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[54] ELECTRONIC CODE PERMUTATION LOCKING APPARATUS

16 Claims, 2 Drawing Figs.

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 167, 147, 168

[56] References Cited

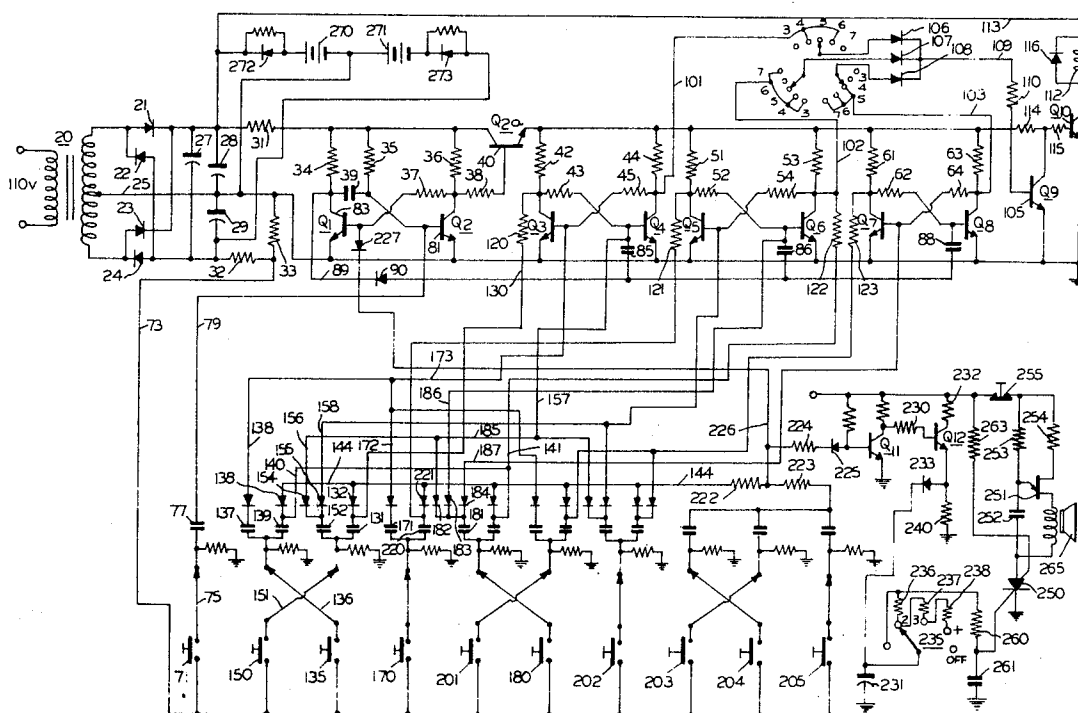
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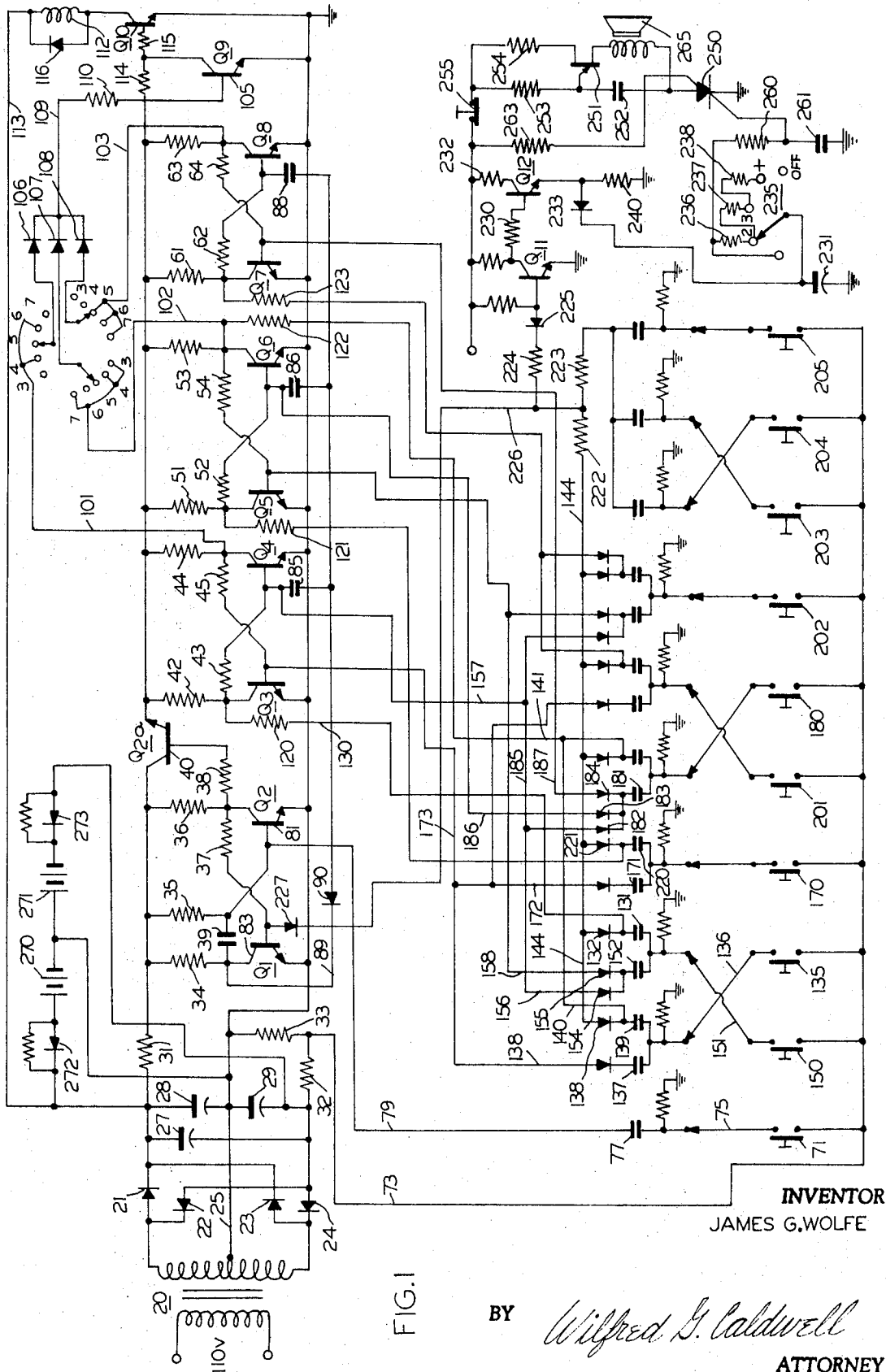
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ABSTRACT: This invention relates to electronic combination locks for operating an electromechanical apparatus, such as a door latch or ignition lock, when in its operative condition. It comprises a plurality of selectable operators digit switches which when operated in a predetermined sequence will switch the lock to its operative condition. A number of bistable or on-off devices are provided with each connected to a predetermined one of the selectable operators switches for operation to a first condition upon operation of its associated operators switch in the sequence and to the other condition upon subsequent operation. A multiple switch and/or logic component is connected to the plurality of bistable devices for sensing a predetermined pattern of conditions from the bistable devices indicative of the last digit of the sequence. A further device is responsive to the sensing means, when sensing the predetermined pattern, to render the lock operative for operating the electromechanical device. Switching means is provided for supplying power to operate the lock, and it is a two position device for supplying power in one of its conditions of operation only, which condition is established by proper selection of one of the operators switches. Reset means are provided for interconnecting the on-off or bistable devices and switching means to interrupt the power when anyone of the operators switches is operated out of the sequence, and a timing circuit is provided similarly to cut off the power to the bistable devices through the switching means after a predetermined interval of time. If the lock has been actuated, power is established over a separate line to the load and once operated is thus not further affected by the switching means or timing circuit until released.



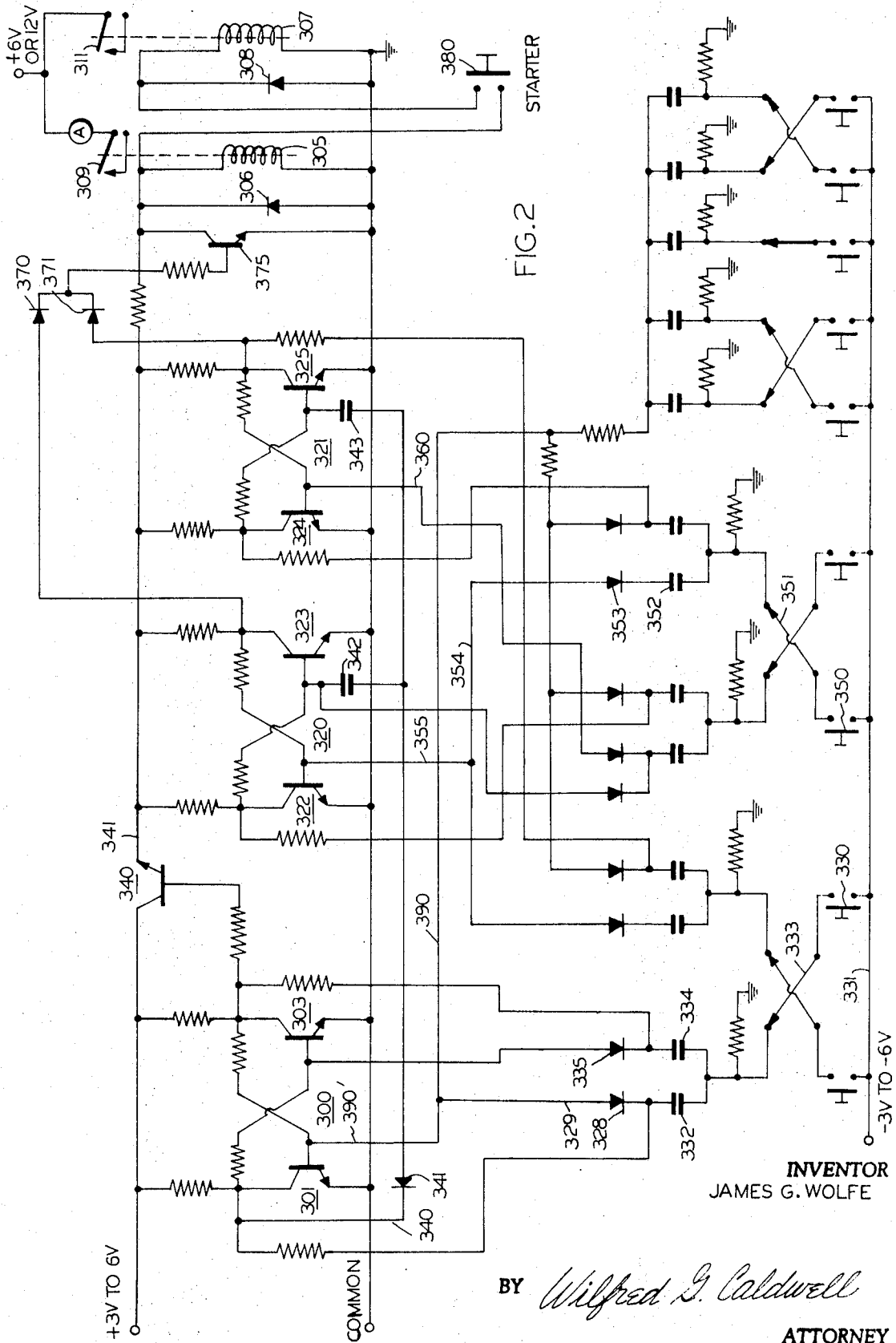


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ELECTRONIC CODE PERMUTATION LOCKING APPARATUS

The invention relates to electronic actuated locks wherein a predetermined permutation is set within the lock, and the latter can only be rendered operative by proper operator manipulation of a plurality of switches in a predetermined sequence. The lock is provided for maximum security and convenience in safeguarding buildings or rooms or the like in the form of a door lock, or vehicles or other devices in the form of an ignition or operating lock.

In its application to doors, lockers, storage areas, and the like, the lock preferably comprises a switching on-off device, e.g. monostable multivibrator, for controlling power to the remainder of the lock. A series gate is rendered operative when the monostable multivibrator is actuated to one condition by selection of one of the operators switches, to admit power to a plurality of on-off or bistable devices. The latter devices are preferably flip-flops connected to operate in a predetermined sequence, e.g. as a binary chain, upon closing of further of the operators switches in proper sequence. The outputs of each of the flip-flops may be brought to a multiple switching and sensing means which is set to select a predetermined condition, i.e. binary number developed by proper actuation of the flip-flops to render the lock actuator mechanism operative, preferably by removing a short circuit in parallel with the load operating initiating device, to permit the actuating mechanism to be operated from the same source of power supply for the locking mechanism.

The monostable multivibrator includes a timing circuit which establishes a predetermined time interval, such as 8 seconds, for properly operating all necessary operators switches. The timing circuit automatically resets the monostable multivibrator to its quiescent state, at the end of the time interval, to cut off power to the flip-flops thereby making it mandatory that operation of the switch be rapidly achieved.

Additionally, each of the operators switches includes a resetting connection to the monostable multivibrator, such that operation of any of the operators switches out of proper sequence also serves to cut off power to the flip-flops, by driving the monostable multivibrator back to its quiescent state.

An alarm mechanism is provided to sound upon improper operation of the lock. It is settable to signal after one or a predetermined number of errors.

Further, an emergency power supply is maintained in charging connection with the circuitry so that the lock may be operated even when the supply voltage is out.

A simpler embodiment is disclosed, in the form of an ignition lock, operative from the power supply of the vehicle. In the interest of economy, the multiple switching and sensing means is replaced by a logical element which can be satisfied from the flip-flops collectively in one condition to supply power to the starter motor. The emergency power supply is ordinarily not necessary, but the alarm circuit may be incorporated if desired.

With the foregoing in mind, it is among the objects of the invention to provide an electronic combination lock which is tamperproof and offers maximum security. A further object of the invention is the provision of an electronic combination lock in which the permutation sequence, as well as the number of operators switches necessary to operate the lock can be readily set to a predetermined permutation.

Another object of the invention is the incorporation of an alarm system for signalling improper operation of the lock after a given number of errors, as well as an emergency power supply automatically ready for use whenever the main power supply fails.

Other and further objects of the invention will become apparent from the following detailed description thereof, when taken in light of the accompanying drawings, wherein:

FIG. 1 is an electrical circuit diagram of the preferred embodiment facilitating change of the predetermined permutation and providing the alarm and emergency power functions, and

FIG. 2 is a circuit diagram of a simplified electronic combination lock, shown in its application to a vehicle ignition lock.

In FIG. 1, transformer 20 is provided to step the supply voltage, e.g. 110 volt AC down to a useable voltage level for the solid state components to be described. A full wave bridge rectifier comprises diodes 21, 22, 23 and 24 to provide a positive and negative unfiltered DC voltage with a common return lead 25 serving as a center tap of transformer 20. Capacitors 27, 28 and 29, along with resistors 31, 32, and 33 filter the rectified AC voltage to provide a smooth DC voltage output for the logic circuitry.

Further, resistors 32 and 33 form a voltage divider with a level of voltage at their junction for determining the level of the multivibrator triggering pulses.

The switching means, which controls the application of power to the lock, is shown as the monostable multivibrator comprising transistors Q1 and Q2. It is connected in the usual configuration, including resistors 34, 35, 36 and 37, as well as capacitor 39. This monostable multivibrator controls the base current to the positive voltage series gate transistor Q2a.

In the quiescent state, the monostable multivibrator Q1, Q2 back biases the base 40 of the positive voltage gate transistor Q2a through saturated transistor Q2. Thus Q2a is not conducting in the quiescent state and the power to the remaining circuitry is off. The transistors in FIG. 1 may all be of type 2N3567 and the circuitry is shown for this NPN type wherein negative signals will turn off these transistors. It will, of course, be appreciated that with polarity reversal PNP transistors could be substituted. A negative pulse applied to base 81 of Q2 will change conduction to Q1 and close Q2a, as will be further explained in connection with the operators switches.

Next, the three bistable multivibrators supplied with operating power over gate Q2a and used for developing a series of binary codes will be described. The first bistable multivibrator includes transistors Q3 and Q4, with resistors 42, 43, 44 and 45. The second bistable multivibrator comprises transistors Q5 and Q6, along with resistors 51, 52, 53 and 54. The third bistable multivibrator comprises transistors Q7 and Q8, along with resistors 61, 62, 63 and 64.

In the quiescent condition, with series gate Q2a open, the bistable multivibrators Q3, Q4; Q5, Q6 and Q7, Q8 are nonoperative.

At the lower left of FIG. 1, there is shown operators pushbutton 71, corresponding to the first digit of the permutation 1 3 2 4 6. When the operator closes pushbutton 71, the negative voltage from the junction of resistors 32 and 33 is applied over line 73, via patch cord 75 to capacitor 77, negatively charging this 0.005-microfarad capacitor. The resulting negative triggering pulse back biases transistor Q2 over lead 79 to its base 81 causing the monostable multivibrator Q1, Q2 to change state with conduction being transferred to transistor Q1. Capacitor 39 discharges through resistors 34 and 35 and transistor Q2a is forward biased through resistors 36 and 38, enabling it to conduct current for the length of time it takes capacitor 39 to discharge. It has been found that approximately 8 seconds enables a person familiar with the combination to operate the lock and accordingly, the parameters may be set for an 8-second discharge of capacitor 39 or to another interval if desired. For example, if fewer pushbuttons are used in a permutation, with perhaps fewer bistable multivibrators, such as only Q3, Q4; Q5, Q6, the time interval may be shortened. Conversely, if more than three bistable multivibrators are employed and if additional pushbuttons are used, it may be desirable to lengthen the time interval.

When the monostable multivibrator Q1, Q2 changed state, it generated a negative pulse from the collector 83 of Q1. This negative pulse charged capacitor 85 (connected to Q4); capacitor 86 (connected to Q6) and capacitor 88 (connected to Q8), by way of lead 89 and diode 90. The effect of the negative charging of these capacitors is to back bias Q4, Q6 and Q8 of the multivibrators. Diode 90 prevents positive pulses, generated by multivibrator Q1, Q2 when it goes back to its quiescent state, from forward biasing Q4, Q6 and Q8.

The output of each bistable multivibrator Q3, Q4, Q5, Q6 and Q7, Q8 is connected to switch 100 by leads 101, 102 and 103. Switch 100 is a rotary switch provided to select the number of digits in the permutation. It is shown set for a 5-digit permutation, as will be explained more fully hereinafter.

Switch 100 connects the preselected bistable multivibrator(s) (comprising the sensed pattern) to the base 105 of shunting transistor Q9, by way of one or more of the diodes 106, 107 and 108, over lead 109 and 15,000-ohm resistor 110. Resistor 110 is designed to give the forward bias to saturate Q9 under extreme temperature conditions and diodes 106, 107 and 108 isolate the multivibrators from each other. Transistor Q9 will remain forward biased until the last digit of the permutation has been pushed. While Q9 is forward biased, it shunts the base current to load actuating base of transistor Q10 to prevent Q10 from conducting current which in turn prevents the load (electric door opener coil 112) from being energized. It is noted that the power path for coil 112 is over lead 113 to the rectifier section of the output side of transformer 20. Thus, only if the proper permutation is placed on the operators switches (such as 71), will the short be removed to permit operation of the coil 112, but then the power circuit is direct.

A 560-ohm resistor 114 controls Q9 collector current and Q10 base current with 100-ohm resistor 115 being a current limiting resistor designed such that the collector saturated voltage of Q9 will not cause forward biasing of Q10. Diode 116, which may be of 1N536 type, shunts the high level spike produced by the collapsing field of the electronic door opener thereby protecting transistor Q10 from possible permanent damage.

It will now be shown how the switch 100 enables the preselection of the number of digits required for the operative permutation. It has heretofore been explained that in the quiescent state all transistors Q3 through Q8 are off, but closure of switch 71 back biased transistors Q4, Q6 and Q8 to turn on transistors Q3, Q5 and Q7. Since the output leads 101, 102 and 103 from the bistable multivibrators are taken from the Q4, Q6 and Q8 sides, these voltage levels will be high once switch 71 is closed. The high voltage is represented by digit 1 in the following table, and no voltage output by the digit 0. The table columns are provided from left to right for multivibrators Q3, Q4, Q5, Q6 and Q7, Q8, with the digits being placed in by the operators switches, such as 71.

LOGIC CODE (FIG. 1)

		Permutation 1 3 2 4 6			
		Q3, Q4	Q5, Q6	Q7, Q8	
Switch 71.....	Quiescent.....				
Switch 135.....	1st digit.....	1	1	1	1
Switch 150.....	2nd digit.....	0	1	1	1
Switch 170.....	3rd digit.....	1	0	1	1
Switch 180.....	4th digit.....	0	0	1	1
	5th digit.....	1	1	0	0
	6th digit.....	0	1	0	0
	7th digit.....	1	0	0	0
	8th digit.....	0	0	0	0

From the above table, it may be seen that for the first digit, all bistable multivibrator leads 101, 102 and 103 carry the output voltage level. Lead 101 extends to an unconnected terminal 5 in the upper segment of switch 100, and similarly lead 102 extends to unselected terminal 6 in the left-hand segment. However, lead 103 extends to terminal 5 which is connected and selected; it extends through diode 108 and lead 109 to base 105 of transistor Q9 maintaining the transistor saturated. As the three bistable multivibrators are operated in binary fashion, it will be noted that the second digit produces no output on lead 101 from Q4, because this multivibrator has now been flipped with conduction on Q4. However, the remaining two multivibrators are unchanged and Q9 remains saturated. The third digit changes multivibrator Q3, Q4 and also Q5, Q6 but the voltage level remains at lead 103. For the fourth digit,

lead 103 is still producing a voltage level, but for the fifth digit, the condition for conduction in Q7, is switched to conduction in Q8 and this condition produces no output on lead 103. Since leads 101 and 102 are not connected through switch 100, Q9 is turned off to cause conduction in Q10 to actuate lead 112. Thus, it may be seen by rotating switch 100, the permutation code may be made up of any number of digits herein illustrated, as 3—7 for three multivibrators, or 1—7 if switch 100 segments carried further contacts. For example, if a 7-digit permutation were desired, switch 100 would be rotated so that the segments all made connections with their number 7 terminals and from the chart, it can be seen that lead 101 would be at the high level and leads 102 and 103 at the low level. By selecting both leads 102 and 103 at switch 100, Q9 is turned off and Q10 on for the first time in any pattern 1—7, so it may be seen that the diodes 106, 107 and 108 are connected in logical AND or in OR relation permitting sensing of the predetermined pattern for lock actuation, and the code pattern continues as a decreasing binary count.

It will now be shown how the operators switches, such as 71, if operated in the proper sequence, will step the multivibrators in accordance with the logic code above depicted. First, it should be noted that these multivibrators are isolated as to input triggering pulses from the collectors, preventing false triggering, by resistors 120 (in circuit with Q3), 121 (in circuit with Q5), 122 (in circuit with Q6) and 123 (in circuit with Q7). Each resistor has a value of 150,000 ohms. The connection of the bistable multivibrator collectors, through these isolating resistors, such as lead 130 for resistor 120 extending to the junction of 0.005-microfarad capacitor 131 and diode 132, provides a means of steering input pulses, these paths being duplicated for the other transistors. Returning now to the operators switches, it will be noted that switch 135, in the position of the third switch is connected by patch cord 136 to serve as the second input. Upon closure of switch 135, capacitor 137 immediately charges and the negative triggering pulse follows lead 138 and lead 173 to the base of Q3 where it back biases Q3 in the first bistable state multivibrator, causing it to change state. Since capacitor 139 was already charged from the positive voltage at the collector of Q6 over lead 140 and 141, diode 138 did not transfer the negative triggering pulse and thus the alarm circuit (shown to the lower right of FIG. 1) is not influenced or actuated over alarm lead 144 and monostable Q1, Q2 is not reset to its quiescent state.

Next, the pushbutton 150, corresponding to the third digit in the permutation 1 3 2 4 6, is now depressed. Patch cord 151 permits capacitor 152 to charge and the negative pulse is steered through diodes 154 and 155 to back bias transistors Q4 and Q5 over leads 156, 157 for Q4 and 158 for Q5; thus, both the first and second bistable state multivibrators change state, as is shown in the above logic code.

The fourth pushbutton 170 is depressed to negatively charge capacitor 171, which in turn back biases transistor Q3 over leads 172 and 173 to cause the first multivibrator to change state.

The last (sixth) pushbutton 180, corresponding to the fifth digit in the permutation, is now depressed and capacitor 181 charges and generates a negative pulse through diodes 182, 183 and 184, back biasing transistor Q4 over leads 185 and 157, Q6 over lead 186 and Q7 over lead 187, thereby causing all three bistable multivibrators to change state, as shown in the code above for the fifth digit. At this time, there is no output from the first and second bistable multivibrators. Switch 100 is set for the 5-digit permutation and only the third bistable multivibrator (Q7, Q8) is connected to the base 105 of shunting transistor Q9. With no output from this third multivibrator, Q9 turns off and load actuating transistor Q10 is forward biased through resistors 114 and 115 causing Q10 to conduct and go into the saturated state. This action energizes coil 112 and the door is unlocked.

The switch 100 will accommodate up to seven digits as indicated, in which event in position 7, additional operators switches 201 and 202 could be employed in the manner

hereinbefore described. The eighth, ninth and 10th switches 203, 204 and 205 are connected directly to the alarm line 144 and operation of any one of these latter three switches instantly removes the power (over lead 226) and sets off the alarm or registers in the alarm mechanism. Of course, it will be apparent that by using patch cords between the operator switches and the diode steering matrix that any one or more of the eighth, ninth or 10th positions could be incorporated into the permutation, in lieu of other prior switches.

The sequence of events from the depression of the first pushbutton 71 to the depression of the final pushbutton 180 must take place within the predetermined 8 seconds. After 8 seconds has elapsed, the logic circuitry resets automatically to its quiescent state with Q2 assuming conduction so that series gate Q2a is opened. Furthermore, the pushbutton corresponding to the digits must be pushed in the proper sequence and additionally no pushbutton not associated with the permutation must be pushed or the circuitry will reset to its quiescent state and the alarm circuit will be influenced or tripped.

Each pushbutton except the one (71) corresponding to the first of the permutation is connected to the alarm circuit over lead 144 such that if an improper pushbutton is pushed or a pushbutton pushed out of sequence then the alarm circuit can be tripped and audible sound will occur until manually reset. By way of example, assume that pushbutton 170 is pushed out of sequence. This charges capacitor 220 which in turn generates a negative pulse through diode 221 along lead 144 and through 18,000-ohm resistor 222. At the junction of resistors 222, 223 and resistor 224, diode 227, the pulse divides and follows two paths. The first path is along lead 226 to diode 227 to back bias transistor Q1 causing the monostable multivibrator to change state back to its quiescent state which resets the entire system.

The second path is through resistor 224 (a current limiting resistor) and diode 225 to back bias transistor Q11 for the time duration of the negative pulse. This action causes the collector voltage of Q11 to go positive which forward biases transistor Q12 over 1,000-ohm resistor 230, which transistor is connected as an emitter-follower and the biasing action persists for approximately 300 microseconds. During the time interval that Q12 is forward biased, capacitor 231, which may be a 5-microfarad capacitor, is charging through resistor 232, Q12 and diode 233. The time to fully charge capacitor 231 is considerably longer than the time that Q12 is forward biased, such that each time the alarm circuit receives a signal because of an error, capacitor 231 charges a certain percentage of full charge. Switch 235 selects the number of errors required to trigger the alarm. It is adapted to add resistance as it is moved from position 1 to position 4 with resistor 236 being 3 megohms, resistor 237 being 2.75 megohms and resistor 238 being 1.5 megohms. This switch, in position 2 as shown, is set to give an alarm when three errors have been committed. The first error causes capacitor 231 to charge a certain percentage of full charge and hold this charge. Diode 233 prevents capacitor 231 from rapidly discharging through 20,000-ohm resistor 240. The second error boosts the charge on capacitor 231 and the third error steps the charge to the necessary voltage level required to forward bias the silicon-controlled switch 250, which may be of the 3N84 type.

When SCS 250 is gated on, the oscillator including unijunction transistor 251, 1-microfarad condenser 252 and 1,000-ohm resistor 253 and 330-ohm resistor 254 is energized to oscillate and produce an audible tone that will persist until the reset switch 255 is pushed to open the circuit. This alarm can, of course, be concealed or within the locked room. Resistors 236, 237, 238 and 3-megohm resistor 260 are current limiters for the cathode gate control of the SCS. The 0.02-microfarad capacitor 261 is a transient signal filter. The 100,000-ohm resistor 263 controls the "rate effect" of the SCS. Speaker 265 provides the audible alarm. When capacitor 252 charges through resistor 253 to a level that forward biases unijunction 251, the unijunction conducts through the speaker causing the tone. Capacitor 252 rapidly discharges through the emitter base one junction and the cycle repeats itself.

The emergency power supply consists of batteries 270 and 271 in series with rectifiers 272 and 273 to permit trickle charging during normal circuit operation and to provide a source of the proper polarity voltage for emergency use.

In FIG. 2, there is shown a permutation ignition lock for vehicles and it comprises a simpler embodiment of the door lock described, but in general, the same operating principles otherwise obtain.

The power source, for the ignition source, is supplied by the vehicle battery. However, the monostable multivibrator of the previous lock is now replaced by a bistable multivibrator 300 comprising transistors 301 and 303. The function of this device remains generally the same, namely to control the supply of power to the logic circuit. The load now comprises relay coils 305 and 307 for operating, respectively relay contacts 309 for the vehicle ignition coil circuitry and relay contacts 311 for the starter motor circuitry. The first relay 309 also controls the gauges of the instrument panel, radio, lights, and other accessories, while the contacts 311 only control the starter motor circuit.

Additionally, only two logic bistable multivibrators 320 and 321 are shown, including respectively transistors 322, 323 and 324, 325.

The first pushbutton 330 is pushed causing the switching bistable multivibrator to change state. Accordingly, in the permutation 2 1 4 3, the pushbutton 330 extends negative potential from lead 331 over patch cord 33 to produce a negative pulse at capacitor 334 which passes through diode 335 to turn off transistor 303. In turn, series gate transistor 340 is forward biased to continue power line 341 to the logic bistable multivibrators 320 and 321. The negative pulse from pushbutton 330 does not reset multivibrator 300 because capacitor 332 is at a positive potential from the +3 to +6 volt source and no pulse is passed over lead 329 including diode 328 to reset line 390-390'.

After transistor 301 is conducting, the remaining pushbuttons in the permutation are pushed and the operation is the same as previously described. Again, a logic code is presented, but it is a code which operates when both multivibrators 320 and 321 are producing no output voltage.

LOGIC CODE (FIG. 2) FOR IGNITION LOCK

Permutation 2 1 4 3			
		320	321
Switch 330...	Quiescent.....		
	1st digit.....	1	1
	2nd digit.....	0	1
	3rd digit.....	1	0
Switch 350...	4th digit.....	0	0

In the above code, it will be noted that in the quiescent state, neither multivibrator 320 or 321 is actuated. However, when conduction is established in transistor 301, it causes a negative pulse in lead 340 which passes over diode 341 to turn off transistor 323 over capacitor 342 and also turn off transistor 325 over capacitor 343 thus affording the output conditions in the above chart for the first digit, namely 1 and 1.

The same principle obtains until the last digit is entered (fourth digit) by closure of switch 350. This provides a negative pulse over patch cord 351, via capacitor 352, diode 353 and leads 354 and 355 to turn off transistor 322, thus affording a zero output in the left-hand segment of the above chart. Transistor 324 of the second multivibrator is already off as a result of the third digit which applied a negative pulse via lead 360, thereby producing a zero output in the left-hand column.

From the above, it can be seen that this is the first time that no outputs have been applied to both diodes 370 and 371 connected as an AND or as an OR circuit and accordingly, the transistor 375 (corresponding to transistor Q9 of FIG. 1) is no longer forward biased, and power is now available directly to the relays 305 and 307. These relays are protected by diodes 306 and 308 during collapse of their magnetic fields. How-

ever, starting motor relay does not energize until the starter button 380 is depressed.

To shut the ignition system off, the pushbutton 330, relating to the first digit of the permutation, is depressed for the second time causing the first bistable multivibrator 300 to switch conduction back to its closed condition, i.e. transistor 303 becoming conductive, and cut off the power supply.

Similarly, the reset line 390-390' is provided as before to switch the state of multivibrator 300 to cut off the power whenever a button is depressed out of the sequence or when a button not associated with the permutation is depressed thereby affording the safety protection function.

It will now be appreciated that the variations shown in FIGS. 1 and 2 may be used in any combination, as for example, the multiple switch 100 of FIG. 1 could be incorporated in the circuitry of FIG. 2 to permit the selection of a different number of digits for the permutation to start the motor of the vehicle. Switch 100 may be omitted from the circuit of FIG. 1 in accordance with the teachings related to FIG. 2.

Additionally, the use of the first stage for supplying power can be derived from either a monostable or bistable stage. Also, of course, the alarm circuitry of FIG. 1 could be incorporated into FIG. 2.

For these reasons, it is intended that the invention be limited only by the scope of the appended claims, wherein what is claimed is.

I claim:

1. An electronic combination lock, for operating an electromechanical means, when in its operative condition and having a normally nonoperative condition, comprising in combination a plurality of selectable operators digit switches which when operated in a predetermined sequence will switch the lock to its operative condition; a number of bistable means each connected to a different one of the selectable operators switches for operation to one condition upon operation of the associated operators switches in said sequence and to the other condition upon subsequent operation; means interconnecting said bistable means for operation in accordance with binary sequencing; output circuits for each bistable means to provide outputs indicative of the condition of operation; multiple switching means connected to the output circuits of the plurality of bistable means for preselecting the number of operators switches to be operated in the sequence to render said lock operative; sensing means connected to the multiple switching means and responsive thereto to sense a predetermined pattern of conditions in accordance with binary code therefrom indicative of the last digit of said sequence; means responsive to the sensing means when sensing said predetermined pattern to render the lock operative for operating the electromechanical means; switching means for supplying power to operate the lock, said switching means comprising two position operating means for supplying power in one of its conditions of operation; and reset means interconnecting the operators switches to the two position means to interrupt the power when one of the operators switches is operated out of said sequence.

2. The lock of claim 1 wherein the bistable means and the switching means comprise multivibrators.

3. The lock of claim 1 wherein the switching means comprises a monostable multivibrator including timing means for resetting it, and the reset means are connected to reset the multivibrator independently of the timing means.

4. The lock of claim 1 further comprising circuit connections from the switching means to each bistable means to establish a predetermined set of operating conditions among the bistable means upon operation of the switching means to its one condition of operation, and said switching means being operated to said one condition of operation by actuation of its associated operators switch.

5. The lock of claim 4 wherein said switching means comprises a power lead connected from a source of power to the bistable means, a series gate connected in the lead to open and close it, said switching means further comprising a multivibra-

tor for closing the series gate when in said one condition of operation.

6. The lock of claim 5 wherein said power lead is connected to the electromechanical means, and said means responsive to the sensing means comprises shunting means connected to the power lead for diverting energy from the electromechanical means until said predetermined pattern of conditions is sensed.

7. An electronic lock having an operative condition and a normally nonoperative condition and adapted to be placed in its operative condition by operation of a plurality of selectable operators means in a predetermined sequence, comprising in combination a number of multivibrator stages each connected to a different selectable operators means for operation to a first condition upon subsequent operation, means interconnecting said stages for operation in accordance with binary sequencing, sensing means collectively responsive to the on-off means to sense a predetermined pattern of conditions therefrom conforming to a binary code, means responsive to the sensing means when sensing said predetermined pattern to render the lock operative, switching means for supplying power to operate the lock, and reset means interconnecting the respective operators means with the switching means to interrupt the power whenever an operators means is operated out of said sequence.

8. The lock of claim 7 further comprising a source of power connected to the switching means and to the operators means, said on-off means comprising bistable multivibrators, and said operators means comprising switches whereby closure of one of the switches applies a pulse to at least one of: the switching means and at least one of the multivibrators.

9. The lock of claim 8 wherein the sensing means comprises a logical circuit responsive to only one set of conditions of operation of the bistable multivibrators to actuate the means responsive thereto, and means for selecting said one set of conditions as the predetermined pattern from a plurality of patterns available from operation of the bistable multivibrators.

10. An electronic permutation lock comprising binary counting means, switching means for connecting a source of power to the binary counting means, a plurality of operators switches, circuits interconnecting the operators switches with individual stages of the binary counting means to cause the latter sequentially to count when the operators switches are operated in a predetermined sequence, output circuits from the binary counting means, sensing means comprising a logic circuit responsive to a predetermined pattern of outputs selected from a binary code from the output circuits, load actuating means operated by the sensing means when the logic circuit senses the predetermined pattern, and reset circuits connected between the operators switches and the switching means to disconnect the source of power whenever an operators switch is operated out of said predetermined sequence.

11. The lock of claim 10 wherein the binary counting means comprise a plurality of bistable multivibrators.

12. The lock of claim 11 wherein the switching means comprises a multivibrator and a series gate, said gate being connected between the power source and the bistable multivibrators, and said multivibrator being connected to open and close the gate.

13. The lock of claim 12 wherein the load actuating means comprise electromechanical operating means connected across the power source, and shunting means for normally diverting energy from the operating means, said logic circuit opening the shunting means when the predetermined pattern is sensed.

14. The lock of claim 10 further comprising an alarm circuit including an alarm connected for actuation from the reset circuits, the alarm circuit comprising storage means responsive to each error occasioned by operating the operators switches out of the predetermined sequence, and means for selecting a number of errors at the storage means to operate the alarm.

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15. The lock of claim 10 wherein the sensing means comprises multiple switching means connecting the output circuits to the logic circuit, and means at the multiple switching means for selecting the number of digits in the permutation to determine the predetermined pattern.

16. The lock of claim 15 further comprising battery storage

means, and rectifiers connecting the battery means across the power source to receive trickle charge during normal operation and to serve as emergency power when the power source fails.

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