

[54] **METHOD AND APPARATUS FOR
PRODUCING ENCODED ELECTRICAL
KEYS**

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abandoned, which is a continuation-in-part of Ser. No.
628,599, April 5, 1967, Pat. No. 3,544,769.
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340/166 R, 29/625
[51] Int. Cl. G11c 17/00, H05k 3/00
[58] Field of Search..... 340/166 R, 176, 147 R,
340/149 R

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[57] **ABSTRACT**

A method and apparatus producing an encoded electrical key or key-card when utilizing a key or card blank on which there is an electrical circuit pattern having a common conductor or buss, and a plurality of terminals each connected to the buss by a fusible link. The encoding apparatus comprises a capacitor to be electrically connected to the common buss and charged by a power supply to a level sufficient to open-circuit one of the fusible links. Selection switch means control discharge of the capacitor through selected ones of the fusible links. The resultant pattern of open and closed-circuit fusible links offers a binary code permutation defining the coding of the key-card.

13 Claims, 7 Drawing Figures

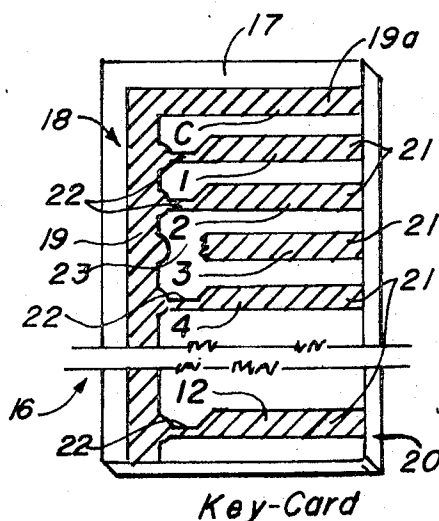


FIG. 1

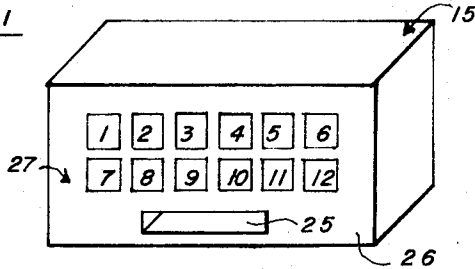


FIG. 3

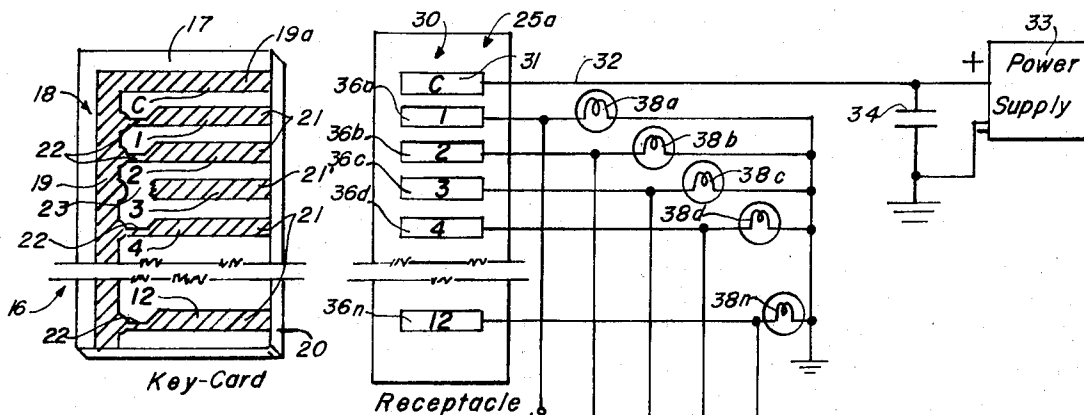


FIG. 2

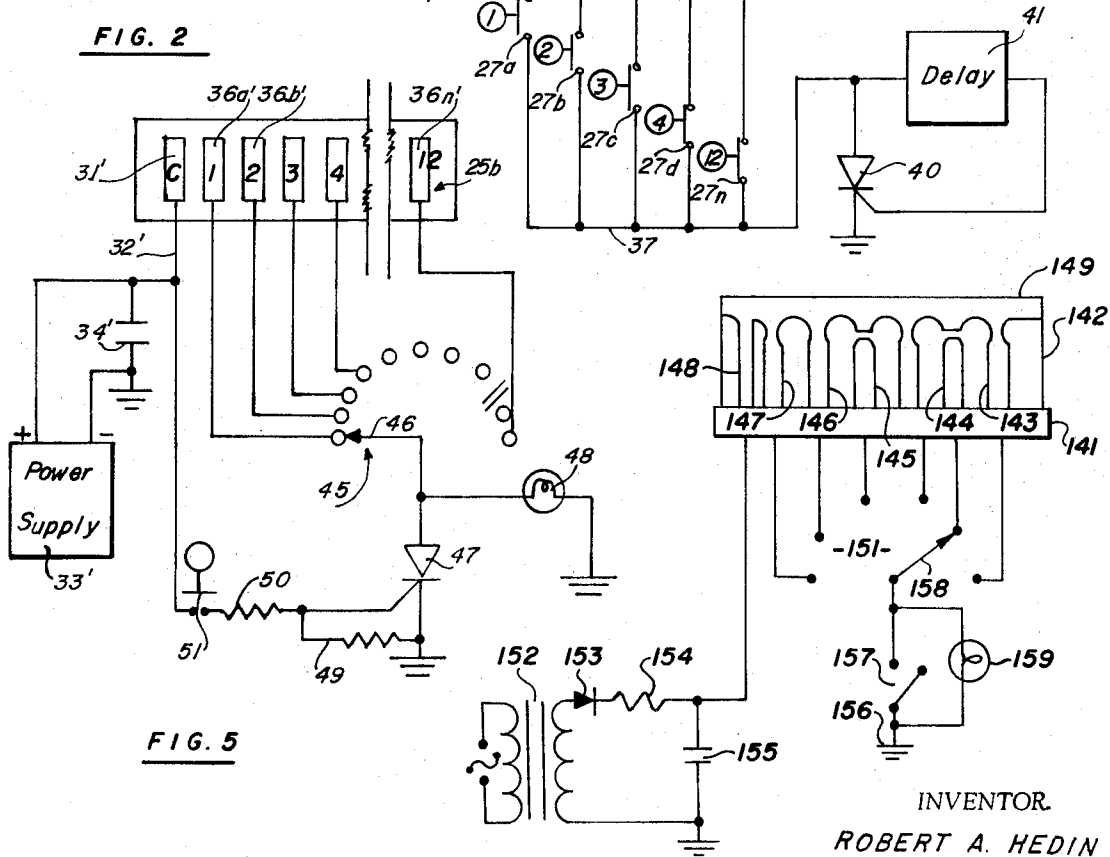


FIG. 5

FIG. 4

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FIG. 6

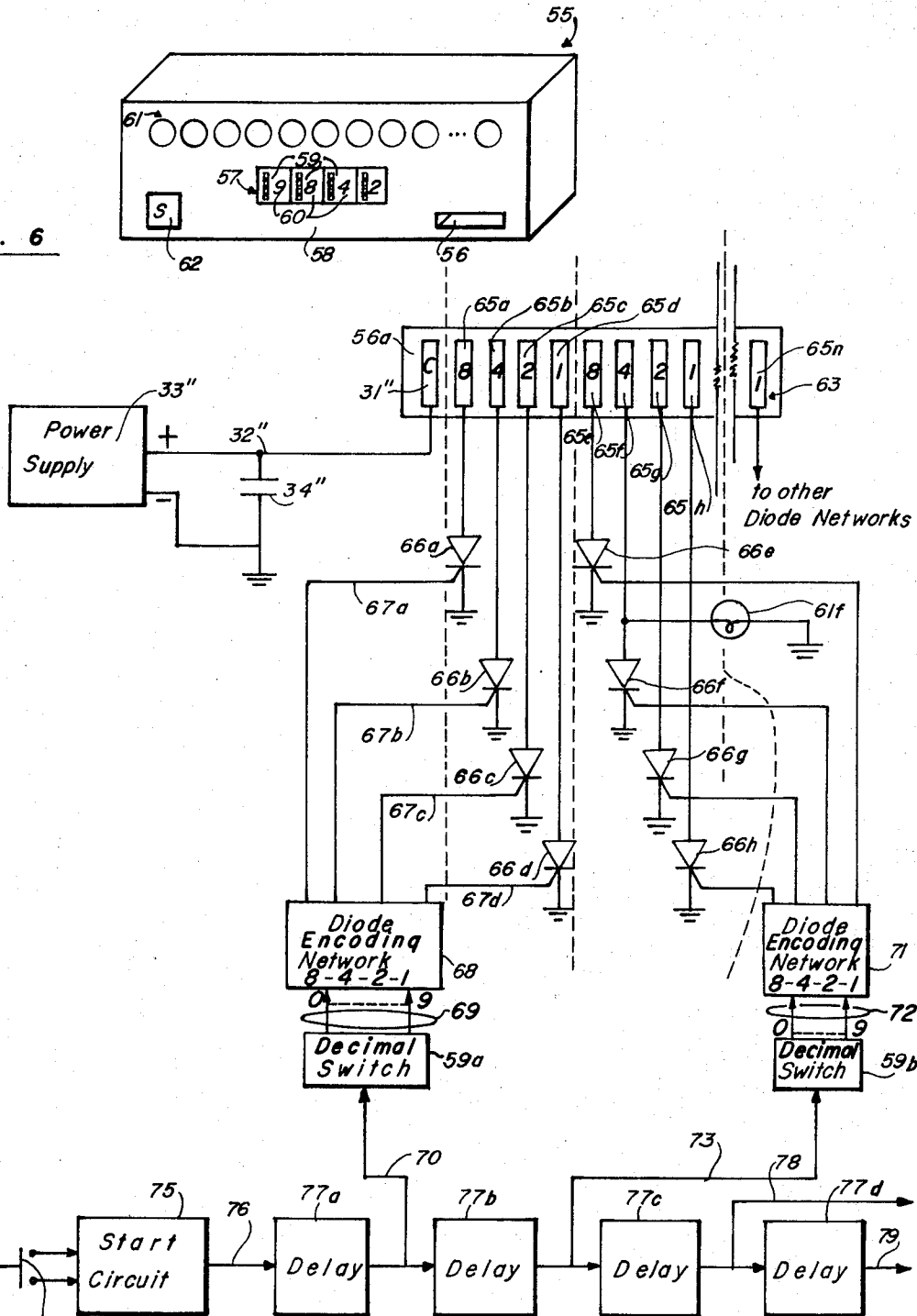


FIG. 7

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METHOD AND APPARATUS FOR PRODUCING ENCODED ELECTRICAL KEYS

CROSS-REFERENCES TO RELATED APPLICATIONS

This is a continuation, of application Ser. No. 27,686 filed Apr. 13, 1970, abandoned, which is a continuation-in-part of my copending application bearing Ser. No. 628,599, filed on Apr. 5, 1967, now U.S. Pat. No. 3,544,769 issued Dec. 1, 1970, entitled ELECTRONIC IDENTIFICATION AND CREDIT CARD SYSTEM and owned by the assignee of the present invention.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a device for encoding electrical key-cards of the type having a circuit pattern including a plurality of fusible links. More particularly, the invention relates to the method and apparatus for encoding an electrical key or key-card blank for blowing out selected ones of the fusible links. The resultant pattern of blown and unblown fusible links defines the code of the key-card in accordance with a preselected code such as a binary code.

2. Description of the Prior Art

Key-cards that include an electrical circuit pattern containing a binary permutation of open and closed-circuit paths have found use in conjunction with electronic locks and security apparatus. The key-cards include an electrically insulative substrate on which is disposed an electrical printed circuit including a common conductor or buss and a plurality of terminals which are either electrically connected or disconnected to the common buss. The particular circuit pattern defines the code of the key-card.

The manner in which the key-cards may be utilized in conjunction with an electronic lock is disclosed in U. S. Pat. No. 3,392,558 to R. A. Hedin et al. entitled BINARY CODED ELECTRONIC LOCK AND KEY, which has been reissued as No. Re. 27,013, owned by the assignee of the present invention. This patent describes an electronic key actuated security system responsive to a key-card of the type under consideration herein and includes a decoding matrix which determines whether the code or pattern of the inserted key-card is identical to a code or pattern prewired into the circuit. If the codes or patterns are identical, the lock provides an actuation signal to operate an electric door latch or other utilization device; if the codes or patterns are not identical, the door latch is not actuated and an alarm signal is produced.

Another application for the key-cards is set forth in applicant's copending U. S. application Ser. No. 628,599, filed Apr. 5, 1967, entitled ELECTRONIC IDENTIFICATION AND CREDIT CARD SYSTEM, now U.S. Pat. No. 3,544,769. In this system, the coding of the key-card includes a credit card identification number. The key-card is inserted in a device which then indicates to a merchant whether or not credit is still available to the key-card holder. This latter application includes a disclosure of the basic concepts for encoding a key-card of the type of this application and will be described more fully hereinafter.

For many commercial uses, it is impractical to manufacture key-cards of the type described with the combination or binary coded permutation already prewired or entered in the key-card. To do so requires extensive

customizing equipment and increases the manufacturing cost. It is far more practical to fabricate key-card blanks that have a preselected standard circuit pattern such that each of the terminals thereof is electrically connected to a common buss by means of a fusible link or a section of reduced current carrying capacity. Appropriate subsets of these fusible links or sections then may be open-circuited to encode the key-card in accordance with a preselected binary or other code. Such open-circuiting may be accomplished by passing through a selected fusible link or reduced section a current of sufficient magnitude to blow out the link or section, i.e., provide an open circuit condition.

SUMMARY OF THE INVENTION

In accordance with the present invention, there is provided a method and apparatus for encoding key-card or key blanks that have an electrical circuit pattern including a common buss or conductor and a plurality of terminals each connected by a fusible link to the common buss. There are utilized a temporary storage device such as an electrical capacitor, a power supply for charging the device, a silicon controlled rectifier, and appropriate switch means for defining a low impedance circuit path to discharge the capacitor independently through selected ones of the fusible links and through the silicon controlled rectifier. The charge on the capacitor is sufficiently great so as to blow out or open-circuit the selected fusible link when the capacitor is so discharged.

In a first embodiment, one terminal to the capacitor is grounded and the other terminal is connected via one contact of a key-card receptacle to the common buss of the key-card to be encoded. The receptacle also includes additional contacts equal to the number of codable terminals on the key-card. Each such contact is connected via a separate, normally-open switch to a common line. This common line provides the input to a delay circuit, and also is connected to one non-control electrode of a silicon controlled rectifier (SCR). The other non-control electrode of the SCR is grounded, and the output of the delay is directed to the SCR control electrode.

Shortly after a particular switch is closed, the delay circuit will provide an output gating on the SCR; the capacitor then discharges through the selected key-card fusible link, the SCR and the closed switch to ground. The current from the capacitor is of sufficient magnitude to blow out or open-circuit the associated fusible link. The process is repeated for other selected fusible links to complete the encoding process.

In another embodiment, each key-card receptacle contact is connected to a corresponding terminal of a rotary switch; the switch contact arm is connected via an SCR to ground. The SCR is triggered by an actuate signal so as to discharge the capacitor through the common buss, the selected key-card fusible link and the SCR to ground, again accomplishing the encoding process.

In a binary coded decimal (BCD) embodiment, the fusible links are divided into sets of four and are connected to ground via corresponding sets of four SCR's. A decade switch and a diode network is used to select which of the four fusible links in each set will be open-circuited; the capacitor is discharged simultaneously through the selected links in the set. A chain of delay circuits interconnects the decade switches, so that once

the selected decimal code has been entered, a single switch may be used to initiate encoding of the entire key-card.

Thus it is an object of the present invention to provide a method and apparatus for encoding a key-card of the type having an electrical circuit pattern including terminals connected by fusible links to a common buss.

Another object of the present invention is to provide a device for encoding key-cards of the type described and including a capacitor, means for charging the capacitor, and means for discharging the capacitor through a silicon controlled rectifier and through selected ones of the key-card fusible links, the charge on the capacitor being sufficient to open-circuit the selected link.

It is another object of the present invention to provide an encoder for key-cards of the type described, and including a receptacle designed to receive a key-card, and a plurality of switches interconnecting selected ones of the key-card fusible links with a single SCR to complete a discharge path for the capacitor through a selected one of the fusible-links.

A further object of the present invention is to provide a key-card encoding device of the type described including means for indicating visually the code entered in the key-card.

Still a further object of the present invention is to provide an encoder for key-cards of the type described, the encoder including means for selecting a decimal representation of the code to be entered, and means for encoding the key-card with the binary coded decimal equivalent of the selected code.

BRIEF DESCRIPTION OF THE DRAWINGS

Still other objects, features, and attendant advantages of the present invention will become apparent to those skilled in the art from a reading of the following detailed description of the preferred embodiments constructed in accordance therewith, taken in conjunction with the accompanying drawings wherein like numerals designate like parts in the several figures and wherein:

FIG. 1 is a perspective view of encoding apparatus embodying the invention;

FIG. 2 is a plan view of an electrical key-card that has been encoded in accordance with the present invention;

FIG. 3 is an electrical schematic-circuit diagram of the key-card encoder embodied in the apparatus of FIG. 1;

FIG. 4 is an electrical schematic-circuit diagram of another embodiment of the key-card encoder and a key-card applied to it;

FIG. 5 is an electrical schematic diagram of yet another embodiment of a key-card encoder in accordance with the present invention;

FIG. 6 is a perspective view of another embodiment of a key-card encoder wherein the desired code or pattern may be selected by means of decimal decade switches; and

FIG. 7 is an electrical schematic diagram of the key-card encoder of FIG. 6.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the drawings, there is shown in FIG. 1 a key-card encoder 15 that will establish a code on a key-card blank so as to produce a card such as that

shown in FIG. 2 and identified by the reference character 16. Key-card 16 includes an electrically insulative substrate or carrier 17 on which an electrical circuit pattern has been formed by conventional printed or etched circuit techniques. The circuit pattern so formed includes a common conductor or buss 19 extending in spaced parallel relation with a front edge 20 of key-card 16. A portion of common buss 19 extends to edge 20 to form a terminal 19a as illustrated. There also is a plurality of terminals 21, 21' that, in the un-coded or blank state of the key-card, are connected by fusible links or sections 22 of reduced current carrying capacity to the common buss 19. The width of each terminal 21, 21' is significantly greater than the width of the associated fusible link 22, the width ratio between each terminal 21, 21' and link 22 preferably being greater than 5 to 1.

With such a key-card blank, when an electrical current of sufficient magnitude is provided between common buss terminal 19a and a selected one of terminals 21, 21' the corresponding fusible link 22 will be blown out or open-circuited. Thus, in FIG. 2 it may be seen that there has been established a new circuit pattern 18 in which the fusible link originally associated with terminal 21' has been so blown out, leaving a gap 23 between terminal 21' and common buss 19.

It will be appreciated that in differently coded key-cards 16, there will be one or more open-circuited or buss-disconnected terminals 21' in different patterns. The particular circuit pattern or binary permutation of buss-connected terminals 21 and buss-disconnected (i.e., open-circuited terminals 21' defines the coding of key-card 16 in accordance with a preselected code, which may be any well known code such as one based on a binary notation.

A key-card such as key-card 16 may be encoded using the encoder 15 of the present invention. Specifically, the blank key-card to be encoded is inserted in a receptacle 25 situated on a front panel 26 of encoder 15 adapted to accommodate a key-card 16 positioned therein. Also mounted on front panel 26 are a plurality of decimal coded push-button switches 27. In a preferred embodiment, switches 27 are of the type having built-in lamps which back-light the decimal numerals indicated on the panel portion of each push-button switch 27. Generally, the number of switches 27 will correspond to the number of encodable terminals 21, 21' on the key-card to be encoded.

Typical electrical circuitry associated with encoder 15 is illustrated in FIG. 3. Referring thereto, receptacle 25a (which may correspond to receptacle 25 of FIG. 1) includes a plurality of electrical contacts 30 equal in number to the total number of terminals on the standard key-card 16 to be encoded. A contact 31 is arranged to receive the common buss terminal 19a of key-card 16 when the card is properly positioned into the receptacle 25a to cause the two to be in electrical contact. The contact 31 is electrically connected via a line 32 of the (+) terminal of a power supply 33. The line 32 also is connected to one terminal of a temporary storage device or a capacitor 34. The other terminal of capacitor 34 is connected between the negative (-) terminal of the power supply 33 and ground potential. The capacitor 34 is charged by power supply 33 to a level sufficiently great so that when it is discharged through one of fusible links 22, that link will be blown out or open-circuited.

A contact 36a of receptacle 25a is electrically connected to a first terminal of a normally open push-button switch 27a, which may correspond to the push-button switch 27, "1" in FIG. 1. The other terminal of switch 27a is connected to a common line 37. The contact 36a also is connected to one terminal of a lamp 38a the other terminal of which is connected to ground potential. The lamp 38a may comprise the lamp (described above) situated within the push-button switch 27 designated "1" in FIG. 1.

In like manner, each of contacts 36b-36n of receptacle 25a is connected to an individual terminal of respective switches 27b-27n, the other terminal of each such switch being connected to the common line 37. Similarly, the contacts 36b-36n also are connected to one terminal of respective lamps 38b-38n, the other terminal of each such lamp being connected to ground.

The common line 37 is connected to the anode electrode of a silicon controlled rectifier (SCR) 40, the cathode electrode of which is connected to ground. Common line 37 also provides the input lead to a delay circuit 41, the output circuit of which is connected to the control electrode of the SCR 40.

Operation of the key-card encoder of FIG. 3 can now be examined in more detail. First, the key-card 16 to be encoded is inserted in receptacle 25a. Note that initially each terminal of the inserted standard key-card is connected to common buss 19 by means of a respective fusible link 22; a closed circuit condition exists as to all of the links. As a result, when the card 16 is correctly in position, a current path is provided from power supply 33 via key-card 16 to light up all of lamps 38a-38n. For example current through lamp 38a flows along the path including the positive (+) terminal of the power supply 33, line 32, contact 31, terminal 19a of the key and common buss 19 of key-card 16, the fusible link 22 and terminal 21 associated with receptacle contact 36a, contact 36a, and lamp 38a to ground. As noted, all of lamps 38a-38n initially will be energized visually indicating to the operator that no fusible links 22 have been blown out or are in open circuit condition.

To blow out a selected one of fusible links 22, the associated one of switches 27a-27n is depressed. For example to blow out the fusible link associated with receptacle contact 36c, switch 27c is closed. This closure completes a current path from the positive (+) terminal of power supply 33 via line 32, contact 31, common buss 19, the terminal 21 associated with contact 36c, contact 36c, switch 27c and common line 37. As a result, a positive signal is provided to the input of delay circuit 41.

After a brief period of time, determined by the preselected delay time of circuit 41, an output signal is provided from delay circuit 41 which triggers SCR 40 into conduction. This immediately provides a low impedance path from line 32 through key-card 16, contact 36c, closed switch 27c and through SCR 40 to ground and which path allows the capacitor 34 to discharge therethrough. As noted earlier, the capacitor 34 was charged to a level sufficiently great so as to pass current of sufficient magnitude through the terminal 21 to cause a blow out or an open circuit condition of the fusible link 22 through which the capacitor 34 is discharged. In the present instance, this discharge blows out the fusible link 22 associated with contact 36c, resulting in gap 23 as shown in FIG. 2.

It should be noted that selected delay time for the delay circuit 41 insures that capacitor 34 will not discharge at the instant that one of push-button switches 27a-27n is depressed. Such discharge simultaneous with switch closure is undesirable, since it may result in considerable arcing at the terminals of the switch being closed, and further may cause reduced current flow by discharging capacitor 34 through the finite resistance of the switch as it is being closed.

As soon as the fusible link 22 associated with contact 36c is open-circuited the circuit path to SCR 40 is also opened and its conduction is cut off. At this time the capacitor 34 is solely connected to the power supply 33 and is charged up by the power supply 33. Moreover, since gap 23 in key-card 16 represents an electrical open-circuit, no current flows to lamp 38c, and lamp 38c goes off thereby visually signalling an open-circuit condition.

To complete the encoding process, other selected ones of switches 27a-27n are depressed independently and sequentially to cause blow out of the corresponding selected ones of fusible links 22. When this blow out procedure has been completed for the selected set of fusible links, the selected pattern of open and closed circuits recorded on key card 16 will be indicated by the corresponding condition of the lights 38a-38n. The lights that are still on will signal that the corresponding terminals 21 still are electrically connected to common buss 19, and the lights 38a-38n which are extinguished will indicate that the corresponding terminals 21' have been disconnected from common buss 19. The visual signals represented by the condition of the lights 38a-38n reproduce identically the selected pattern on the key-card 16 and the pattern of a preselected coding for the key-card.

Referring now to FIG. 4, there is shown a diagram of a form of the key-card encoder in which the code will be selected through operation of a rotary switch. That encoder has a key-card receptacle 141, and there is further shown a key-card 142 that has been encoded while engaged with receptacle 141. It will be understood, of course, that key-card 142, before coding, was a blank having all of its circuit-path conductors 143-149 intact. The terminal end of each conductor (143-147) connects to a corresponding contact on a rotary switch 151. A power supply comprising transformer 152 having its primary winding connected to an alternating current source and its secondary winding connected to a rectifier 153, current-limiting resistor 154, and capacitor 155 applies a direct current voltage to conductors 148 and 149 on the key-card 142. Thus, while the key-card is in its blank state, the voltage will be applied through the conductors 143-147 to corresponding contacts of rotary switch 151. The return path to the power supply ground 156 will be through a selected one of those contacts, the rotary contact 158, and switch 157. When key-card 142 is in its blank state and is placed in receptacle 141, the first binary zero or blow-out in the key-card 142 is selected by suitably setting rotary switch 151. Thereafter, switch 157 is closed and capacitor 155 discharges through the fusible section of the selected conductor (143-147) on the key-card 142. This permanently opens this circuit path on the key-card. Successive binary zeros are similarly encoded. This means provides a simple and economical way to produce encoded key-cards. The code may be ascer-

tained by rotating switch 151 through its various steps while observing indicator lamp 159.

An embodiment of the invention similar to the circuit of FIG. 4 is illustrated in FIG. 5. In this embodiment, the manually operated switch 157 of FIG. 4 is replaced by the silicon controlled rectifier (SCR) 47. Referring thereto a key receptacle 25b includes a contact 31' adapted to receive key-card common buss terminal 19a (FIG. 2) and connected via a line 32' to the positive (+) terminals of a power supply 33' and to a capacitor 34', as illustrated. The other terminal of capacitor 34' and the negative (-) terminal of the power supply 33' both are connected to ground potential.

The receptacle 25b includes a plurality of contacts 36a', 36b', ...36n' which are connected respectively to the terminal positions of a multi-terminal rotary switch 45. The rotary arm 46 of switch 45 is connected to the anode electrode of the silicon controlled rectifier (SCR) 47 and to one terminal of a lamp 48. The other terminal of lamp 48 is connected to ground, as is the cathode electrode of SCR 47. The control electrode of the SCR 47 is connected to ground via a resistor 49. The control electrode of SCR 47 is connected to line 32' via a resistor 50 and a normally open push-button switch 51.

In operation, contact arm 46 of rotary switch 45 is rotated to a selected position placing it in electrical circuit with one of contacts 36a'-36n'. Thus, when a blank key-card has been applied to receptacle 25a, contact arm 46 will be in circuit with a selected fusible link 22 on the key-card. Current then will flow in a path including line 32', contact 31', common buss 19 on the key-card (FIG. 2), the selected fusible link 22, the associated one of contacts 36a'-36n', switch arm 46 and lamp 48 to ground. Accordingly, lamp 48 will be energized and its illumination will indicate that the selected fusible link 22 has not yet been blown.

As before, capacitor 34' will have been charged by power supply 33'. Now, by depressing push button switch 51, a current path is provided from the plus (+) terminal of power supply 33' via the now closed switch 51, resistor 50 and resistor 49 to ground. As a result, the voltage at the control electrode of SCR 47 will be sufficiently positive so as to turn on silicon controlled rectifier 47. The capacitor 34' then will discharge through the path including the selected fusible link 22, the corresponding one of terminals 36a'-36n', switch contact arm 46 and SCR 47. As noted, the charge on capacitor 34' will be sufficient to cause concomitant blow-out of the selected fusible link 22. If blow-out has been accomplished successfully, no current will flow through the designated path and the lamp 48 will no longer be energized and the lack of illumination will visually signal an open circuit condition.

It should be noted that in the circuit of FIG. 5, that no time delay is necessary since, unlike the configuration of FIG. 3, push-button switch 51 is not in the discharge path of capacitor 34'.

Now referring to FIG. 6, there is shown yet another embodiment of the key-card encoder. As shown therein, an encoder 55 is adapted for entering a binary coded decimal (BCD) digit in accordance with the 8-4-2-1 binary notation upon a key card which is inserted in a receptacle 56. The decimal digit to be entered on the key-card positioned in the receptacle 56 is selected manually by means of a data entry device 57 arranged on a front panel 58 of the encoder 55. The de-

vice 57 includes a set of decimally coded thumb wheel selector switches 59 each having an associated decimal digit display 60. The encoder 55 also includes a plurality of lamps generally designated 61 which display the aforementioned binary-decimal notation code entered on the inserted key-card 16. A start (S) switch 62 also is mounted on encoder panel 58 for initiating the encoding operation.

A schematic diagram of the encoder 55 is illustrated in FIG. 7. Referring thereto, receptacle 56a (which may correspond to receptacle 56 of FIG. 6) includes a plurality of contacts generally designated 63. A contact 31'', adapted to receive key-card common buss terminal 19a, is connected via a line 32'' to the plus (+) terminal of a power supply 33'' in common with one terminal of a capacitor 34''. The common terminal 31'' is also identified as a "C" terminal. The negative (-) terminal of the power supply 33'' and the other terminal of capacitor 34'' are both grounded.

The receptacle 63 also includes a plurality of other contacts 65a-65n adapted to receive the encodable terminals 21 of the inserted key-card 16. In the embodiment shown, contacts 65a-65d are associated with the first binary coded decimal digit, or the units digit, for example, while contacts 65e-65h are associated with the second binary coded decimal digit which may be the tens digit, etc, the aforementioned contacts are also identified as 8-4-2-1 contacts for each decimal digit in accordance with their position in the binary notation. Each of the contacts 65a-65d for the units digit is connected to the anode electrode of an associated one of silicon controlled rectifiers 66a-66d. The cathode of each of SCR's 66a-66d is connected directly to ground, and the control electrode of each of SCR's 66a-66d is connected via a respective line 67a-67d to a diode encoding network 68. The network 68 receives an input along a channel 69 from a decimal switch 59a which may comprise one of thumb wheel selector switches 59 shown in FIG. 6. In turn, the decimal switch 59a receives an input along a line 70.

In a typical embodiment, decimal switch 59a simply may comprise a single pole, ten position switch the contact arm of which is connected to line 70 and the terminals of which are connected to ten wires comprising channel 69 for representing the decimal digits 0-9. In such instance, the diode network 68 may comprise a conventional encoding network based on the 8-4-2-1 notation to provide signals on those of lines 67a-67d corresponding to the binary coded decimal equivalent of the decimal digit represented by the selected wire in channel 69. For example, if decimal switch 59a were set to the decimal digit position "3", a signal provided via channel 69 would cause diode network 68 to provide output signals on lines 67a and 67b, but not on line 67c or 67d. These output signals represent the binary digits 0011 wherein the binary digits 2 and 1 are both activated (2+1=3) and thereby represent the BCD equivalent of the decimal number "3."

In similar manner, contacts 65e-65h are connected to the anodes of SCR's 66e-66h, the cathodes of each such SCR being connected directly to ground. The control electrode of each of SCR's 66e-66h is connected to another diode encoding network 71 which receive via a line 72 an input from decimal switch 59b. The switch 59b, which also may correspond to one of selector switches 59 shown in FIG. 6 itself receives an input on a line 73. The remainder of the contacts 63 may be sim-

ilarly connected in sets of four to corresponding SCR's, diode networks and decimal switches (not shown).

The start switch 62a is connected to a start circuit 75 which provides an output signal along a line 76 as soon as switch 62a is closed. The signal on line 76 is fed to a first delay circuit 77a, the output of which is provided via line 70 to decimal switch 59a and to a second delay circuit 77b. The output of delay 77b is provided via line 73 to decimal switch 59b and also input to another delay circuit 77c. The output of delay 77c is fed via a line 78 to another decimal switch (not shown) and to another delay circuit 77d. The output of delay 77d is fed via a line 79 to yet another decimal switch, etc. Of course, there will be a number of delay circuits 79a, 79b . . . equal to the number of decimal digits required to represent the BCD equivalent of the decimal digits to be recorded on the key-card being encoded.

To display the binary coded decimal digit entered on key-card 16, each of contacts 65a-65n also may be connected to one terminal of an associated one of the lamps 61; the other terminal of each lamp may be grounded. For simplicity in FIG. 7, only one such lamp, designated lamp 61f, is shown.

Operation of the circuitry of FIG. 7 can now be examined. Initially, key-card 16 is inserted in receptacle 56. Since none of fusible links 22 have been open-circuited, a current path is provided from the plus (+) terminal power supply 33'' via contact 31'', common buss 19, each of fusible links 22 and contacts 65a-65n to the associated lamps 61. Accordingly, all of lamps 61 (typified by lamp 61f in FIG. 7) will be energized indicating key-card 16 to be un-coded.

Next, the decimal equivalent of the desired decimal digit is entered using decimal switches 59a, 59b . . . of data entry device 57. The start push-button 62 is depressed, closing switch 62a and causing the start circuit 70 to produce an output signal along line 76. After a time period provided by delay 77a, an output signal will appear on line 70 and at decimal switch 59a. A signal will be set via channel 69 to diode encoding network 68 corresponding to the setting of decimal switch 59a, to produce output signals on lines 67a-67n representing the BCD equivalent of the selected decimal digit. Accordingly, the corresponding ones of SCR's 66a-66d will go into conduction. For example if decimal switch 59a is set to "3", SCR's 66a and 66b will go on and SCR's 66c and 66d will remain off.

When this happens, capacitor 34'', which previously has been charged by power supply 33'', will discharge through the parallel path including common buss 19, the key-card terminals associated with contacts 65a and 65b, and through SCR's 66a and 66b to ground. The charge on capacitor 34'' will be sufficiently large so as to blow out or open-circuit both of the fusible links 22 associated with contacts 65a and 65b. As a result, the current path through these contacts will be open-circuited and the corresponding ones of lamps 61 will be extinguished. The encoded pattern in binary notation, then, reading left to right is 0011, correctly representing the digit "3".

Note that the signal provided to decimal switch 59a along line 70 also is provided to delay 77b. At the end of the time delay provided by circuit 77b, and subsequent to the blow out of the selected ones of the fusible links associated with SCR 66a-66d, delay 77b will provide an output along line 73 to decimal switch 59b. In like manner, decimal switch 59b will cooperate with

diode network 71 to provide control signals to those of SCR's 66e-66h corresponding to the BCD equivalent of the decimal number entered in decimal switch 59b.

Again, capacitor 34'' will discharge through the selected ones of SCR's 66e-66h, thereby encoding the associated terminals of key-card 16. The signal provided on line 73 also will initiate operation of delay circuit 77c which in turn will provide an output on line 78 after a selected period of time. This signal on line 78 will be fed to the next one of decimal switches 59 to initiate encoding of the corresponding next four terminals of key-card 16. This process will continue until all terminals of key-card 16 have been encoded.

What is claimed is:

1. Apparatus for encoding an electrical key of a kind that a person will momentarily apply to an electrical security system with a code operable to actuate the security system, and utilizing key blanks each having thereon a plurality of circuit paths interconnected by fusible elements, said apparatus comprising a key receptacle having electrical circuit paths insulatively spaced thereon in a spaced relationship corresponding to the spaced relationship of the plurality of circuit paths on the key blank so that the key blank when engaging the receptacle will place its corresponding circuit paths in electrical contact with corresponding individual circuit paths of the receptacle,

an electrical power source,

a temporary energy storage device coupled to said power source to be energized therefrom for storing electrical energy therein,

circuit means for placing said power source and said energy storage device in electrical circuit relation with at least one of said circuit paths of said key receptacle, said circuit means normally being in open circuit condition, and

including switch means operable to place said circuit means in closed circuit condition to apply the energy stored in said temporary energy storage device through said circuit means to said one circuit path of said key receptacle for burning out the fusible element associated with the circuit path of the key blank which corresponds to said one circuit path of said key receptacle and which is in electrical contact with said one circuit path of said key receptacle to effect encoding of the key blank.

2. Apparatus as defined in claim 1 wherein said temporary energy storage device is an electrical capacitor.

3. Apparatus as defined in claim 1 including signaling means connected to said circuit means for signaling the electrical condition of the circuit paths of a key blank engaged in the receptacle.

4. Apparatus as defined in claim 1 wherein said circuit means include selection switching means adapted to select one or another circuit path of the receptacle for said circuit relation.

5. Apparatus as defined in claim 4 wherein the selection switching means comprise an encoding network for automatically selecting a plurality of the circuit paths of the receptacle in accordance with a preselected code.

6. Apparatus as defined in claim 5 wherein the encoding network is a diode network arranged in accordance with a preselected code for selecting certain circuit paths in accordance with the code.

7. Apparatus as defined in claim 4 wherein said temporary energy storage device is an electrical capacitor

and wherein an operation of the switch means provides a low impedance path for discharging the capacitor through said circuit means, the arrangement being such that the key blank when applied to the receptacle will provide a closed circuit through the circuit paths of the key and the corresponding circuit paths of the receptacle, so that the discharge of the capacitor acting through a selected circuit path of the key receptacle will cause the corresponding circuit path of the key blank to assume an open circuit condition.

8. Apparatus for encoding electrical keys of a kind that a person will momentarily apply to an electrical security system to actuate the system, and utilizing key blanks each having an insulative carrier on which electrically conductive distinct contact strips are disposed for engaging corresponding contacts of a security system when an encoded key blank is momentarily applied to the system, there being a common electrical conductor connected to each of the contact strips of the key by fusible means to form a multiplicity of individual closed circuit paths on the insulative carrier of the key blank, said apparatus comprising,

a receptacle for receiving a key blank to be encoded and having a multiplicity of contacts each of which will be engaged by one of the contact strips of the key blank when the key blank is received thereby, a source of electric power sufficient to destroy a selected one of the fuse means on the key blank so as to place in open circuit condition a selected individual circuit path associated with the destroyed fuse means on a key blank to effect encoding of the key,

circuit means for connecting selected ones of said receptacle contacts to said source of power,

and selector switch means forming a portion of said circuit means operable to direct the power through selected combinations of contacts of said multiplicity of contacts on the receptacle to encode a key blank that may engage the receptacle with open and closed circuits that will be determined by the

selected combination of contacts on the receptacle and which will determine a multiplicity of electric signals to be applied in a selected binary code combination by the key for actuating a security system.

9. Apparatus as set forth in claim 8 in which there are signalling means connected to a portion of said circuit means for signaling the electrical condition of the fuse means of a key blank engaged with said key blank receptacle, whereby to indicate the circuit condition of the respective contact strips of a key blank relative to the common electrical conductor connected to each of the contact strips.

10. Apparatus as set forth in claim 9 in which said source of power comprises a capacitor that stores the energy to open circuit a contact strip relative to the common conductor by destroying the fuse means interconnecting the common conductor and the associated contact strip on a key blank, and there being a circuit portion connecting said signaling means to a portion of said source of power in parallel relation to said capacitor whereby to indicate the condition of the contact strips of a key blank engaged in the key receptacle independently of the operation of said capacitor.

11. Apparatus as set forth in claim 10 in which said selector switch means have a portion movable to direct the power successively through one selected receptacle contact and another, said signalling means being connected to said selector switch portion to indicate successively the condition of each selected contact.

12. Apparatus as set forth in claim 10 in which said selector switch means comprise a plurality of switches connected each to one contact of said multiplicity of receptacle contacts, and said signalling means comprising lamps connected each to one of those contacts.

13. Apparatus as set forth in claim 10, in which said selector switch means comprise an encoding network acting automatically in response to a selected code applied thereto to direct the power to receptacle contacts that are determined by a further code.

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