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[56] **References Cited**
UNITED STATES PATENTS
 1,923,968 8/1933 Chase..... 70/278
 2,855,588 10/1958 Allen..... 340/276
 3,192,448 6/1965 Hevenor..... 317/134
 3,321,673 5/1967 Wolfe..... 70/278 X
 3,411,152 11/1968 Jackson..... 70/278 X
 3,475,932 11/1969 Germanton 70/278

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[54] **ELECTRONIC LOCK AND SECURITY SYSTEM**
14 Claims, 5 Drawing Figs.

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 70/264, 317/134, 70/315, 340/274
 [51] Int. Cl..... E05b 49/04
 [50] Field of Search..... 70/263,
 264, 378, 315; 317/134

ABSTRACT: A combination code board retains latched-in circuitry as initially set up by the first operation of same. Thereafter, this code will release a door lock whenever the combination is worked. The lock combination can be canceled by electric control.

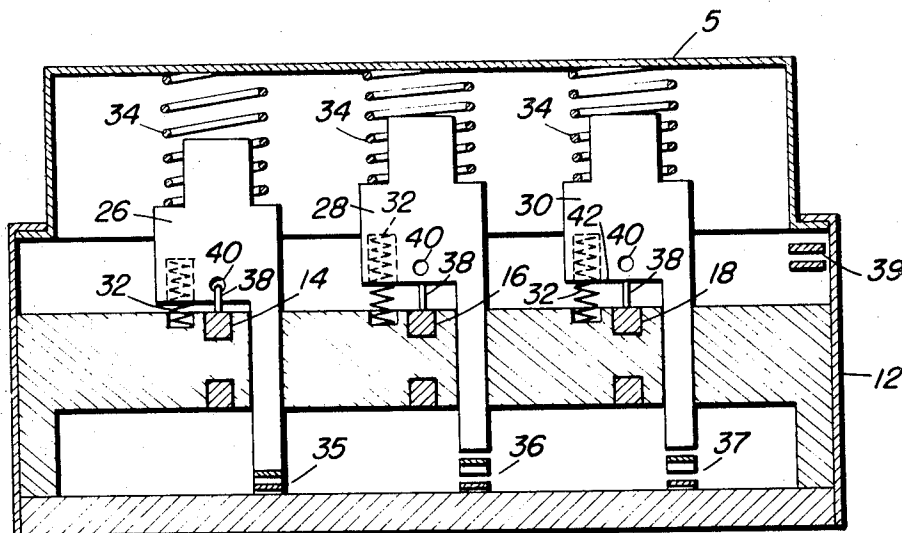


FIG. 2

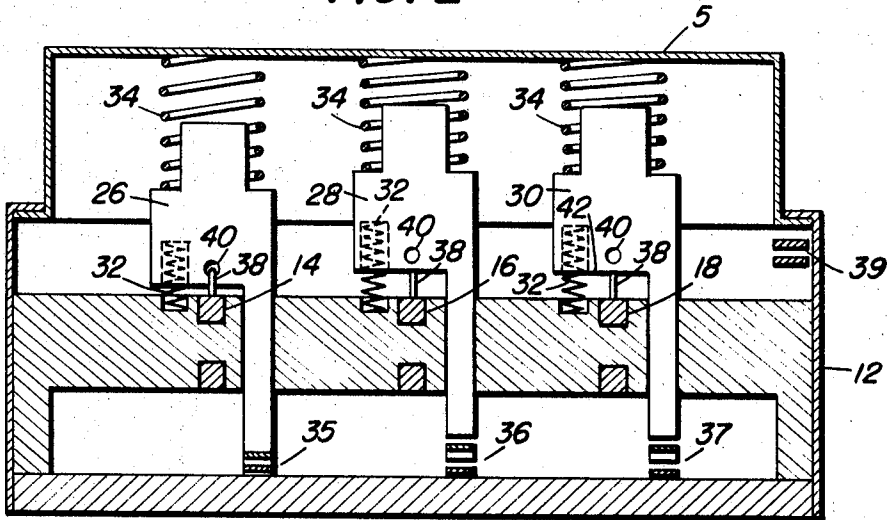


FIG. 1

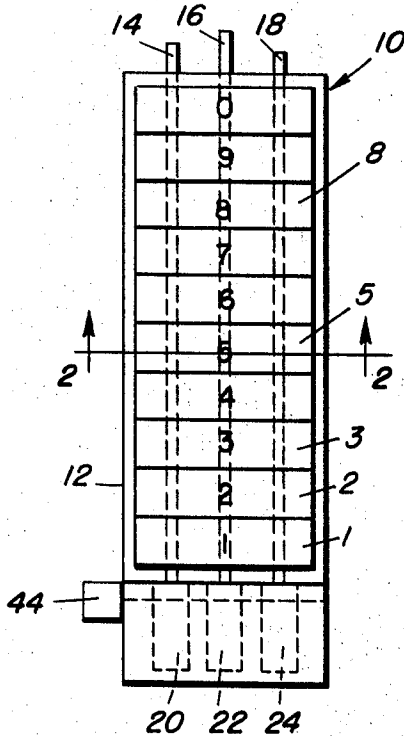
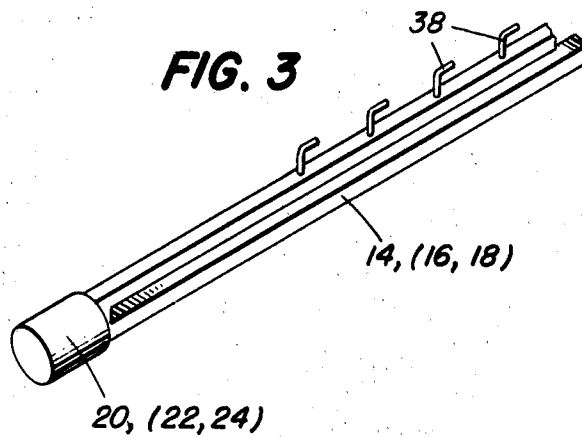


FIG. 3



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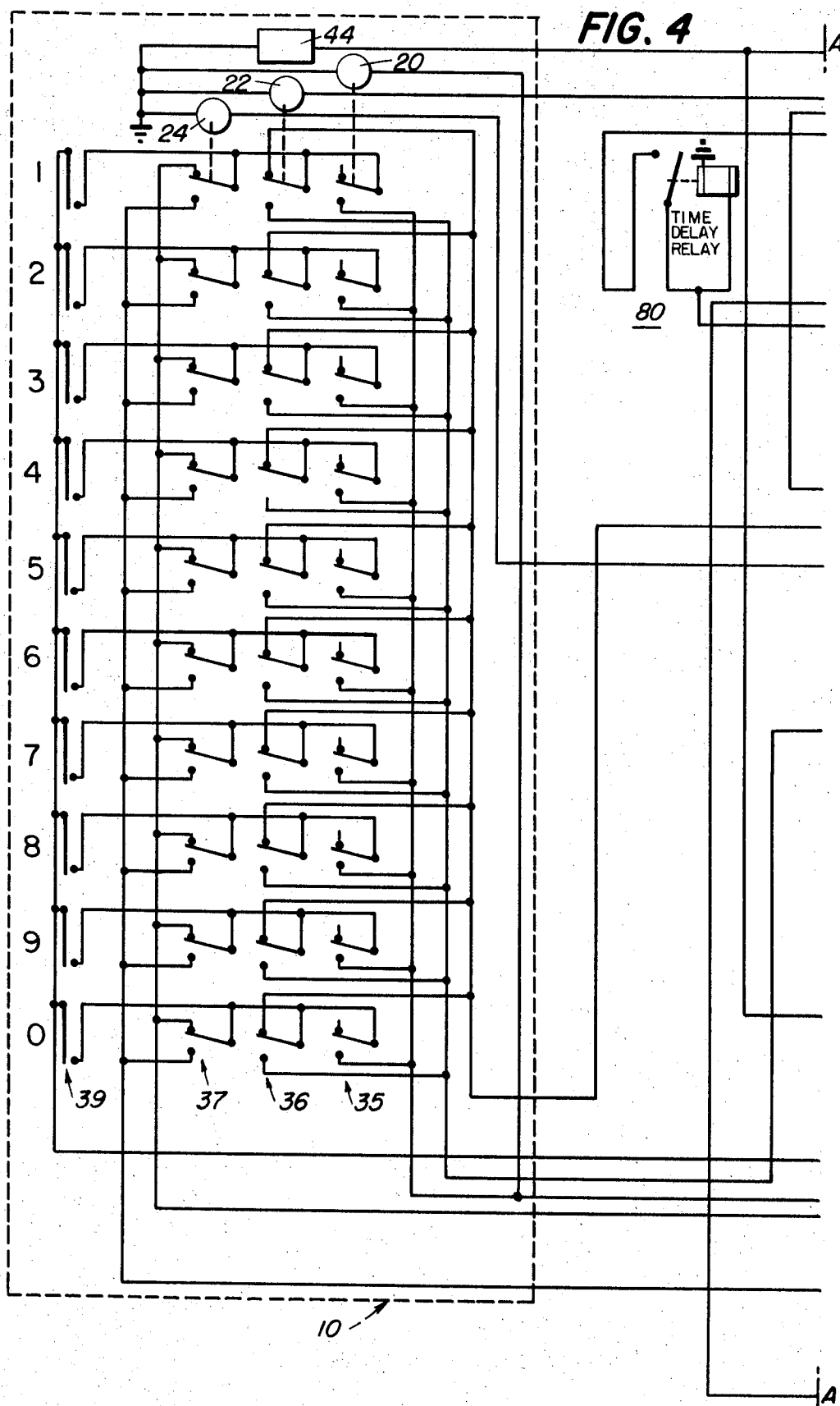
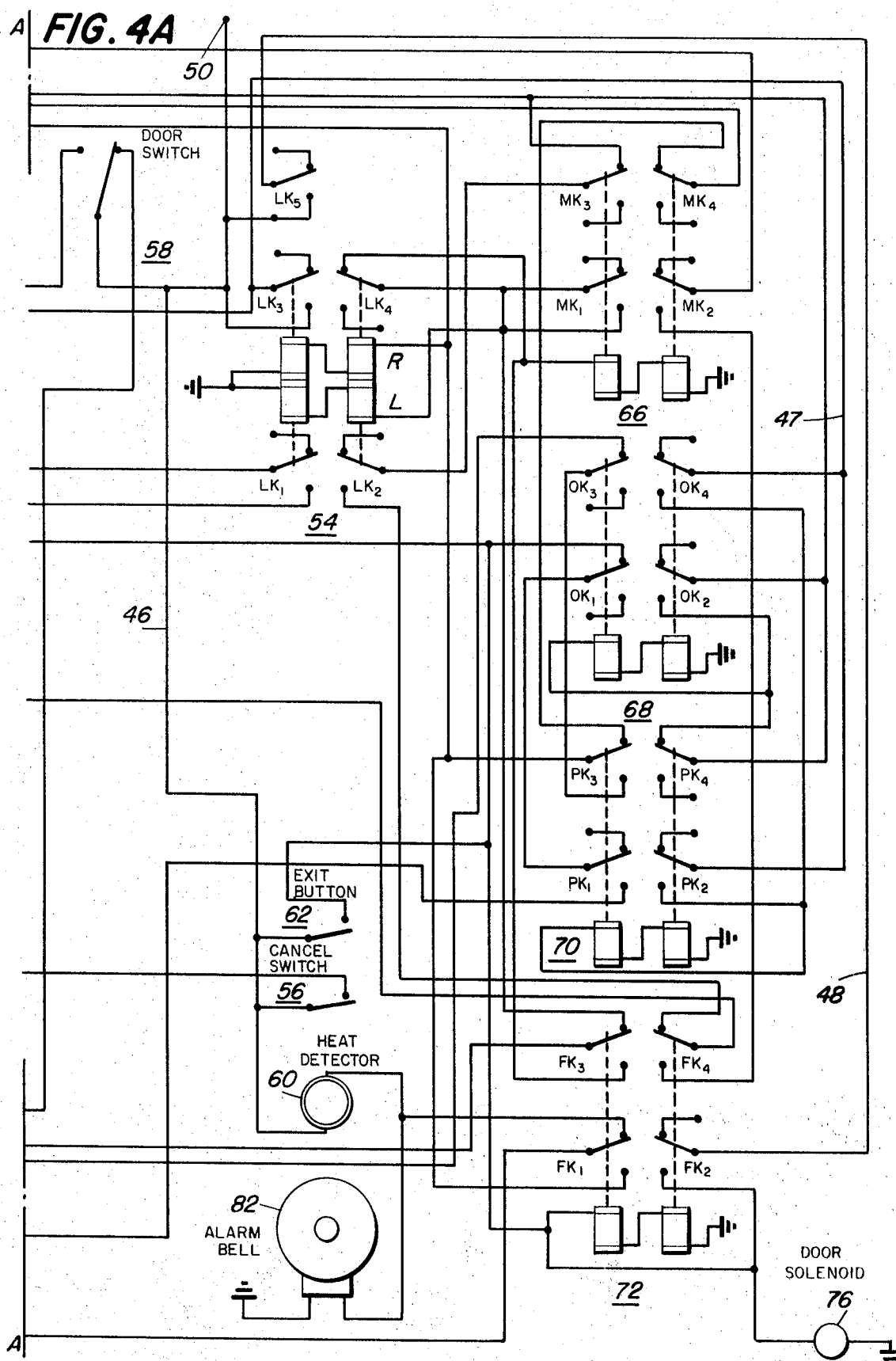


FIG. 4A



ELECTRONIC LOCK AND SECURITY SYSTEM

This invention relates generally to security apparatus, and more particularly to an electric lock security system for hotel room doors which includes front desk monitoring and reset features.

Key loss is a problem in the hotel business. Furthermore, there is always the problem of duplicated keys and resulting unauthorized entry of premises. While electric combination locks are known, they have not in the past, been much in favor because of the difficulty of changing the combination after each occupancy of a room. Otherwise, the same problem of unauthorized entry exists once the code is divulged.

It is an object of this invention, therefore, to provide a combination lock of the electric type which is set up by the initial operation with a code known only to the immediate guest, and which, when the room is vacated, the combination is canceled.

Another object of this invention is to provide a remote-electric door, security arrangement for a multiple-closed area which operates over only two wires from each enclosure.

Yet another object of this invention is to provide a system for electrically unlocking a door by a local combination or by remote switch, together with a forced entry or fire alarm feature.

Still another object of this invention is to provide an improved keyboard for a combination lock which features an electromechanical memory.

Other objects and attendant advantages of this invention will become more readily apparent and understood from the following detailed specification and accompanying drawings in which:

FIG. 1 is a schematic of a combination selection board for controlling the electric combination lock of this invention;

FIG. 2 is an enlarged cross section taken on line 2-2 of FIG. 1 with the first digit 5 of a code set in;

FIG. 3 is a perspective view of a slide rack for the combination selection board of FIG. 1;

FIG. 4 is a schematic diagram showing the electric combination lock system as a whole; and

FIG. 4A is a continuation of the schematic of FIG. 4 to the right of line A-A.

Referring now to the details of the invention as shown in the drawings, in FIG. 1, reference numeral 10 indicates generally a combination selection board. This combination selection board 10 comprises an elongated rectangular casing 12 which includes a plurality of spring-loaded buttons or keys 1, 2, 3, 4, 5, 6, 7, 8, 9, and 0, which are marked with indicia, numerals as shown (or alphabet) and arranged in vertical order. Three spaced-slide racks 14, 16, and 18 extend vertically through the casing 12 and terminate within thrust solenoids 20, 22, and 24, respectively.

Each key, 1, 2, 3, 4, 5, 6, 7, 8, 9, and 0, overlies three spaced-key stems 26, 28, and 30 which are slidably received in the casing 12. These stems 26, 28, and 30 are each spring-loaded by a compression-coiled spring 32 to stand away from the casing 12, but can be depressed simultaneously through individual stronger coiled springs 34 which back up against the key 1, 2, 3, 4, 5, etc.

The function of the stems 26, 28, and 30 is to depress contact springs 35, 36, or 37, respectively, each having a one-pole, two-throw configuration. A one-pole, one-throw contact 39 is closed directly by the button body of the key 1, 2, 3, etc. itself.

The function of a slide rack 14, 16, and 18 is to move longitudinally upwardly under urging of an associated solenoid 20, 22, and 24, respectively, and in that order lock in the respective depressed stem 26, 28, or 30 when three different (or same keys) are actuated.

Locking occurs through the medium of 10, spaced-locking hooks 38 which extend transversely from each slide rack 14, 16, and 18, as shown in FIG. 3. A hook 38 engages a hole 40 in the particular key stem 26, 28, or 30 which is depressed at the moment. The racks 14, 16, and 18 are held upward, after their

movements by a common transverse magnetic release latch 44 which prevents their dropping back by gravity until signaled.

It will be noted from FIG. 2, the lefthand contact spring 35 is thus held down. The other springs 36 and 37 alongside, can be closed by another depression of the same key 5, depending on whether slide racks 16 or 18 are in their down or up positions. In the latter case, the hooks 40 underlie a step 42 formed in the stem 28 (or 30), preventing closure thereof.

Consequently, once a slide rack 14, 16, or 18 has moved to close one set of contact springs 35 (in the example) the lefthand contact springs 35 for any remaining keys of board 10 will not close when a key is depressed. After three digits of the code are thus chosen and locked in, further depressions of any of the keys will result in no effective contact closures except for the contact 39.

Referring now to the schematic diagrams, FIGS. 4 and 4A together, all currents supplied to the electrical lock system originate at a connection 50, which voltage is referenced to ground. The "hot" wire 46 supplies current from source 50 to the open contacts LK3 and LK5 of a latching relay 54, and to a cancel switch 56 and an "Exit" door button 62. Also supplied by the "hot" wire 46 is a door switch 58.

In addition, a heat detector 60 which has an alarm bell 82 is supplied with electricity. The contacts of switch 58 are shown in the positions occupied with a closed door, thereby, current continues down to a common connection of all of the contact springs 39 of the keys 1, 2, 3, etc. of combination selection board 10. As previously related, each key 1, 2, 3, etc. can actuate three contact springs 35, 36, and 37 of single-pole, double-throw type and in addition, a single-pole, single-contact spring 39.

A tenant chooses a three digit combination code at his option. He opens the door by entering this combination on his first actuation of the combination selection board 10. In the following example, the code 5-8-6 is used.

INITIAL SETTING OF COMBINATION

Press key 5, all contact 39, 35, 36, and 37 close. Current flows only through contact 39 and 35, the others leading to open circuitry and energizes solenoid 20. The slide rack 14 moves and engages to lock down contact 35. Current flows through back contacts FK3 of a relay 72, through back contacts LK4 of a latching relay 54 to energize a relay 66. The contacts MK1 thereof, close and energize the latch coil L of latching relay 54 which shifts all contacts and remains latched after released key 5 opens contact 39. Relay 66 is released. A time delay relay 80 starts up through contacts LK3 of the latching relay 54.

Press key 8, contact 39 closes, contact 36 closes. Current travels through back contacts FK4 of relay 72, through contacts LK2 of latching relay 54, through back contacts MK3 of relay 66 to energize solenoid 22. The slide rack 16 moves up and engages to lock down contact 36. A branch circuit through contacts PK4 energizes a relay 68, which closes and holds itself in via contacts OK2. Current now moves through contacts LK3 of the latching relay 54, through contacts LK3 of the latching relay 54, through contacts OK4 of relay 68 to energize relay 70 which closes and holds through contacts PK2. Relay 68 is deenergized and releases when contact 39 of key 8 is released, but relay 70 remains held since it is supplied from a secondary "hot" line 47 coming from contacts LK3 of the latching relay 54.

Press key 6, contact 39 closes, contact 37 closes. Current moves through contact PK1 of relay 70, through contacts OK1 of relay 68 to solenoid 24 which shifts slide rack 18 to lock down contact 37. A relay 72 and a door lock solenoid 76 energize. Both of the latter hold through contacts FK2 from a third "hot" line 48, via contacts LK5 of latching relay 54, even after the key 6 is released opening contact 39. The door now is unlocked.

The previously mentioned time delay relay 80 functions as a resetting factor in the circuitry by applying current to the

release coil R of the latching relay 54. A reasonable delay which allows time to work the combination is thus provided. Relay 72 will remain closed; however, through the left contacts of door switch 58 and from contacts FK1 of relay 72. As soon as the door is closed, this circuit is broken and relay 72 relaxes and the door lock solenoid 76 releases to relock the door.

The "Exit" door button 62 in the interior will energize the relay 72 and door lock solenoid 76 at any time. In case of a forced entry (relay 72 and door solenoid 76 not energized) current will pass the left contacts of the door switch 58 through the back contacts FK1 of relay 72 and sound alarm bell 82.

With the combination set up in the combination selection board 10, only the subsequent correct digits entered thereon will switch the circuitry as related and unlock the door. Too great a delay in entering the combination or in opening the unlocked door will result in the time delay relay 80 energizing the latching coil R to dump the already selected digit information held by the relays 66, 68, or 70.

For authorized entry, by a manager for example, the cancel switch 56 is provided. This may be key operated and/or located remotely. This switch 56 energizes the magnetic release latch 44 which then drops the slide racks 14, 16, and 18 to erase the three-digit code held in the combination selection board 10.

Security is provided for in the following manner. Assuming a key is pressed which is not of the preset code, none of the forward contacts of contacts 35, 36, and 37 will close because of the lockup by the slide racks 14, 16, 18.

Should any of the nonselected numerals be depressed but including by chance the first correct digit, current will flow through contact 39, through the back contact of 36, through the now-closed contact LK1 of the latching relay 54, through back contacts MK4 of relay 66, through back contacts PK3 of relay 68 and to the release coil R of the latching relay 54, thus canceling the first digit.

Should both the first and second digit of the code be guessed correctly, but the third digit be wrong, current flows through contact 39, through the back contact of 37, through the back contact OK3 of relay 68, through the front contact PK3 of closed relay 70 and thence to energize the release coil R of latching relay 54 to dump the incorrect sequence.

By chance, the subsequent wrong entry of the code might be a repetition of the prior correct digit. The circuit will lead through 39, through the closed forward contact 36, through back contact FK4 of relay 72, through LK2 of latching relay 54, through MK3 of relay 66, but end ineffectively at open contact OK2 of released relay 68 and open contact PK4 of closed relay 70. However, the back contact of 37 will conduct current through a path including back contact OK3 of relay 68, through the front contact PK3 of closed relay 70 to the release coil R of latching relay 54.

Obviously many modifications and variations of the present invention are possible in light of the above teachings. It is, therefore, to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

What I claim is:

1. A centrally monitored electric combination lock system for hotel doors and the like, comprising: combination selection board means including variable means for introducing a selected code into the system, means for recording said code, means for establishing a circuit upon the recording of said code, lock means operatively responsive to said established circuit, means for breaking said circuit while retaining the recorded code, said means for introducing the code being operable in accordance with the code to reestablish the circuit and being inoperative to reestablish the circuit if operated in any manner other than that of the selected code, means for operating said lock means independently of said established circuit, and means for monitoring and clearing the selected code from said system from a remote location so that the same or another selected code may be introduced.

2. A system as recited in claim 1, wherein the means for introducing a selected code comprises a keyboard having plural rows of key assemblies, and wherein the means for recording said code comprises a respective rack assembly movably mounted in said keyboard in alignment with each of said rows, each rack assembly having structure adapted for engagement, on movement of the rack, with a portion of a key assembly depressed in the respective row aligned with the rack, and with each rack assembly having structure offset from the first said structure and adapted for preventing depression of other key assemblies in said row subsequent to said movement of the rack.

3. A system as recited in claim 2 wherein each key assembly comprises: a depressable key, a key stem in spaced relation with the key, spring means for urging the key stem towards the key, and spring means stronger than the first said spring means for urging the key stem away from the key on depression of the key.

4. A system as recited in claim 3, wherein the means for recording said code includes solenoid means for moving the respective racks, and contact means responsive to depression of the respective key stems for actuating said solenoid means.

5. A system as recited in claim 4, wherein each said key is adapted for actuation of a key stem in plural of said rows of key assemblies.

6. A system as recited in claim 4, wherein the means for recording said code includes a magnetic release latch adapted for engaging all said racks on said movement thereof by the solenoid means, thereby preventing retraction of said moved racks.

7. A system as recited in claim 4, wherein the means for establishing a circuit comprises spring switch means responsive to depression of each said key stem, plural circuit means respectively common to the spring switch means in each row of key assemblies, and relay means connected with the plural circuit means and adapted for establishing serial portions of said circuit corresponding to said recorded code.

8. A system as recited in claim 7, wherein said means for breaking said circuit includes switch means operated by opening said door, and a code cancelling circuit responsive to said switch means and adapted to release a said relay means.

9. A system as recited in claim 8 wherein said means for breaking the circuit includes a manually operable switch.

10. A system as recited in claim 9 wherein all said circuits, circuit means, and solenoids are operated on direct current, and wherein the direct current is supplied through a reversible switch at said central location, whereby reversal of said reversible switch releases said magnetic release latch and retracts all said solenoids and racks, thereby clearing said system.

11. A system as recited in claim 8, including an alarm circuit actuated by the door switch means for signaling at said remote location on opening of said door, and a second switch means actuated by opening said door, the second switch means adapted to open said alarm circuit in response to establishment of said circuit corresponding to the code, thereby preventing the alarm from sounding when the door is opened after actuation of the lock means through said combination selection board means.

12. A system as recited in claim 11, and a heat detector operatively connected through said alarm circuit for signaling at said remote location.

13. A system as recited in claim 12, and an electric key switch adapted to bypass all said means for establishing a circuit corresponding to said recorded code and said alarm circuit, and to actuate said lock means.

14. A system as recited in claim 7 wherein said relay means includes a time delay relay means activated by depression of an initial key in establishing said circuit corresponding to said recorded code, and deactivated by depression of a last key in establishing said circuit within the time of said delay, said time delay relay means being adapted to interrupt the establishment of said circuit corresponding to said recorded code on expiration of said delay time prior to depression of said last key.