

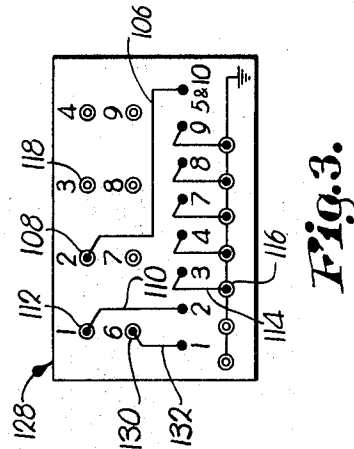
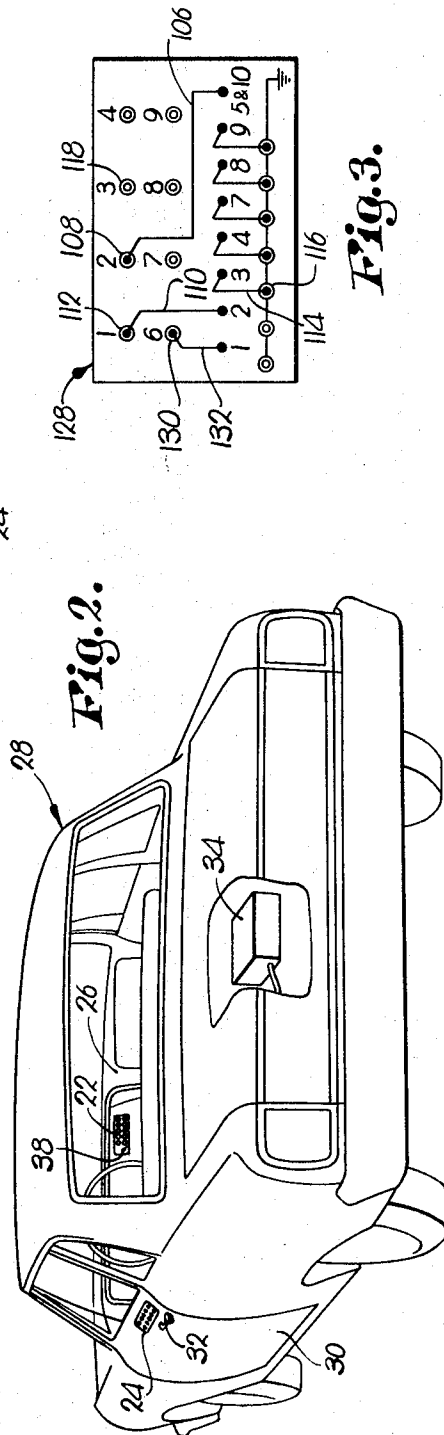
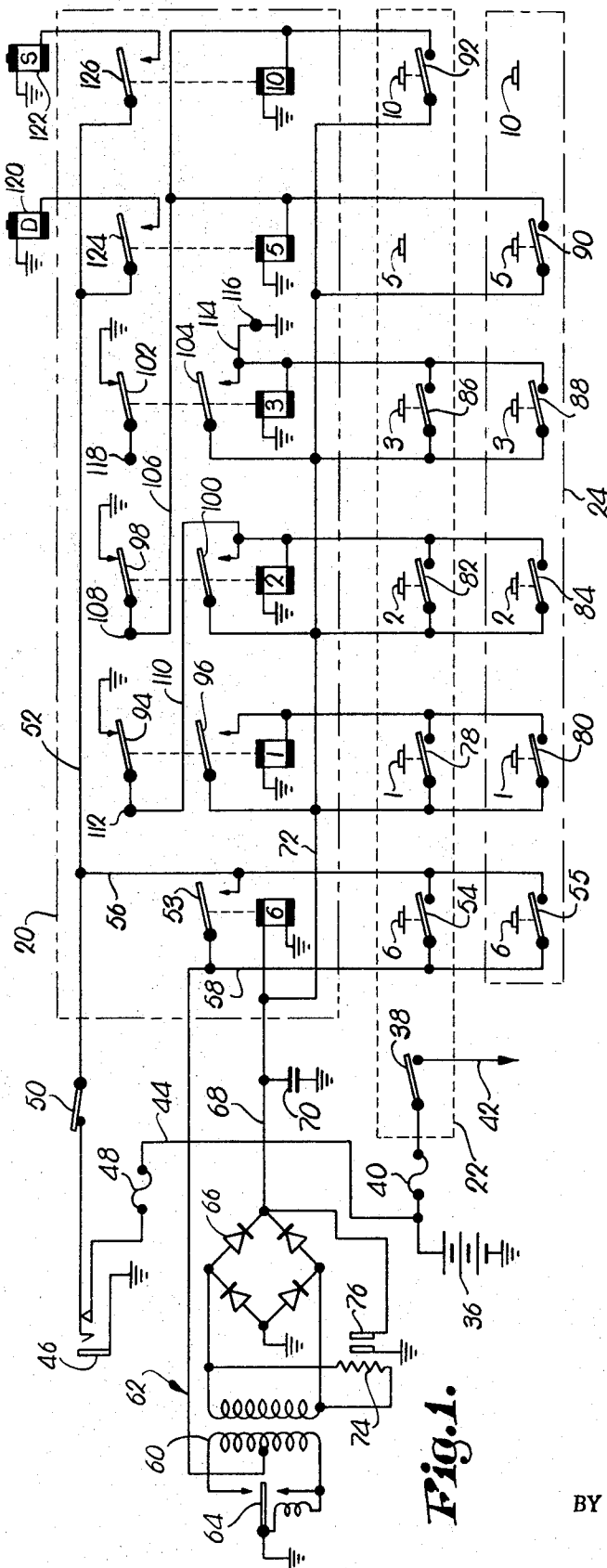
Dec. 1, 1970

D. D. GAUMER ET AL

3,544,804

SEQUENCE INITIATED ELECTRICAL ACTIVATOR

Filed Dec. 16, 1968



INVENTORS.

David D. Gaumer
Charles D. Hanna
Charles E. Bailey
Leighton E. Trickel

BY *Schmidt, Johnson, Novey,*
Williams & Bradley,
ATTORNEYS.

1

2

3,544,804

SEQUENCE INITIATED ELECTRICAL ACTIVATOR

David D. Gaumer, 1330 N. Walnut, Kingman, Kans. 67068; Charles D. Hanna, 525 N. Anna, Wichita, Kans. 67212; and Charles E. Bailey, W. 2nd St.; and Leighton E. Trickle, N. Chariton St., both of Kingman, Kans. 67068

Filed Dec. 16, 1968, Ser. No. 784,032

Int. Cl. B60r 25/04

U.S. Cl. 307—10

10 Claims

ABSTRACT OF THE DISCLOSURE

A security system especially adapted for an automotive vehicle employs a register which establishes a security combination through the use of a plurality of electrical components, such as relays, operable only in a predetermined sequence. Keyboards on the driver's door and the dash have numbered keys or push buttons which actuate switches that, in turn, operate the components within the register. When the proper combination is formed by sequential actuation of the keys, a lock release solenoid in the door or the starter circuit for the vehicle engine may be operated to open the door or start the vehicle. Additional keys are provided on each keyboard to minimize the possibility of guessing the combination, resetting of the register being effected if any of such additional keys are depressed or if the keys representing the combination are actuated in other than the proper order. The combination is readily changed through the use of a plug and jack patch panel which may be locked within the trunk of the vehicle.

Statistics indicate that a major factor contributing to the high incidence of auto theft is that a significant number of automobile owners frequently leave their vehicles unlocked or with the ignition key in place in the ignition switch. This, of course, invites theft and, in spite of the frequent urging of law enforcement officials, failure to lock or remove the key from a parked vehicle continues to be a widespread practice. Furthermore, even the most well intended owner may occasionally forget and may thus inadvertently leave a vehicle in an unsecure condition.

Another factor contributing both to auto theft and the breaking and entering of commercial establishments is the inability of the mechanical, key-operated lock to provide a maximum safeguard. Only a certain number of key configurations are available for locks of a given type, therefore one cannot be assured that a key of proper configuration is not in the hands of a potential intruder. The foregoing considerations would, of course, suggest the use of mechanical combination locks, but such locks have a number of obvious disadvantages in that they are slow to operate, require precise manipulation and are oftentimes relatively easy to "crack" or decode, and the combination of a particular lock is not easily changed.

It is, therefore, an important object of the present invention to provide a security system which utilizes a combination and yet does not possess the disadvantages of mechanical type combination locks.

Another important object of this invention is to provide a security system of the combination type which may be rapidly operated without difficult manipulation under adverse light conditions by one having knowledge of the combination.

Another important object of the invention is to provide a system as aforesaid in which the correct combination is not detectable by feel or observation or other identification.

Specifically, still another important object of the invention is to provide a security system wherein an electrically operable register is utilized which establishes the security combination, and wherein a keyboard is employed having keys which must be operated in a predetermined order determined by the register.

As a corollary to the last object above, it is an important aim of this invention to provide such a system in which the likelihood of guessing the correct combination is substantially minimized by virtue of the provision of additional keys not a part of the combination which, if actuated, reset the register and require that the keys representing the combination be exclusively sequentially actuated in the proper order.

Furthermore, it is an important object of the present invention to provide a security system having an electrically operable register that establishes a security combination and in which the combination may be easily changed by altering electrical connections within the register.

Yet another important object is to provide a security system as aforesaid for an automotive vehicle wherein the combination must be known in order to open a door into the passenger compartment and start the vehicle engine.

In furtherance of the last object above, it is an important aim of this invention to provide keyboards on the door and dash of an automotive vehicle having keys which must be operated in the proper order in accordance with a known combination before entry may be gained to the passenger compartment and the vehicle engine rendered operational.

In the drawing:

FIG. 1 is an electrical schematic diagram of the security system adapted for use on an automotive vehicle;

FIG. 2 is a perspective view of the vehicle showing the locations of the two keyboards and the unit containing the register, patch panel, and associated circuitry of the system; and

FIG. 3 is a diagrammatic representation of the patch panel showing the arrangement of the plugs and the jacks for the selected combination.

Referring to FIG. 1, a register for establishing a security combination is contained within a broken line box designated 20, a starter panel or keyboard is diagrammatically represented by a broken line box 22, and a door panel or keyboard is diagrammatically represented by a broken line box 24. The physical locations of the keyboards 22 and 24 are illustrated in FIG. 2 where it may be seen that the keyboard 22 is mounted on the dash 26 of a motor vehicle 28 within the passenger compartment thereof. The keyboard 24 is mounted on the door 30 adjacent the driver's seat. When closed, the door 30 is maintained in a locked condition at all times except when the lock is released in a manner to be subsequently described. The door keyboard 24 is mounted just above the usual door handle 32 provided on the outside of the door 30 which is grasped to pull the door open as the lock is released. A portion of the trunk of the vehicle 28 is broken away to reveal a unit 34 which houses register 20 and associated electrical circuitry to be described.

In FIG. 1 the battery 36 of the vehicle is shown having its negative terminal grounded to the vehicle chassis as indicated by the ground symbol. The positive terminal of battery 36 is connected to an ignition switch 38 through a fuse 40. The ignition switch 38 is illustrated as forming a part of the starter keyboard 22 and is in series between the battery 36 and a lead 42 that extends to the ignition circuit (not shown) of the vehicle engine. A lead 44 connects the positive terminal of battery 36 to a jack 46 through a fuse 48. The jack 46 may be mounted inside

3

the front fender of the vehicle 28, for example, and provides a means of bypassing battery 36 and connecting an auxiliary battery to the system in the event that the battery 36 should become discharged. The jack 46 normally provides a closed circuit from lead 44 to a reset switch 50 which is held closed by the door 30 until the latter is opened. The switch 50 may be mounted in the jamb of door 30 in the same manner as conventional interior courtesy light switches.

The reset switch 50 is in series with a lead 52 which comprises a low voltage power lead for the register 20. Ten bistate electrical components in the form of electro-mechanical relays are employed in register 20, six of such relays being illustrated in FIG. 1. Their coils are designated by the numerals 6, 1, 2, 3, 5 and 10 respectively. A relay switch 53 is operated by relay coil 6 and has its normally open contact connected to a lead 56 extending from power lead 52, the lead 56 being connected to the normally open contacts of two parallel connected, single-pole push button switches 54 and 55. The push button switch 54 is in the starter keyboard 22, while the other switch 55 is in the door keyboard 24. The push buttons thereof are designated by the numeral 6 to correspond to the associated relay coil 6, and comprise keys of the keyboards 22 and 24 along with other such push buttons to be subsequently described. The keys are readily seen in FIG. 2 and are arranged in two rows of five keys on each of the keyboards 22 and 24.

A lead 58 is connected to the movable poles of the two push button switches 54 and 55 and extends to the center tap of the primary winding of a step-up transformer 60 which forms a part of a DC to DC converter 62. A vibrator 64 is connected to the primary winding of transformer 60 and the secondary winding thereof feeds a bridge rectifier network 66. The positive output of network 66 is delivered along a lead 68 to one connection of the relay coil 6, the negative side of the network output and the other connection to coil 6 being grounded. A filter capacitor 70 is connected across lead 68 and ground. Since the voltage of the battery 36 at the present time in most vehicles is 12 volts, the converter 62 is employed to raise the voltage to 24 volts for application to the components of the register 20, a high voltage power lead 72 being connected to lead 68. The higher voltage lessens the wire size required for cables interconnecting the two keyboards 22 and 24 and the unit 34.

The maximum time of operation of the converter 62 is limited by a thermal time delay relay having a filament 74 connected across the secondary winding of transformer 60, and a pair of normally open contacts 76 connected in series between lead 68 and ground. The contacts 76 close after a predetermined time such as, for example, two minutes.

One electrical side of each of the relay coils 1, 2, 3, 5 and 10 is permanently grounded as indicated by the symbols. A pair of parallel connected, single-pole, normally open push button switches 78 and 80 associated with keyboards 22 and 24 respectively are connected in series between high voltage power lead 72 and the other electrical side of relay coil 1. This same basic arrangement is employed for relay coils 2 and 3, a pair of parallel connected push button switches 82 and 84 and a pair of parallel connected push button switches 86 and 88 being connected in series between lead 72 and relay coils 2 and 3 respectively. A single push button switch 90 in the door keyboard 24 is connected in series between lead 72 and relay coil 5, and a single push button switch 92 in the starter keyboard 22 is connected in series between lead 72 and relay coil 10. The push buttons of switches 78-92 are designated by the numerals 1, 2, 3, 5 and 10 to correspond with the associated relay coils 1, 2, 3, 5 and 10 respectively. The various keys formed by the push buttons are numbered on their faces for identification by the numbers 1 through 10 in accordance with the corresponding relay coils 1 through 10, but it will be noted that a switch for

4

the button or key 5 on the starter keyboard 22 and a switch for the key 10 on the door keyboard 24 are not provided for reasons which will become clear hereinafter.

A pair of relay switches 94 and 96 are operated by relay coil 1, pairs of relay switches 98, 100 and 102, 104 being operably associated with relay coils 2 and 3 respectively. Each of the switches 96, 100 and 104, upon closure thereof, provide a holding circuit for the respective relay. Each of the relay switches 94, 98 and 102 has its normally closed contact connected to ground as indicated.

The common connections of relay coils 5 and 10 and their associated push button switches 90 and 92 are both connected to the pole of relay switch 98 by a lead 106. The connection is effected via a jack 108 which is connected to the pole of switch 98. As will be discussed hereinafter, the lead 106 terminates in a plug which mates with jack 108. In similar fashion, the common connection of relay coil 2 and its push button switches 82 and 84 is connected to the pole of relay switch 94 by a lead 110 which plugs into a jack illustrated at 112. A lead 114 is connected to the common connection of relay coil 3 and its push button switches 86 and 88 and is plugged into a grounded jack illustrated at 116. The movable pole of the relay switch 102 is also connected to a jack 118 but this jack is not used in the illustrated circuit setup.

A pair of control devices in the nature of a lock release solenoid 120 for the door 30 and a starter solenoid 122 are connected to the normally open contacts of a pair of relay switches 124 and 126 respectively. The switch 124 is operated by the armature of relay coil 5, and the switch 126 is operated by the armature of relay coil 10. The movable poles of both of the switches 124 and 126 are connected to the low voltage power lead 52.

OPERATION

The register 20 establishes a security combination which, in the illustrated arrangement, is represented by the numbers 6, 1 and 2, in that order, followed by either 5 or 10. The sequence 6-1-2-5 is the combination used to unlock the door 30, and the sequence 6-1-2-10 is the combination required in order to start the engine of the vehicle 28. It is assumed for purposes of illustration that the operator of the vehicle, who has knowledge of the combination, is approaching the vehicle, the latter having been previously left unattended with the windows raised and the doors locked. As mentioned above, the door 30 is always locked except during opening and closing thereof, this being the case since it is required that the door unlock solenoid 120 be energized in order to release the lock.

Having knowledge of the basic combination 6-1-2, the operator sequentially depresses the push buttons or keys on keyboard 24 bearing 6, 1 and 2 as numerical identification. Referring to FIG. 1, it may be seen that depressing the key 6 on the door keyboard 24 effects momentary closure of switch 55 to energize the primary winding of the transformer 60 of converter 62 via the following circuit: From battery 36 along lead 44 to auxiliary power jack 46, through switch 50 and along lead 52 to lead 56, and through switch 55 and along lead 58 to transformer 60. This energizes the vibrator 64 and places the converter 62 in operation, whereupon the output voltage delivered along lead 68 energizes relay coil 6 to close relay switch 53. This provides a holding circuit through switch 53 to maintain the converter 62 in operation after the key 6 is released.

With relay coil 6 energized and high voltage now present on lead 72, actuation of the second key 1 of the combination in the door keyboard 24 momentarily closes switch 80 to energize relay coil 1, the latter then being held energized through its relay switch 96. When the operator then depresses key 2 of the door keyboard 24, closure of switch 84 effects energization of relay coil 2 in the same manner, the latter holding through its relay switch 100. The operator may now depress key 5 to close

5

switch 90 and energize relay coil 5, whereupon switch 124 is closed to energize the door unlock solenoid 120. It is preferred, however, that the door handle 32 be mechanically connected to switch 90 so that actuation of the door handle or associated door button, as the case may be, will cause closure of switch 90 to energize solenoid 120 without the need to hold key 5 depressed while opening the door 30. This would be done strictly as a matter of convenience so that the door 30 may be opened by a one-hand operation.

It is evident that key 6 must be depressed first in order to make power available for the energization of the other relays of the register 20. It is now assumed that an error is made and that key 2 is the second key depressed. Since relay coil 1 is not energized, its relay switch 94 is in the position illustrated; therefore, closure of switch 84 by actuation of key 2 shorts the high voltage power lead 72 directly to ground through switch 84, lead 110, and switch 94. When this occurs, relay coil 6 is de-energized and switch 53 opens, removing power from the converter 62. The register 20 is thus completely reset since any relay coil therein previously energized is now de-energized and returned to its standby state. The operator must now begin the sequential combination again and complete the sequence correctly in order to open the door 30.

The error illustrated above could have been honestly committed or could represent an attempt by a would-be intruder to gain entrance to the passenger compartment. A more likely situation, however, would be that the intruder would happen to depress key 6 first but would then depress another key such as key 3 in an attempt to identify the combination. It may be seen that the actuation of key 3 immediately resets the register 20 since the normally open contact of switch 88 is grounded by lead 114. It is to be understood that all of the other unused relay coils 4, 7, 8 and 9 (not shown) are also grounded on both sides in the same manner as relay coil 3 so that actuation of any key other than the keys forming the proper combination effects complete resetting of the register 20. Furthermore, depressing key 5 before key 2 is actuated has the same effect by virtue of the lead 106 which is grounded through relay switch 98 until such time that the relay coil 2 is energized.

When the operator opens the door 30 to enter the vehicle 28 after having correctly formed the proper combination through actuation of the appropriate keys of the door keyboard 24, the reset switch 50 opens to break the power circuit to the converter 62 and reset the register 20. Thus, it is now required that the operator form the combination on the keys of the starter keyboard 22. The door is, of course, reclosed so that operating voltage is made available to the converter 62 upon closure of switch 54 by actuation of the key 6. The operation proceeds as before except that, after finishing the basic combination 6-1-2, the operator then depresses key 10 to close switch 92, thereupon relay coil 10 is energized to close switch 126 and activate the starter solenoid 122. It should be understood that the starter solenoid 122 forms a part of the usual starter circuit associated with an internal combustion engine, causing energization of a starter motor (not shown) which cranks the engine to effect starting thereof. The ignition circuit is illustrated as separately energized by closure of the ignition switch 38. It may now be appreciated that the key 5 on the starter keyboard 22 and the key 10 on the door keyboard 24 are dummy keys included so a would-be thief will not be able to readily determine which keys effect the starting and door unlock functions. Resetting of the register 20 is effected by closure of the contacts 76 of the time delay relay, which immediately reopen so that restarting may be quickly effected in the event that the engine should stall.

A patch panel 128 is illustrated in FIG. 3 and would be housed within unit 34. The panel 128 provides a means of rapidly changing the combination as may be desired

6

for maximum security. The jacks and corresponding leads referred to above with respect to FIG. 1 are identified in FIG. 3 by their reference numerals. Although the patch panel 128 is illustrated diagrammatically, the manner in which the combination is formed is clearly portrayed. Eight leads extend from panel 128 and are identified by the numerals "1," "2," "3," "4," "7," "8," "9" and "5 and 10." These leads extend from the correspondingly numbered relay coils in the manner as illustrated for lead 114 which is plugged into the grounded jack 116. The row of grounded jacks of which jack 116 is a part is provided so that all of the relays not used to form the combination may be grounded in the manner as illustrated for relay 3 to effect resetting of register 20 as discussed when one not having knowledge of the combination attempts to operate either of the keyboards. The jacks labelled "1," "2," "3," "4," "6," "7," "8" and "9" are connected to one of the switches operated by the correspondingly designated relay coils in the manner as illustrated in FIG. 1 and described above for jacks 112, 108 and 118. An exception to this is jack 130 labelled "6" on the patch panel 128, the jack 130 being a dummy jack since relay coil 6 is always first to be energized. Therefore, to form the combination 6-1-2 and 5 or 10, the lead 132 (FIG. 3) from relay coil 1 is plugged into the dummy jack 130 to simply store the lead 132. Thus, the only connections to relay coil 1 are as illustrated in FIG. 1 so that it is the only coil that may be energized after coil 6 is energized and high voltage is made available on lead 72. The third numeral of the combination is formed by plugging lead 110 into jack 112 and finally, therefore, lead 106 is plugged into jack 108. From the foregoing, it may be readily appreciated that any combination can be formed beginning with 6 and ending with 5 or 10.

In the event that the battery 36 should become discharged while the vehicle 28 is parked and locked, the auxiliary power jack 46 provides a means of operating the door unlock solenoid 120. It is presupposed that the hood of the vehicle 28 is latched by a solenoid controlled release so that the hood cannot be raised to gain access to the battery 36. To avoid breaking into the vehicle, a plug (not shown) and attached leads are stored on the exterior of the vehicle 28 for use when such a condition arises. Thus, a fresh battery brought to the vehicle 28 may be connected to the plug and the latter inserted in the jack 46 to disconnect the battery 36 from lead 52 and substitute the external battery therefor.

If desired, all of the doors of the vehicle 28 may be provided with unlock solenoids, and door keyboards may be provided on both front doors. When the system is utilized as a combination lock for the doors of commercial establishments or for other security applications, it may be desirable to connect the system to an alarm which would sound in the event that the keys are actuated in the wrong sequence, indicating that some one who likely does not have knowledge of the combination is attempting to gain illegal access.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. Sequentially initiated electrical apparatus comprising: an electrically operable register establishing a security combination and having a plurality of operational states each representing a component of said combination;
- a keyboard having a plurality of keys operably coupled with said register and sequentially actuatable in an order to cause the register to sequentially assume said operational states thereof in accordance with said combination;
- a control device coupled with said register, the latter conditioning said device for operation when the register assumes its last operational state in response to actuation of a corresponding key following sequen-

tial operation of the register through the preceding states thereof,

said register including a plurality of electrically operable components corresponding to said components of the combination, each of said electrically operable components thereof, defining a corresponding operational state of the register,

there being additional electrically operable components and said keyboard having additional keys for operating corresponding additional components;

circuit means operably associated with the first mentioned electrically operable components and coupled with said additional components for returning any operated component of said first mentioned components to its standby state to reset the register in response to operation of one of said additional components, whereby to require exclusive sequential actuation of the first mentioned keys in said order before the register assumes the last operational state thereof;

first selectively connectable and disconnectable connection means between certain of the first mentioned electrically operable components interconnecting the same to define said order of actuation of the first mentioned keys; and

second selectively connectable and disconnectable connection means interconnecting said additional components and said circuit means,

said first and second connection means being selectively operable to change said order and establish a new combination selected from all of said keys, and connect the electrically operable components omitted from the new combination with said circuit means.

2. Apparatus as claimed in claim 1,

there being means coupled with said register for returning the latter to a standby condition to reset the register upon actuation of any of said first mentioned keys out of said order, whereby to require said first mentioned keys to be actuated in said order without error before the register assumes the last operational state thereof.

3. Apparatus as claimed in claim 1,

said device comprising lock releasing means adapted to be operably associated with a normally locked door, whereby to provide an electrical combination lock having a combination that may be selectively changed for maximum security.

4. A security system for an automotive vehicle having a circuit for rendering the prime mover of the vehicle operational, and a door for the passenger compartment thereof which is normally locked, said system comprising:

an electrically operable register establishing a security combination and having a plurality of operational states each representing a component of said combination;

first and second keyboards adapted for disposition on said door and in said compartment respectively, and each having a plurality of keys operably coupled with said register and sequentially actuatable in an order to cause the register to sequentially assume said operational states thereof in accordance with said combination;

lock releasing means for said door coupled with said register;

switching means adapted for disposition in said compartment for control by the vehicle operator, said switching means being coupled with said register and adapted to be coupled with said circuit for activating the latter,

said register conditioning said lock releasing means for operation and conditioning said switching means for circuit-activating operation when the register assumes its last operational state in response to actuation of a corresponding key of either of said keyboards following sequential operation of the register through the preceding states thereof; and

means coupled with said register for returning the latter to a standby condition to reset the register in response to opening of said door, whereby to require actuation of the keys of said second keyboard in said order after entering the passenger compartment before the vehicle may be operated.

5. The system as claimed in claim 4,

there being means coupled with said register for returning the latter to said standby condition to reset the register upon actuation of any of said keys of either keyboard out of said order,

each of said keyboards having at least one additional key; and

circuitry operably associated with said register for returning the latter to said standby condition to reset the register in response to actuation of the additional key of either keyboard, whereby to also require that the first mentioned keys of either keyboard be exclusively actuated in said order without error before the register assumes the last operational state thereof.

6. The system as claimed in claim 4,

said register including a plurality of electrically operable components corresponding to said components of the combination, each of said electrically operable components having a standby state and, upon operation thereof, defining a corresponding operational state of the register,

there being additional electrically operable components and each of said keyboards having additional keys for operating corresponding additional components;

circuit means operably associated with the first mentioned electrically operable components and coupled with said additional components for returning any operated component of said first mentioned components to its standby state to reset the register in response to operation of one of said additional components, whereby to require exclusive sequential actuation of the first mentioned keys in said order before the register assumes the last operational state thereof;

first selectively connectable and disconnectable connection means between certain of the first mentioned electrically operable components interconnecting the same to define said order of actuation of the first mentioned keys; and

second selectively connectable and disconnectable connection means interconnecting said additional components and said circuit means,

said first and second connection means being selectively operable to change said order and establish a new combination for each keyboard selected from all of the keys thereof, and connect the electrically operable components omitted from the new combination with said circuit means, whereby to permit the combination to be selectively changed for maximum security.

7. The system as claimed in claim 6,

said first and second connection means including a plurality of jacks representing corresponding electrically operable components and operably coupled therewith, a plurality of jacks operably coupled with said circuit means, and a plurality of plugs representing corresponding electrically operable components and operably coupled therewith for selective insertion into said jacks.

8. In an automotive vehicle having a circuit for rendering the prime mover of the vehicle operational, the combination with said circuit of:

an electrically operable register establishing a security combination and having a plurality of operational states each representing a component of said security combination;

a keyboard having a plurality of keys operably coupled with said register and sequentially actuatable in an order to cause the register to sequentially assume said

9

operational states thereof in accordance with said security combination;
 operator controlled switching means coupled with said register and coupled with said circuit for activating the latter,
 said register conditioning said switching means for circuit-activating operation when the register assumes its last operational state in response to actuation of a corresponding key following sequential operation of the register through the preceding states thereof, whereby to permit operation of the vehicle,
 said register including a plurality of electrically operable components corresponding to said components of the combination, each of said electrically operable components having a standby state and, upon operation thereof, defining a corresponding operational state of the register,
 there being additional electrically operable components and said keyboard having additional keys for operating corresponding additional components;
 circuit means operably associated with the first mentioned electrically operable components and coupled with said additional components for returning any operated component of said first mentioned components to its standby state to reset the register in response to operation of one of said additional components, whereby to require exclusive sequential actuation of the first mentioned keys in said order before the register assumes the last operational state thereof;
 first selectively connectable and disconnectable connection means between certain of the first mentioned electrically operable components interconnecting the same to define said order of actuation of the first mentioned keys; and
 second selectively connectable and disconnectable connection means interconnecting said additional components and said circuit means,

10

said first and second connection means being selectively operable to change said order and establish a new combination selected from all of said keys, and connect the electrically operable components omitted from the new combination with said circuit means.

9. The invention as claimed in claim 8,
 there being means coupled with said register for returning the latter to a standby condition to reset the register upon actuation of any of said first mentioned keys out of said order, whereby to require said first mentioned keys to be actuated in said order without error before the register assumes the last operational state thereof.

10. The invention as claimed in claim 8,
 said first and second connection means including a plurality of jacks representing corresponding electrically operable components and operably coupled therewith, a plurality of jacks operably coupled with said circuit means, and a plurality of plugs representing corresponding electrically operable components and operably coupled therewith for selective insertion into said jacks.

References Cited

UNITED STATES PATENTS

2,650,989	9/1953	Heath	307—10
2,843,843	7/1958	Davis	317—134 X
2,855,588	10/1958	Allen	317—134 X
2,897,376	7/1959	Rieckman	307—10
3,251,204	5/1966	Siegel	70—278 X

ROBERT K. SCHAEFER, Primary Examiner

T. B. JOIKE, Assistant Examiner

U.S. Cl. X.R.

70—278; 180—114; 317—134