

In addition, since the Q output of FF₁ indicates the unlocked state and the Q output of FF₂ indicates the locked state in the case of Fig. 7, these signals can be used for indicating, for alarms or the like. Since the current does not flow in the photo-couplers 33 and 34 when the door is opened, signals S₁ and S₂ both become "L" level so that both Q terminals of FF₁ and FF₂ become "L" level, that is, the inverted output $\bar{Q}$ terminals are at "H" level. If this is detected by the AND circuit 43, that the door is in an open state of the door can be known. Although the outputs of FF₁ and FF₂ overlap for a period that is half of the clock period at the time of the switch-over between unlocking and locking, it is so short that it can be ignored with regard to the indication lamp. However, when there is the possibility of the occurrence of the erroneous operation of the arm device or the like, an integrator is provided before the alarm device to make it insensitive to short signals, so it is easily possible to ignore signals of this time period.

Fig. 9 illustrates an example of the circuit arrangement of an additional circuit 200 which is added to the circuit shown in Fig. 7 for the purpose of forming a lock device which is automatically locked when the door is closed after the door has been opened once (this will be referred to as a hotel lock device hereinafter). The door open signal S₄ is input to an AND circuit 55 through an inverter 54 and, furthermore, the output signal from a memory 53 is also applied thereto. The output signal from the AND circuit 55 is applied to an actuator 56 and to the connecting point between the relay 47 and the switch 49 through a manual operating switch 57 for automatically locking.

When the door is opened once, the door open signal S₄ is sent from the AND circuit 43. The memory circuit 53 memorizes the door open signal S₄ and sends a signal to the AND circuit 55. Since the signal from the inverter 54 is at "L" level at this time, the output from the AND circuit is also at "L" level. Next, when the door is closed, the signal from the AND circuit 43 becomes "L" level and the output of the inverter 54 becomes "H" level. The AND circuit 55 is opened in accordance with the output from the inverter 54 and the signal from the memory circuit 53, and the signal of "H" level is applied to the actuator 56. The actuator 56 applies the signal to the relay 47 via the manual switch 57 to de-energize the relay 47. At the same time the memory content of the memory circuit 53 is erased. When the relay 47 is energized, as described above, the electric lock device is locked.

Thus, when the switch 57 is closed, this electric lock device can possess the function of a hotel lock so that once a person opens the door and exits, and the door has closed, the person cannot re-enter the room without the key.

Although the switch 57 is turned ON/OFF by the manual operation in the embodiment shown in Fig. 9, it is also possible to arrange so as to automatically close the switch 57 for a predetermined time period, e.g. for the night time. According to the arrangement described above, even if the locking operation is forgotten at the closing of an office or the like, the door is automatically locked without the locking operation with the key when the last person goes out. It is very easy to realize a timer device for automatically opening or closing the switch 57 at a predetermined time by means of a conventional circuit.

Fig. 10 shows another embodiment of an additional circuit 203 having the same function as that of the additional circuit shown in Fig. 9. This additional circuit 203 comprises a relay 58 having contact points rc-1 and rc-2 which are operated by the energization of the coil RC, a power source 59, a capacitor 201 and a relay 204 having a contact point rd operated by the energization of a coil RD.

The operation of the circuit of Fig. 10 will be described. When the door is opened, the relay 58 is actuated by the signal S₄ from the AND circuit 43. Since the contact point rc-1 is a make contact, it is switched as shown by the dotted line when the relay 58 is operated, so that the capacitor 201 is charged. The capacitor 201 is used instead of the memory circuit 53. The contact point rc-2 is a break contact, and it is at the position shown by the dotted line during the period the relay 58 is operating, that is, the period the door is open. The contact point rc-2 has the same function as that of the AND circuit 55 shown in Fig. 9. The relay 58 is rendered inoperative when the door is closed, and the contact points rc-1 and rc-2 are returned to the positions shown by the solid lines. The discharge current from the capacitor 201 flows into the relay 204 when the contact point rc-2 is closed, and the relay 204 is actuated. Thus, the relay 47 is operated by the operation of the make contact rd to carry out the locking operation. The relay 204 acts as the actuator 56 of Fig. 9.

Although the examples of additional circuits are arranged using relay circuits, the present invention is not limited to the relay circuit and an additional circuit which can attain the same aims may be arranged by utilizing conventional semi-conductor techniques or the combination of relay and semi-conductor.

60 Claims

1. An electric lock system having an electric lock device (61) for a door and a monitoring/controlling device (60) for, over two lead wires (12), controlling the operation of said electric lock device (61) and for monitoring the locked and unlocked state of the electric lock device (61) and the open or shut state of the door; the electric lock device (61) comprising a locking latch (3), a solenoid (4) for operating the latch, two

diodes (8, 9), and a change-over switch (6) interlocking with the operation of said solenoid (4) and connected in circuit with an exciting coil (11) of the solenoid, with the diodes (8, 9) and with the leads (12), the change-over switch, and the diodes being arranged such that in one switch position current is able to flow in one direction through the coil (11) and one of the diodes and in the other switch position current is able to flow in the opposite direction through the coil and the other diode; there being a door switch (10) connected in circuit with the electric lock device components such that the level of current flowing in one direction through the leads (12) depends upon the open or closed state of the switch; and the monitoring/controlling device (60) having a power source circuit (13, 15, 16, 17) connected to feed current to said leads (12) and a monitoring device (18, 19) for monitoring the state of said lock device by monitoring current flowing through leads (12), the power source circuit having a switching arrangement (13, 21) to feed current to the coil (11) via leads (12) in one direction to effect opening of the latch (3), in the other direction to effect closing of the latch (3) and via a current reducing resistance (14, 22, 23) for monitoring the state of the electric lock system; characterised in that said door switch (10) either has a door switch resistance (20) connected in parallel therewith and this parallel combination is connected in series in one of the power supply leads to coil (11) or has a door switch resistor (20') connected in series therewith and this series combination is connected across the supply leads in parallel with said coil (11) and diode (8, 9) arrangement; and in that for monitoring purposes said power supply feeds an alternating polarity voltage via said current reducing resistor to said leads (12), and the monitoring device (60) comprises level indicating means (29) for producing state signals indicating the level state of the current flowing through the circuit and an indicating device (30) fed with signals representing the polarity of the monitoring alternating voltage and with said state signals and which determines from these signals if the door is open, the door is closed and locked, the door is closed and unlocked, there is a short-circuit or there is a disconnection in the circuit.

2. An electric lock system according to claim 1 wherein said level indicating means (29) produces a first state signal if the monitoring current exceeds a first level, and a second state signal if the monitoring current exceeds a second higher level.

3. An electric lock system according to claim 1 or wherein the alternating polarity voltage is produced using a reversing switch arrangement (26, 26a, 26b; 27, 27a, 27b) between a DC voltage source (28) and said switching arrangement (21), a clock pulse source (24) connected to control said reversing switch arrangement to cyclically reverse the polarity of the voltage fed from the DC voltage source (28) to said switching arrangement (21) and wherein said indicating device (30) is coupled to receive output from said clock pulse source (24) to use in its comparison function.

4. An electric lock system having an electric lock device (31) for a door and a monitoring/controlling device (60) for, over two lead wires (12), controlling the operation of said electric lock device (31) and for monitoring the locked and unlocked state of the electric lock device (31) and the open or shut state of the door; the electric lock device (31) comprising a locking latch (3), a solenoid (4) for operating the latch, two diodes (8, 9) and a change-over switch (6) interlocking with the operation of said solenoid (4) and connected in circuit with an exciting coil (11) of the solenoid, with the diodes (8, 9) and with the leads (12), the change-over switch and the diodes being arranged such that in one switch position current is able to flow in one direction through the coil (11) and one of the diodes and in the other switch position current is able to flow in the opposite direction through the coil and the other diode; there being a door switch (10) connected in circuit with the electric lock device components such that the level of current flowing in one direction through the leads (12) depends upon the open or closed state of the switch; and the monitoring/controlling device (60) having a power source circuit (13, 15, 16, 17) connected to feed current to said leads (12) and a monitoring device (33, 34) for monitoring the state of said lock device by monitoring current flowing through leads (12), the power source circuit having a switching arrangement (13, 21) to feed current to the coil (11) via leads (12) in one direction to effect opening of the latch (3), in the other direction to effect closing of the latch (3) and via a current reducing resistance (14, 22, 23) for monitoring the state of the electric lock system; characterised in that a second electric lock device (32) is provided, similar to said electric lock device (31) and comprising a locking latch (3), a solenoid (4), diodes (8-2, 9-2), and exciting coil (11-2), the second lock device (32) being connected in parallel with said electric lock device (31) to receive locking and unlocking operation current from said monitoring/controlling device (60); in that said first lock device is lockable and unlockable by means of a key: in that unlocking signal generating means (39, 41 RA) are provided for causing said monitoring/controlling device (60) to supply unlocking current signals to said second electric lock device (32) after said electric lock device (31) is unlocked with a key; in that locking signal generating means (40, 42 RB) are provided for causing said monitoring/controlling device (61) to supply an unlocking current signal for said second electric lock device (32) after said electric lock device (31) is locked with a key; and in that an input portion (51) of said unlocking signal generating means is provided selectively to prevent production of unlocking signals by the unlocking signal generator solely as a result of the use of the key to unlock the lock device (31).

5. An electric lock system according to claim 4 wherein said input portion (51) is arranged to operate in accordance with the locked or unlocked state of a second door.

6. An electric lock system according to claim 3 or 4 including a circuit (43, rc-1) for generating an open door indicating signal when the door is open; a memory unit (53, 201) for storing said open door indicating signal; a gating arrangement (55, rc-2) designed to give an output if said open door indicating signal is absent and if an open door indicating signal is stored in said memory unit (53); a driving device (56, RD)

coupled to receive the output from said gate arrangement and the output of which driving device is coupled to said locking signal generating means (47) to cause the generation of a locking signal current when the door is closed after having been opened.

7. An electric lock system according to claim 6 wherein an additional switch (57) is provided between said driving device (56, RD) and the locking generating signal arrangement (47) to enable said locking arrangement to be disconnected.

8. An electric lock system according to claim 7 wherein said switch (57) is a time switch such that said locking arrangement may be time-programmed.

10 Revendications

1. Système de serrures électriques comportant une serrure électrique (61) pour une porte et un dispositif de contrôle et de commande (60) destiné par deux fils conducteurs (12) à commander le fonctionnement de ladite serrure électrique (61) et à contrôler l'état verrouillé et déverrouillé de la serrure électrique (61) et l'état d'ouverture et de fermeture de la porte, la serrure électrique (61) comportant un pêne de verrouillage (3), un électro-aimant (4) pour actionner le pêne, deux diodes (8, 9) et un commutateur à permutation (6) associé avec le fonctionnement dudit électro-aimant (4) et connecté en circuit avec une bobine d'excitation (11) de l'électro-aimant, avec les diodes (8, 9) et avec les conducteurs (12), le commutateur à permutation et les diodes étant agencés de manière que dans une position du commutateur, un courant puisse circuler dans un sens par la bobine (11) et l'une des diodes et que dans l'autre position du commutateur, un courant puisse circuler dans le sens opposé par la bobine et l'autre diode; un commutateur de porte (10) étant connecté en circuit avec les composants de la serrure électrique de manière que l'intensité du courant qui circule dans un sens par le conducteur (12) dépende de l'état d'ouverture ou de fermeture du commutateur, et le dispositif de contrôle et de commande (60) comportant un circuit de source d'alimentation (13, 15, 16, 17) connecté pour fournir un courant auxdits fils (12) et un dispositif de contrôle (18, 19) pour contrôler l'état de ladite serrure en contrôlant le courant qui circule par les fils (12), le circuit de source d'alimentation comportant un dispositif de commutation (13, 21) pour fournir un courant à la bobine (11) par les fils (12) dans un sens pour assurer l'ouverture du pêne (3), dans l'autre sens pour effectuer la fermeture du pêne (3) et par une résistance de réduction de courant (14, 22, 23) pour contrôler l'état du système de serrures électriques, caractérisé en ce que ledit commutateur de portes (10) comporte une résistance de commutateurs de portes (20) connectée en parallèle avec lui et cette combinaison en parallèle étant connectée en série dans l'un des conducteurs d'alimentation vers la bobine (11), ou une résistance de commutateur de portes (20') connectée en série avec lui et cette combinaison en série étant connectée entre les conducteurs d'alimentation en parallèle avec ladite bobine (11) et lesdites diodes (8, 9), et en ce que, pour un but de contrôle, ladite source d'alimentation fournit une tension de polarité alternative par ladite résistance de réduction de courant auxdits conducteurs (12), et le dispositif de contrôle (60) comportant un dispositif indicateur de niveau (29) qui produit des signaux d'état indiquant l'état du niveau du courant qui circule dans le circuit et un dispositif indicateur (30) qui reçoit des signaux représentant la polarité de la tension alternative de contrôle et lesdits signaux d'état et qui détermine à partir de ces signaux, si la porte est ouverte, si la porte est fermée et verrouillée, si la porte est fermée et déverrouillée, s'il existe un court-circuit ou une déconnexion dans le circuit.

2. Système de serrures électriques selon la revendication 1, dans lequel ledit dispositif indicateur de niveau (29) produit un premier signal d'état si le courant de contrôle dépasse un premier niveau et un second signal d'état si le courant de contrôle dépasse un second niveau plus élevé.

3. Système de serrures électriques selon la revendication 1 ou 2, dans lequel la tension de polarité alternative est produite en utilisant un dispositif de commutateurs inverseurs (26, 26a, 26b, 27, 27a, 27b) entre une source de tension continue (28) et ledit dispositif de commutation (21), une source d'impulsions d'horloge (24) connectée pour commander ledit dispositif de commutation inverseur afin d'inverser cycliquement la polarité de la tension fournie par la source de tension continue (28) audit dispositif de commutation (21) et dans lequel ledit dispositif indicateur (30) est couplé pour recevoir la sortie de ladite source d'impulsions d'horloge (24) pour l'utiliser dans sa fonction de comparaison.

4. Système de serrures électriques comprenant une serrure électrique (31) pour une porte et un dispositif de contrôle et de commande (60) destiné, par deux fils conducteurs (12) à commander le fonctionnement de ladite serrure électrique (31) et à contrôler l'état verrouillé et déverrouillé de la serrure électrique (31) et l'état d'ouverture et de fermeture de la porte; la serrure électrique (31) comportant un pêne de verrouillage (3), un électro-aimant (4) pour actionner le pêne, deux diodes (8, 9) et un commutateur à permutation (6) associé avec le fonctionnement dudit électro-aimant (4) et connecté en circuit avec une bobine d'excitation (11) de l'électro-aimant, avec les diodes (8, 9) et avec les conducteurs (12), le commutateur à permutation et les diodes étant agencés de manière que dans une position du commutateur, le courant puisse circuler dans un sens par la bobine (11) et l'une des diodes et que dans l'autre position du commutateur, un courant puisse circuler dans le sens opposé par la bobine et l'autre diode; un commutateur de porte (10) étant connecté en circuit avec les composants de la serrure électrique de manière que le niveau du courant circulant dans un sens par les conducteurs (12) dépende de l'état d'ouverture ou de fermeture du commutateur; et le dispositif de contrôle et de commande (60) comportant un circuit de source d'alimentation (13, 15, 16, 17) connecté pour fournir un courant auxdits conducteurs (12) et un dispositif de

- contrôle (33, 34) pour contrôler l'état de ladite serrure en contrôlant le courant qui circule par les conducteurs (12), le circuit de source d'alimentation comportant un dispositif de commutation (13, 21) pour fournir un courant à la bobine (11) par les conducteurs (12) dans un sens pour effectuer l'ouverture du pêne (3), dans l'autre sens pour effectuer la fermeture du pêne (3) et par une résistance de réduction de courant (14, 22, 23) pour contrôler l'état du système de serrures électriques, caractérisé en ce qu'il comporte une
- 5 seconde serrure électrique (32) similaire à ladite serrure électrique (31) et comportant un pêne de verrouillage (3), un électro-aimant (4), des diodes (8-2, 9-2) et un enroulement d'excitation (11-2), la seconde serrure (32) étant connectée en parallèle avec ladite serrure électrique (31) pour recevoir un courant de commande de verrouillage et de déverrouillage provenant dudit dispositif de contrôle et de commande
- 10 (60); en ce que ladite première serrure peut être verrouillée et déverrouillée au moyen d'une clé; en ce qu'un générateur de signal de déverrouillage (39, 41, RA) est prévu pour que le dispositif de contrôle et de commande (60) fournisse des signaux de courant de déverrouillage à ladite seconde serrure électrique (32) après que ladite serrure électrique (31) a été déverrouillée avec une clé; en ce qu'un dispositif générateur de signaux de verrouillage (40, 42, RB) est prévu pour que ledit dispositif de contrôle et de commande (61)
- 15 fournisse un signal de courant de déverrouillage pour ladite seconde serrure électrique (32) après que ladite serrure électrique (31) a été verrouillée avec une clé; et en ce qu'une partie d'entrée (51) dudit générateur de signal de déverrouillage est prévue sélectivement pour interdire la production de signaux de déverrouillage par le générateur de signaux de déverrouillage, seulement sous l'effet de l'utilisation de la clé pour déverrouiller la serrure (31).
- 20 5. Système de serrures électriques selon la revendication 4, dans lequel ladite partie d'entrée (51) est agencée pour fonctionner selon l'état verrouillé ou déverrouillé d'une seconde porte.
6. Système de serrures électriques selon la revendication 3 ou 4, comprenant un circuit (43 Rc-1) pour produire un signal indicateur de porte ouverte, lorsque la porte est ouverte; une unité de mémoire (53, 201) pour mémoriser ledit signal indicateur de porte ouverte; un circuit à portes (55, Rc-2) réalisé pour produire
- 25 une sortie si ledit signal indicateur de porte ouverte est absent et si un signal indicateur de porte ouverte est mémorisé dans ladite unité de mémoire (53); un dispositif de commande (56, RD) connecté pour recevoir la sortie dudit circuit à portes et dont la sortie est couplée avec ledit générateur de signal de verrouillage (47) pour entraîner la production d'un courant de signal de verrouillage quand la porte est fermée après avoir été ouverte.
- 30 7. Système de serrures électriques selon la revendication 6, dans lequel un commutateur supplémentaire (57) est prévu entre ledit dispositif de commande (56, RD) et le générateur de signal de verrouillage (47) pour autoriser la déconnexion dudit dispositif de verrouillage.
8. Système de serrures électriques selon la revendication 7, dans lequel ledit commutateur (57) est un commutateur temporisé de manière que ledit dispositif de verrouillage puisse être programmé dans le
- 35 temps.

Patentansprüche

1. Elektrisches Verschlusssystem mit einer elektrischen Schloßvorrichtung (61) für eine Tür und einer
- 40 Überwachungs- und Steuereinrichtung (60) zur über zwei Verbindungsdrähte (12) erfolgenden Steuerung des Betriebes der elektrischen Schloßvorrichtung (61) und zur Überwachung des gesperrten und ungesperrten Zustandes der elektrischen Schloßvorrichtung (61) sowie des offenen oder geschlossenen Zustandes der Tür, wobei die elektrische Schloßvorrichtung (61) eine Falle (3), ein Solenoid (4) zur Betätigung der Falle, zwei Dioden (8, 9) und einen mit dem Betrieb des Solenoides (4) gekuppelten sowie
- 45 mit der Erregerspule (11) des Solenoides, mit den Dioden (8, 9) sowie den Drähten (12) zu einem Schaltkreis zusammengeschalteten Umschalter (6) aufweist, der mit den Dioden derart angeordnet ist, daß in seiner einen Schaltstellung Strom in einer Richtung durch die Spule (11) sowie eine der Dioden fließt und in seiner anderen Schaltstellung Strom in der Gegenrichtung durch die Spule (11) sowie die andere Diode fließt, wobei eine mit den Bestandteilen der elektrischen Schloßvorrichtung derart in einen Schaltkreis ge-
- 50 schalteter Türschalter (10) vorgesehen ist, daß der Pegel des in einer Richtung durch die Drähte (12) fließenden Stromes vom offenen oder geschlossenen Zustand des Schalters abhängt, und wobei die Überwachungs- und Steuereinrichtung (60) einen zur Speisung der Drähte (12) mit Strom angeschlossenen Speisekreis (13, 15, 16, 17) und eine Überwachungseinrichtung (18, 19) zur Überwachung des Zustandes der Schloßvorrichtung durch Überwachung des durch die Drähte (12) fließenden Stromes aufweist,
- 55 welcher Speisekreis eine Schaltanordnung (13, 21) zur Stromanspeisung der Spule (11) über die Drähte (12) in der einen Richtung zur Bewirkung der Öffnung der Falle (3), in der anderen Richtung zur Bewirkung des Schließens der Falle (3) und über einen stromvermindernden Widerstand (14, 22, 23) zur Überwachung des Zustandes des elektrischen Verschlusssystems besitzt, dadurch gekennzeichnet, daß der Türschalter (10) entweder einen hierzu parallel geschalteten Türschalter-Widerstand (20), wobei diese Parallelschaltung mit
- 60 einem der Speisekreisdrähte zur Spule (11) in Reihe geschaltet ist, oder einen hiemit reihengeschalteten Türschalter-Widerstand (20') aufweist, wobei diese Reihenschaltung parallel zur Spule (11) und der Dioden-anordnung (8, 9) an die Speisedrähte angeschlossen ist, daß zu Überwachungszwecken der Speisekreis die Drähte (12) über den stromvermindernden Widerstand mit einer Spannung von wechselnder Polarität speist, daß die Überwachungseinrichtung (60) eine Pegelanzeigeeinrichtung (29) zur Erzeugung von
- 65 Zustandssignalen, welche den Pegel des durch den Schaltkreis fließenden Stromes anzeigen, und eine

Anzeigeeinrichtung (30) aufweist, der die Polarität der wechselnden Überwachungsspannung darstellende Signale und die Zustandssignale zugeführt sind und die aus diesen Signalen feststellt, ob die Tür offen ist, die Tür geschlossen und gesperrt ist, die Tür offen ist, die Tür geschlossen und gesperrt ist, die Tür geschlossen und unversperrt ist, ob es einen Kurzschluß oder eine Unterbrechung im Schaltkreis gibt.

5 2. Elektrisches Verschußsystem nach Anspruch 1, dadurch gekennzeichnet, daß die Pegelanzeigeeinrichtung (29) ein erstes Zustandssignal, wenn der Überwachungsstrom einen ersten Pegel überschreitet, und ein zweites Zustandssignal erzeugt, wenn der Überwachungsstrom einen zweiten, höheren Pegel überschreitet.

3. Elektrisches Verschußsystem nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß die Spannung
10 mit wechselnder Polarität unter Verwendung einer zwischen einer Gleichspannungsquelle (28) und der Schaltanordnung (21) vorgesehenen Umkehrschaltanordnung (26, 26a, 27, 27a, 27b) und einer Taktimpulsquelle (24) erzeugt wird, die zur Steuerung der Umkehrschaltanordnung zum zyklischen Umkehren der Polarität der von der Gleichspannungsquelle (28) an die Schaltanordnung (21) abgegebenen Spannung angeschlossen ist, und daß die Anzeigeeinrichtung (30) zum Empfang der Ausgangssignale der Taktimpulsquelle (24) zur Verwendung bei ihrer Vergleichsfunktion angeschlossen ist.

4. Elektrisches Verschußsystem mit einer elektrischen Schloßvorrichtung (31) für eine Tür und einer Überwachungs- und Steuereinrichtung (60) zur über zwei Verbindungsdrähte (12) erfolgenden Steuerung des Betriebes der elektrischen Schloßvorrichtung (31) und zur Überwachung des gesperrten und ungesperrten Zustandes der elektrischen Schloßvorrichtung (31) sowie des offenen oder geschlossenen
20 Zustandes der Tür, wobei die elektrische Schloßvorrichtung (31) eine Falle (3), ein Solenoid (4) zur Betätigung der Falle, zwei Dioden (8, 9) und einen mit dem Betrieb des Solenoides (4) gekuppelten sowie mit der Erregerspule (11) des Solenoides, mit den Dioden (8, 9) sowie den Drähten (12) zu einem Schaltkreis zusammengesetzten Umschalter (6) aufweist, der mit den Dioden derart angeordnet ist, daß in seiner einen Schaltstellung Strom in einer Richtung durch die Spule (11) sowie eine der Dioden fließt und in seiner
25 anderen Schaltstellung Strom in der Gegenrichtung durch die Spule sowie die andere Diode fließt, wobei ein mit den Bestandteilen der elektrischen Schloßvorrichtung derart in einen Schaltkreis geschalteter Türschalter (10) vorgesehen ist, daß der Pegel des in einer Richtung durch die Drähte (12) fließenden Stromes vom offenen oder geschlossenen Zustand des Schalters abhängt, und wobei die Überwachungs- und Steuereinrichtung (60) einen zur Speisung der Drähte (12) angeschlossenen Speisekreis (13, 15, 16, 17) und
30 eine Überwachungseinrichtung (33, 34) zur Überwachung des Zustandes der Schloßvorrichtung durch Überwachung des durch die Drähte (12) fließenden Stromes aufweist, welcher Speisekreis eine Schaltanordnung (13, 21) zur Stromanspeisung der Spule (11) über die Drähte (12) in der einen Richtung zur Bewirkung der Öffnung der Falle (3) in der anderen Richtung zur Bewirkung des Schließens der Falle (3) und über einen stromvermindernden Widerstand (14, 22, 23) zur Überwachung des Zustandes des elektrischen Verschußsystems besitzt, dadurch gekennzeichnet, daß eine der elektrischen Schloßvorrichtung (31) ähnliche zweite elektrische Schloßvorrichtung (32) vorgesehen ist, die eine Falle (3), ein Solenoid (4),
35 Dioden (8-2, 9-2) und eine Erregerspule (11-2) aufweist und parallel zur elektrischen Schloßvorrichtung (31) zur Speisung mit Sperren und Entsperrern bewirkendem Strom von der Überwachungs- und Steuereinrichtung (60) angeschlossen ist, daß die erste Schloßvorrichtung mit Hilfe eines Schlüssels sperrbar und entsperrbar ist, daß eine Entsperrsignal-Generatoreinrichtung (39, 41 RA) vorgesehen ist, die die Überwachungs- und Steuereinrichtung (60) zur Abgabe von Entsperrstromsignalen an die zweite elektrische Schloßvorrichtung (32) nach Entsperrern der elektrischen Schloßvorrichtung (31) mittels eines Schlüssels steuert, daß eine Sperrsignal-Generatoreinrichtung (40, 42 RB) vorgesehen ist, die die Überwachungs- und Steuereinrichtung (61) zur Abgabe eines Entsperrstromsignales an die zweite elektrische Schloßvorrichtung (32) nach Sperren der elektrischen Schloßvorrichtung (31) mittels eines Schlüssels steuert, und daß
45 ein Eingangsteil (51) der Entsperrsignal-Generatoreinrichtung wahlweise vorgesehen ist, der die Erzeugung von Entsperrsignalen durch den Entsperrsignal-Generator bloß als Ergebnis der Verwendung des Schlüssels zum Entsperrern der Schloßvorrichtung (31) verhindert.

5. Elektrisches Verschußsystem nach Anspruch 4, dadurch gekennzeichnet, daß der Eingangsteil (51)
50 zum Betrieb in Abhängigkeit vom gesperrten oder ungesperrten Zustand einer zweiten Tür ausgebildet ist.

6. Elektrisches Verschußsystem nach Anspruch 3 oder 4, gekennzeichnet durch einen Schaltkreis (43, rc-1) zur Erzeugung eines die offene Tür anzeigenden Signales bei offener Tür, eine Speichereinheit (53, 201) zur Speicherung dieses Anzeigesignales, eine Gatterschaltung (55, rc-2), die zur Abgabe eines Ausgangssignales bei Nichtauftreten des Anzeigesignales und bei Speicherung eines Anzeigesignales in der
55 Speichereinheit (53) ausgebildet ist, eine zur Speisung mit dem Ausgangssignal der Gatterschaltung angeschlossene Treiberstufe (56, RD), deren Ausgangssignal der Sperrsignal-Generatoreinrichtung (47) zur Erzeugung eines Sperrsignalstromes, wenn die Tür nach ihrem Öffnen geschlossen wird, zugeführt ist.

7. Elektrisches Verschußsystem nach Anspruch 6, dadurch gekennzeichnet, daß ein zusätzlicher Schalter (57) zwischen der Treiberstufe (56, RD) und der Sperrsignal-Generatoreinrichtung (47) zum
60 Abschließen dieser Einrichtung vorgesehen ist.

8. Elektrisches Verschußsystem nach Anspruch 7, dadurch gekennzeichnet, daß der Schalter (47) ein Zeitschalter ist, sodaß die Einrichtung zeitprogrammierbar ist.

Fig. 1

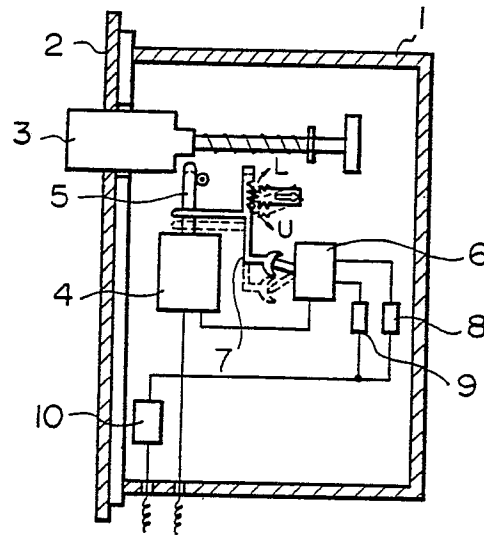


Fig. 2

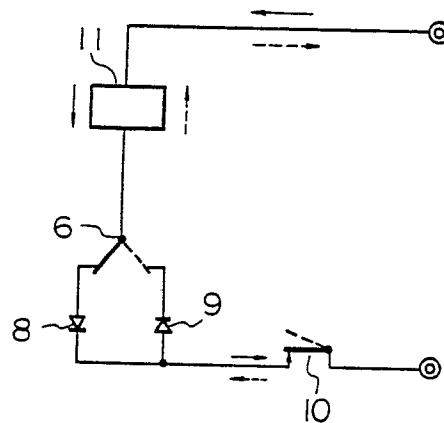


Fig. 3

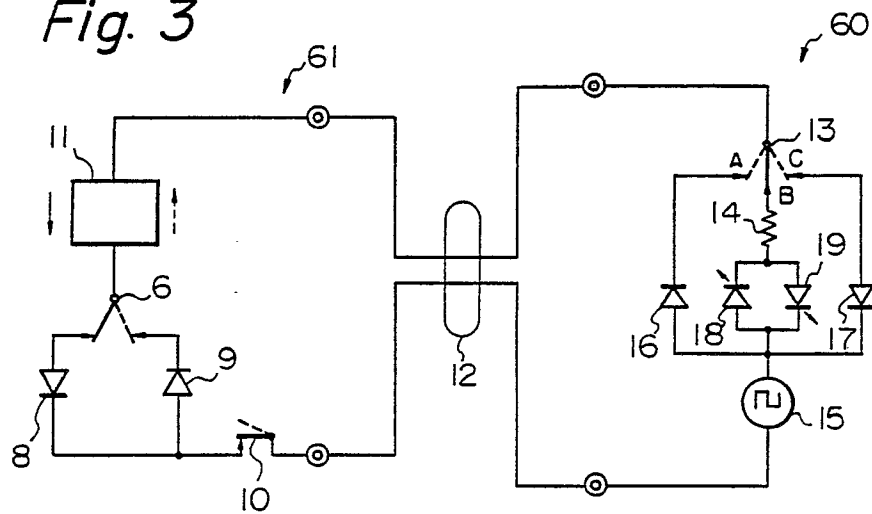


Fig. 4

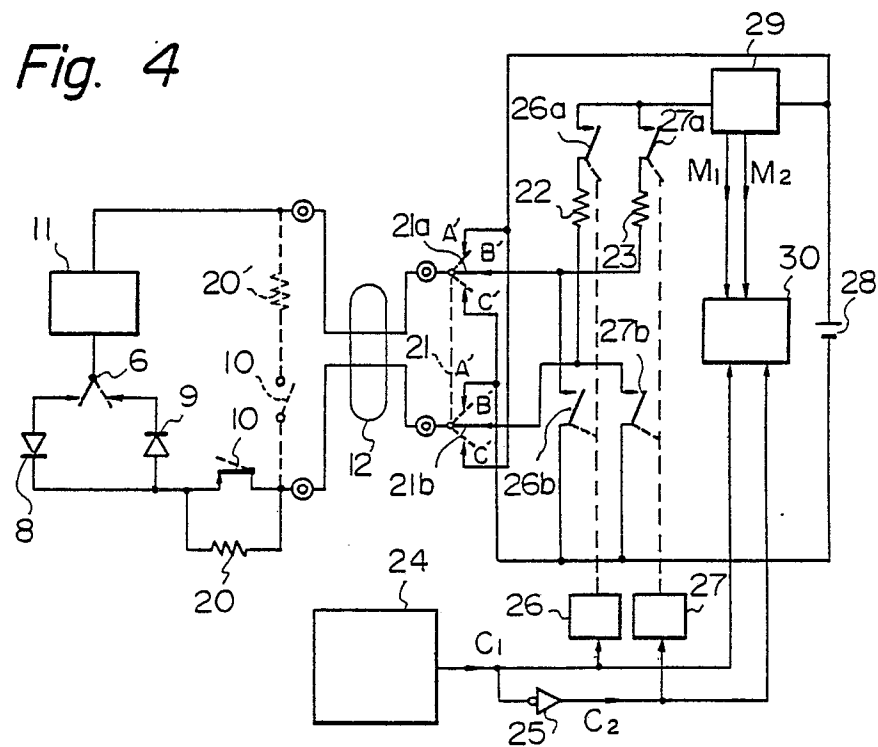


Fig. 5

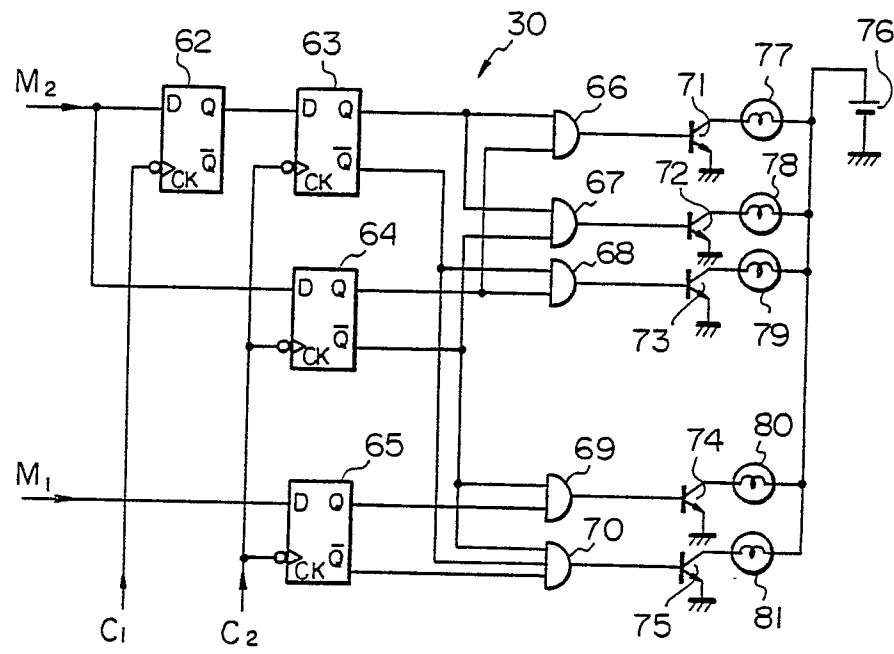


Fig. 6

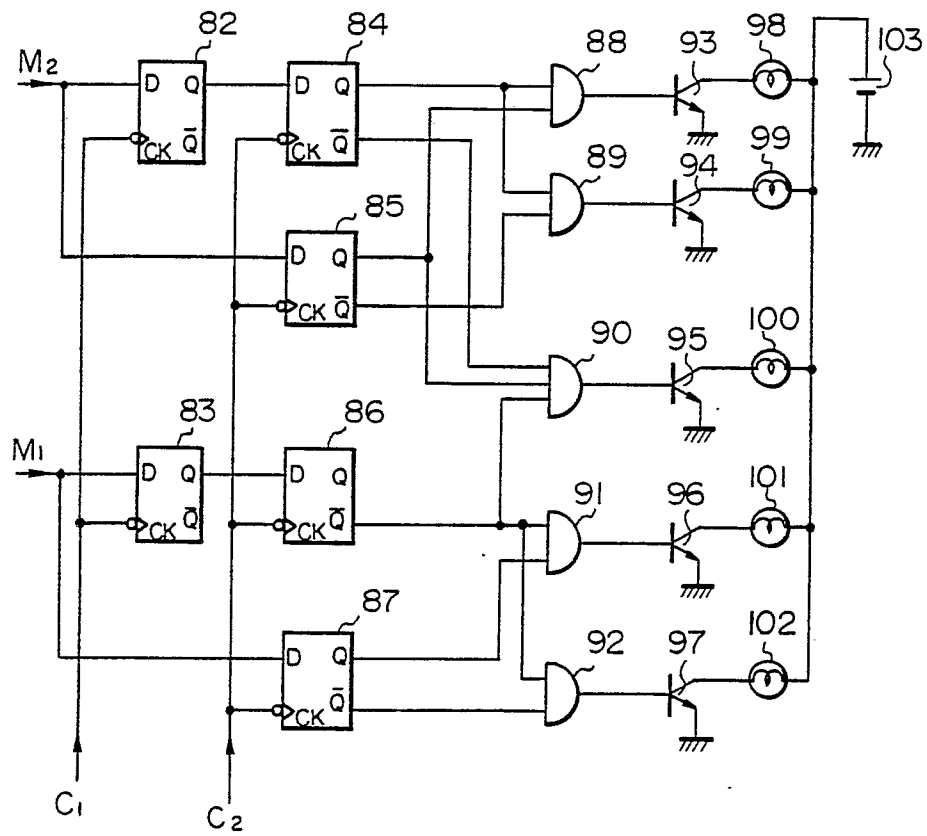


Fig. 7

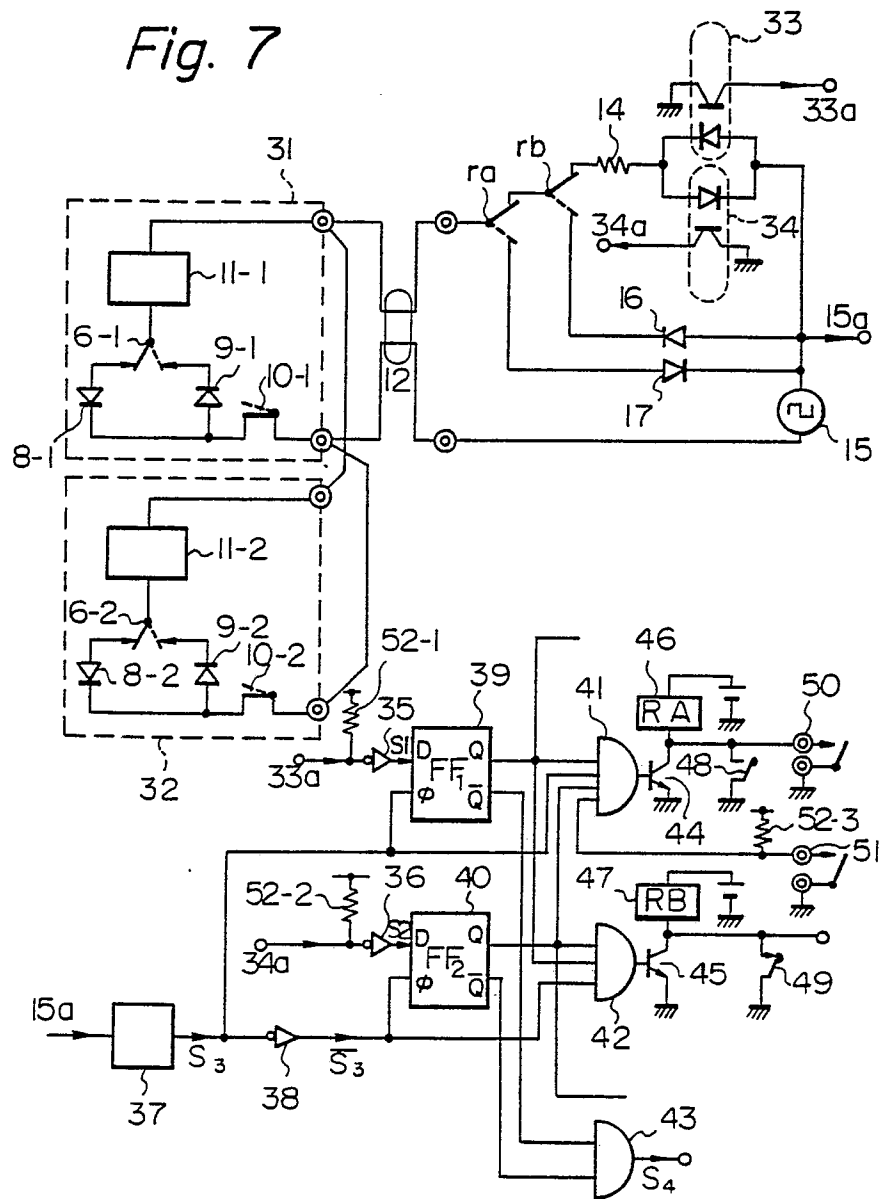


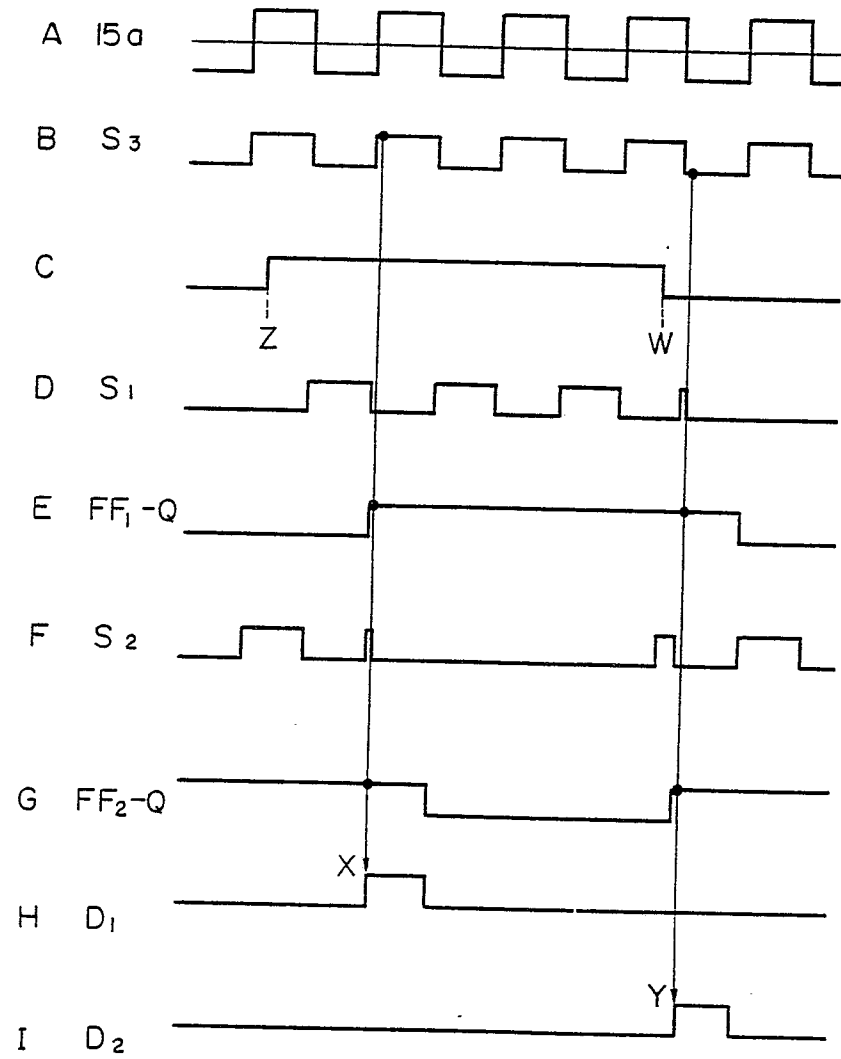
Fig. 8

Fig. 9

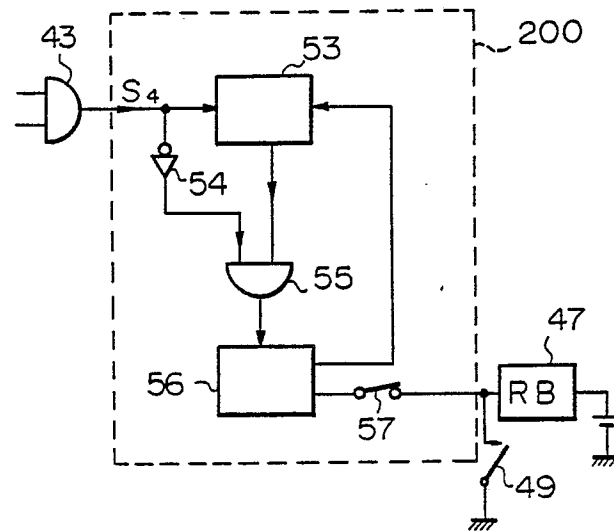


Fig. 10

