

[54] **KEYLESS CONTROL MECHANISM**

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[58] **Field of Search**..... 340/147 R, 149 R, 164 A,
340/164 R; 317/134

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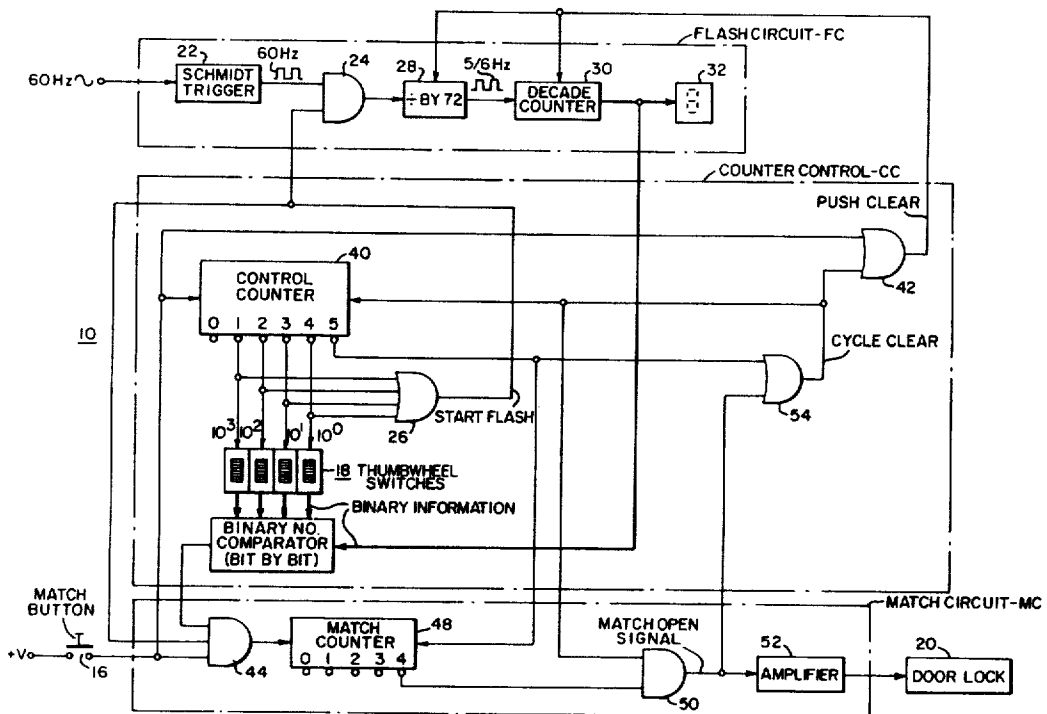
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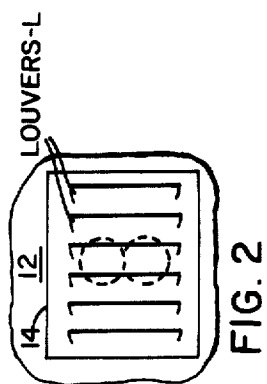
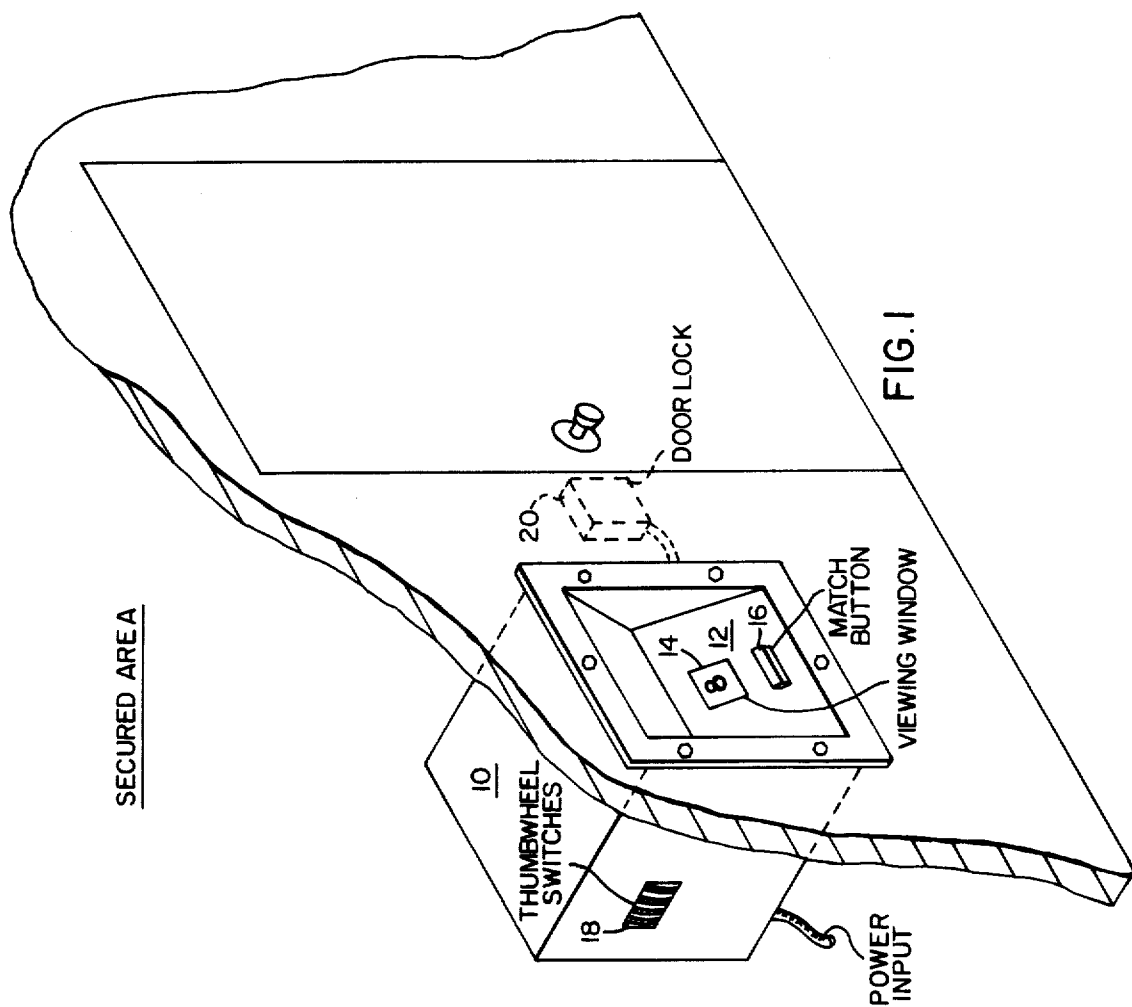
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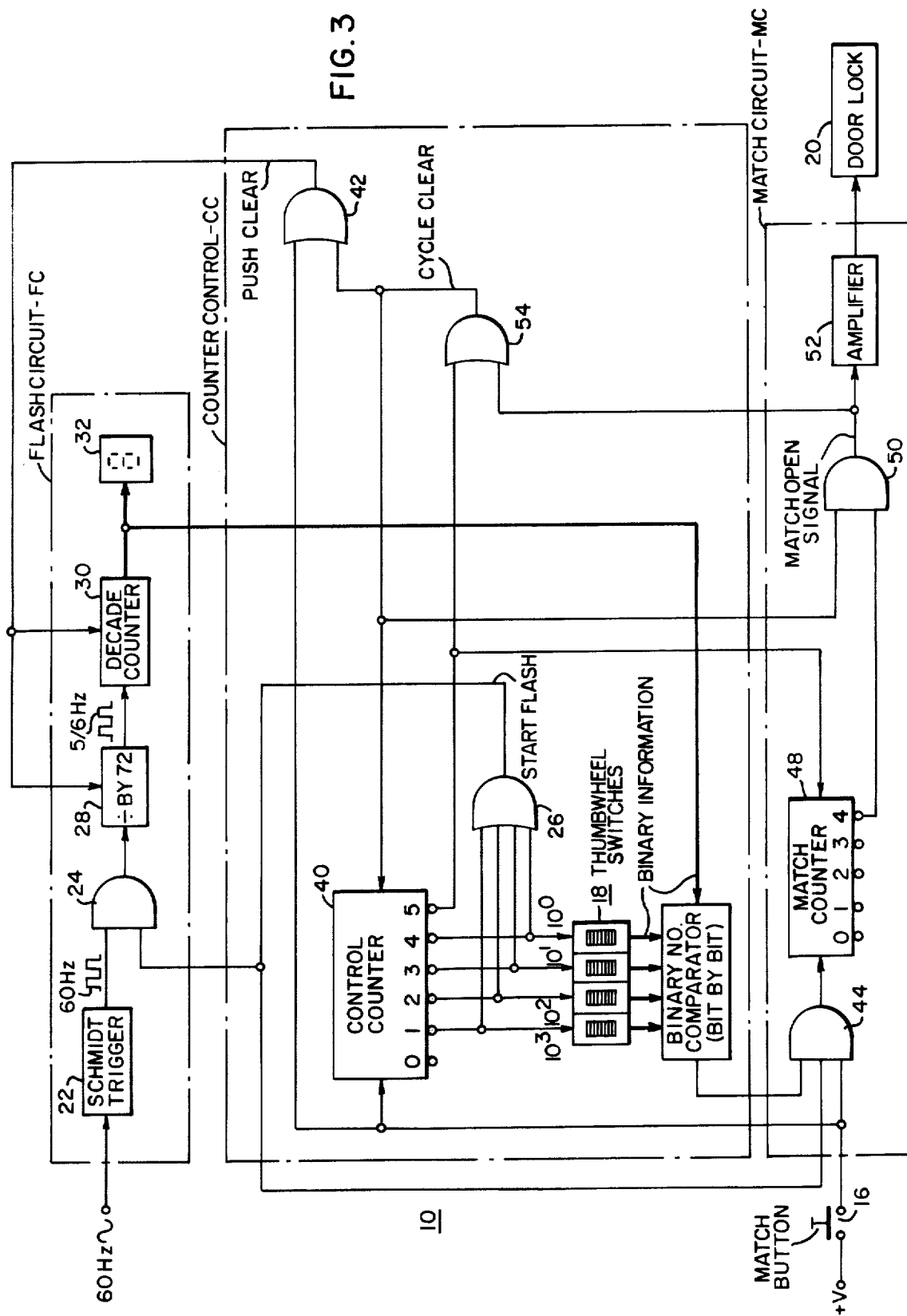
ABSTRACT

A controlled display device sequentially displays code information which is viewable only to an observer positioned at a critical angle relative to the display device. The observers actuation of a device acknowledging a predetermined sequence of code information results in the generation of a control signal.

4 Claims, 3 Drawing Figures







KEYLESS CONTROL MECHANISM

BACKGROUND OF THE INVENTION

The use of keyless locks and keyless actuating devices, for numerous military, industrial, and residential security applications has resulted in the development of numerous mechanical and electrical control systems. Numerous available keyless control systems are of the form whereby the person desiring entry to a protected area or desiring to initiate a predetermined control function communicates to the keyless security device in an attempt to match preset encoded information. This encoded information is either stored electrically by the absence or presence of voltages or mechanically by the positioning of slides or other mechanical parts. The system typically includes multiple actuating switches or buttons on an exposed face panel. The individual desiring to initiate a control function or desiring to obtain entry is required to actuate the buttons in a predetermined sequence which satisfies the encoded information. This type of a security system lends itself to unwanted observation by an unauthorized individual as well as unwanted tampering.

SUMMARY OF THE INVENTION

There is disclosed herein with reference to the accompanying drawings a control mechanism which communicates with the person desiring entry or desiring to initiate control function by means of a display system which sequentially presents to the individual information to which the observer is required to respond by actuating a single button. The system may be programmed to require the observer to actuate the button in response to one or more code characters displayed to achieve the desired entry or initiate the desired control function. The use of a display screen having a critical viewing angle, which can be suitably implemented through the use of light control film such as that available from the 3M Company, severely limits the angle at which an observer can view the displayed code characters. The use of such a display screen prevents unauthorized observation of the display code characters. This system eliminates the need for a plurality of actuating devices or buttons which through normal wear could easily disclose the buttons representing the encoded information.

DESCRIPTION OF THE DRAWINGS

The invention becomes more readily apparent from the following exemplary description in connection with the accompanying drawings:

FIG. 1 is a pictorial representation of an embodiment of the invention;

FIG. 2 is a pictorial illustration of the use of louvers in the display window of FIG. 1; and

FIG. 3 is a block diagram schematic illustration of an embodiment of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1, there is pictorially represented a control system 10 including a display panel 12 consisting of a display screen 14 and a display information match-button 16. The control system 10 of FIG. 1 is utilized in a security application whereby the output signal generated by the control system 10 is functioned to actuate the door-lock mechanism 20. While the dis-

cussion to follow will make use of the security application for the purposes of identifying a practical utilization of the invention, it will be apparent that the concept disclosed is adaptable to numerous control system applications.

In the embodiment illustrated in FIG. 1, a stored code is produced by the setting of thumbwheel switches 18. One or more thumbwheel switches can be utilized depending on the application of the control system. The stored code established by the thumbwheel switches 18 must be satisfied before the control signal is transmitted to actuate the door-lock mechanism 20. An observer desiring entry to the secured area is required to actuate match-button 16 in response to stored code as it is presented in display window 14. Therefore, in order for an observer to gain access to the secured area he must recognize the stored code established by the thumbwheel switches 18 by the proper actuation of the match-button 16. While the embodiment of FIG. 1 utilizes thumbwheel switches 18 for the purpose of establishing the stored code which must be satisfied to produce a control output signal, it is apparent that numerous techniques are available for implementing the requirement for establishing a stored code.

A particularly desirable feature of the control system 10 is the use of a critical viewing angle display window 14 which affectively prevents individuals position other than directly in front of the display window 14 from observing the sequential information displayed to which an observer responds by actuating the match-button 16. This feature prevents an unauthorized observer from gaining access to the correct stored code information. The critical viewing angle display window can be achieved through the use of louvers or through the use of light control film as identified above. The flashing display viewed through the display window 14 can be typically implemented through the use of a light emitting diode (LED) display. FIG. 2 is an illustration of the use of louvers L to establish the critical viewing angle.

There is illustrated schematically in FIG. 3 a typical arrangement of components to implement the operation of the control system of FIG. 1. The schematic embodiment of FIG. 3 includes three basic circuits, a Flash Circuit FC, a Counter Control Circuit CC and a Match Circuit MC.

The initial actuation of the match button 16 develops a signal which is supplied as an input signal to the control counter 40, the push clear OR circuit 42, and the match AND gate circuit 44. The input signal to the control counter 40 shifts the output to position number 1 which in turn feeds the start flash OR circuit 26. Inasmuch as the OR gate 26 requires only one input to develop an output signal, the output signal thus developed is not only supplied to gate the start flash AND circuit 24 as indicated above, but also serves as a second input to match AND gate circuit 44. The number 1 output of the control counter 40 is thus a logic high which causing energization of thumbwheel switch 10³. The observer desiring entry to the secured area now views the sequence of numbers presented to him in the display windows 14 of the Flash Circuit FC and acknowledges the number representing the first correct number of the stored code developed by the thumbwheel switches 18 by actuating the match button 16. If the operation of the match button 16 corresponds to the first number of the stored code the binary number comparator 46 de-

velops a logical high output signal which is supplied as a third input to the match AND gate circuit 44.

A Schmitt trigger circuit 22 in the Flash Circuit FC responds to a 60 Hz sinewave by converting the 60 HZ sinewave to a 60 cycle square wave signal as illustrated. This squarewave is then applied as one input to a start flash AND gate 24. If a logic input signal is coincidentally supplied to the second input of the start flash AND gate 24 from the start flash OR gate 26, the 60 Hz square wave pulse is gated through the start flash AND gate to a divide by 72 circuit 28 which develops a five-sixths Hertz flash frequency output signal. The flash frequency signal is supplied as an input to the decade counter 30 which responds by developing a count sequence from 0 and 9 and then resets to 0. The count sequence developed by the decade counter 30 is supplied in binary form to a seven segment LED display 32, which functions to present the 0 through 9 information to the observer through the display screen window 14 or FIG. 1. Initially, in the system standby condition, a 0 is present in the display window 14 and all system counters are set at 0.

The match AND gate circuit 44 responds to the presence of the three input signals by transmitting a logical high signal as an input to the match counter 48. The match counter 48 responds to the input signal by shifting from position 0 to position 1 while the control counter 40 is shifting from position 1 to position 2 in response to the actuation of the match button 16. Furthermore the actuation of the match button 16 transmits a signal through the push clear OR circuit 50 which functions to both clear the divide by 72 circuit 28 and the decade counter 30 thus bringing the display back to 0. This alerts the observer to the fact that a flash display for the second number of the stored code sequence will soon be initiated.

In anticipation of the second match button actuation the control counter 40 is located at position 2 and is thus set to energize the 10^2 thumbwheel switch and the match counter 48 is located at position 1 indicating that there has been one correct match entered. Again in the second display sequence when the number presented in the display window 14 agrees with the binary number encoded in the binary comparator circuit 46 by the 10^2 thumbwheel switch a logical high is developed at the match AND gate circuit 44 thus requiring actuation of the match button 16 in order to enter another correct match through the match AND gate circuit 44. Assuming a correct actuation of the match button 16 occurs, the logic output signal developed by the match AND gate 44 will cause the match counter 48 to be shifted to position 2 and the control counter 40 will be setting at position 3. Once again the display will be cleared. The same procedure as described above is repeated for the match of the stored code information developed by the 10^1 thumbwheel and the 10^0 thumbwheel.

In the event the match button is not depressed or depressed in response to an incorrect display number the control counter 40 will be shifted one position as usual thus clearing the display, but the match counter 48 will not be shifted.

Prior to the fourth and final actuation of the match button 16 one of two situations may exist, namely i.e., the first three match button actuations have matched the first three numbers in the four number stored code or one or more of the first three match button actua-

tions has not matched the corresponding information in the stored code.

Assuming the first situation where three correct entries have been entered. Under these circumstances the match counter 48 will be in position 3, the control counter 40 will be in position 4, as it would whether the first three entries were correct or not, and the 10^0 thumbwheel switch would be energized. Assuming the observer actuates the match button 16 in response to the display of the fourth number in the stored code the match counter 48 will be stepped to position 4 and the control counter 40 will be stepped to position 5. This results in output signals from the control counter 40 and the match counter 48 which are transmitted as inputs to the match insurance AND gate. The occurrence of simultaneous inputs at match insurance AND gate 50 results in a control signal output from the match insurance AND gate which is transmitted through an amplifying circuit 52 to actuate the lock mechanism 20. A time delay circuit is typically included to maintain the control system output signal for a limited period of time.

The output signal from the match insurance AND gate 50 is also supplied as an input to the cycle clear OR gate 54 with the corresponding output of the cycle clear OR gate being supplied as an input signal the push clear OR circuit 42 thus insuring a reset of the display to 0. The output of the cycle clear OR circuit is also applied to the clear inputs of the control counter 40 and the match counter 48. After the control signal is terminated the control system 10 is returned to a standby condition with all counters set on 0 and a 0 appearing in the display window 14.

Assuming now the situation where the first three actuations of the match button 16 have not satisfied the stored code and a fourth match button actuation is about to be entered. The final actuation of the match button 16, whether it corresponds to a correct or incorrect match, will cause the control counter 40 to be stepped to position 5 causing an output signal to be transmitted through the cycle clear OR gate 54 to produce a cycle clear and assure the transmission of a push clear signal by push clear OR gate 42. This operation assures the resetting of all the counter to 0 and returns of the display to 0. Thus the system is again established in a standby state.

It is noted that there are two different types of input signals possible from the above system. A push clear signal is developed each time the match button 16 is actuated and functions to reset the display to 0. The cycle clear signal is produced only after five actuations of the match button 16, i.e., the first operation to activate the system and the four match button actuations initiated in an effort to match the stored code established by the thumbwheels 18. This cycle clear signal is produced after the five actuations of the match button 16 regardless of the accuracy of the match button actuations.

The operational integrity of the control system 10 is improved by several circuit refinements. For instance there are three inputs instead of two to the match AND gate 44 thus requiring a start flash signal to be present indicating that the counting sequence is occurring. If this input signal is not required it would be possible to match 0 since that is the standby condition and there is a 0 displayed in the window. Additional operational integrity is provided by the match insurance AND circuit 50 which requires not only the presence of the

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fourth match, as reflected by the match counter 48, before generating a control signal output but also requires control counter 40 to be located at position 5.

I claim:

1. Apparatus for generating a control signal in response to predetermined input signals, comprising, first means for sequentially displaying information for viewing by an observer, said first means including a display window having a critical viewing angle requiring the observer to assume a specific position relative to the display window in order to view the displayed information, second means including a single actuator means permitting an observer to selectively acknowledge displayed information and produce signals indicative of the acknowledged display information, and third means

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operatively connected to said second means and responding to said signals to determine if the acknowledged information corresponds to predetermined information, said third means producing a control signal if said acknowledged information corresponds to said predetermined information.

2. Apparatus claimed in claim 1 wherein said display window consists of a light control film.

3. Apparatus claimed in claim 1 wherein said display window includes louvers arranged to establish a critical viewing angle for observing the displayed information.

4. Apparatus claimed in claim 1 wherein said third means includes mechanical thumbwheel switch means for changing said predetermined information.

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