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SEARCH ROOM

Jan. 7, 1969 T. H. HOULE 3,420,987

CODED CONTROL APPARATUS AND METHOD

Filed July 6, 1964 Sheet 1 of 2

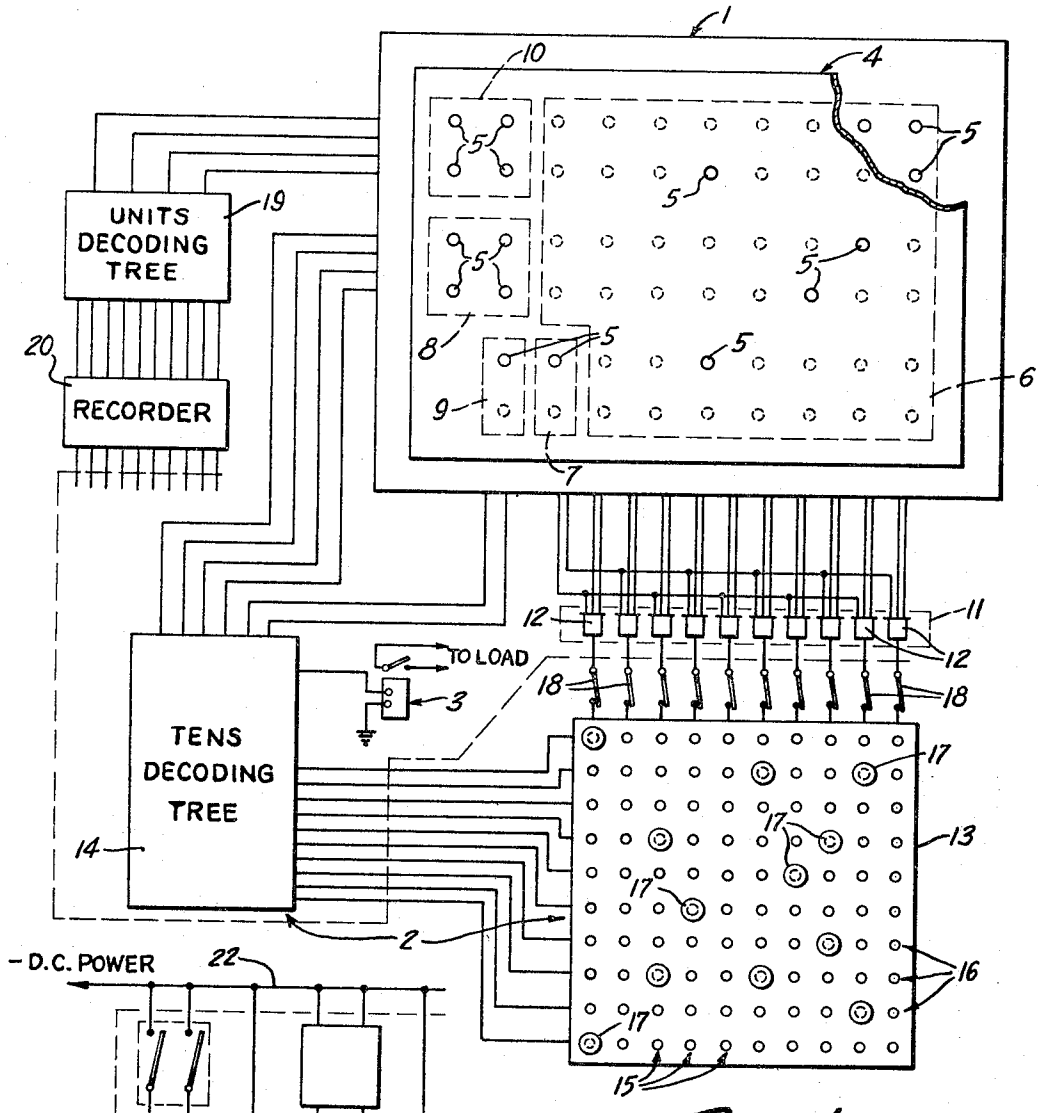


Fig. 1.

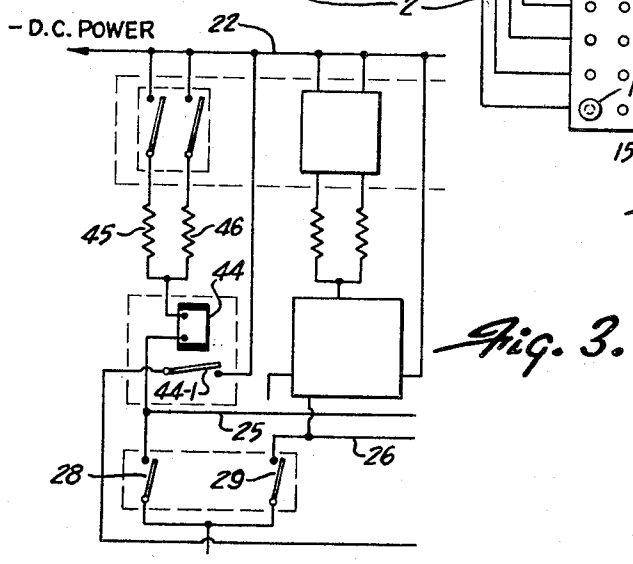


Fig. 3.

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CODED CONTROL APPARATUS AND METHOD

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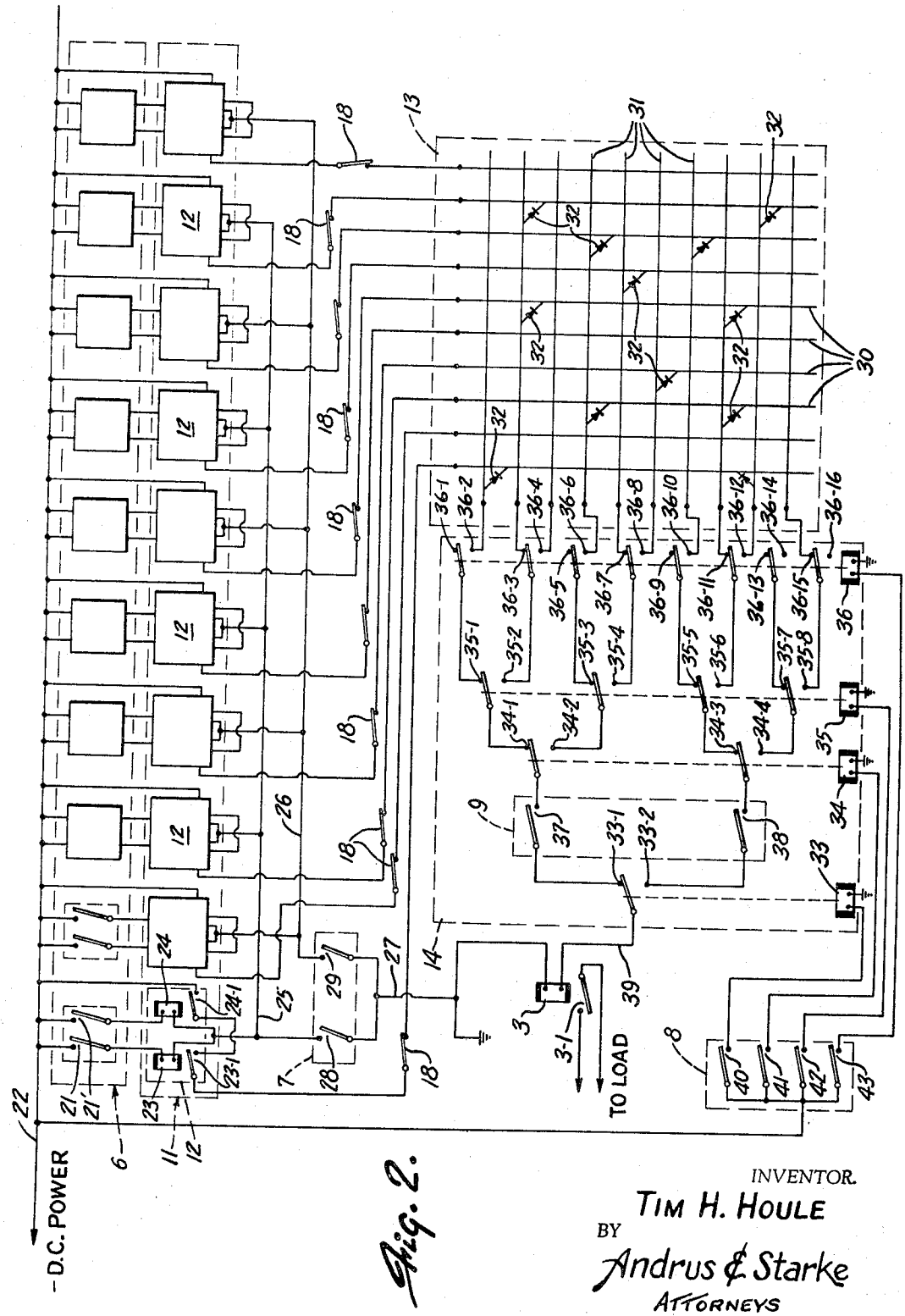


Fig. 2.

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3,420,987

CODED CONTROL APPARATUS AND METHOD

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Int. Cl. G06c 21/00

ABSTRACT OF THE DISCLOSURE

A punched card code system for controlled dispensing of gasoline wherein the customers are grouped, with each group having a common code portion and a unique portion. Two punch decoder units decode the several sections and the outputs are connected in series through a plug board matrix having vertical lines connected to one decoder and horizontal lines connected to the second decoder, the support for the lines has an opening at each junction for releasable insertion of a diode pin. Removal of a pin removes the paitrcular customer and prevents withdrawing of gasoline. A switch is connected in each of the group lines from the first decoder to the vertical matrix lines for group disconnection.

This invention relates to coded control apparatus and methods and particularly to coded systems wherein a multiple bit code is employed and the decoding system is adapted to establish a substantially greater number of outputs than the selected permissive outputs.

Sale and particularly delivery of certain products can advantageously be made through systems employing coded cards, plates and the like. For example, in the distribution of petroleum products, the main supplier will normally have a bulk loading terminal at which very large storage tanks are provided and in which the various grades of gasoline, kerosene, fuel oil and the like are separately stored. The products are taken from the central storage plant or bulk loading terminal to the several retailing stations by suitable tank trucks and the like. Provision for essentially unattended distribution or release of the stored products to the authorized drivers of tank trucks has recently been developed. Generally, such systems have employed key controlled devices or the like which allow authorized tank truck drivers, or other authorized personnel, to actuate the mechanism or the discharge system for withdrawing products directly.

In connection with any one given terminal, there will normally be a substantial number of tank trucks which must carry or withdraw the products therefrom. Thus, the main supplier may have a number of service or retail stations and its own trucks for delivering fuel from the bulk plant to the stations. Additionally, other retailers having a number of stations may have their own delivery trucks and wish to permit the driver to withdraw products from the bulk loading station without the presence of an attendant.

In a practical system, the control system desirably provides for up to 100 customers with individual controls for each to be made available by the main supplier to selected authorized personnel. However, to provide 100 individual key controlled devices substantially increases the cost of the system. Magnetic card systems such as shown in the copending application of Robert W. Ryno and Gilbert A. Schwibinger, Serial No. 380,347, entitled Magnetic Card Reader filed on the same date as this application and assigned to a common assignee herewith, provides a reliable system for increasing the capacity.

The present invention is particularly directed to a card type control and is more particularly adapted to employ

a punched card or the like which can readily provide a relatively large number of coded bits or locations. In the decoding system, individual logic circuits can be provided for each of the 100 customers. Such circuits generally include "AND" type logic circuits in order to provide the necessary security with the related multiple bit codes. Such control circuits, however, substantially increase the overall circuitry and have been found to limit the commercial applicability of the coded systems to retail distribution such as employed with petroleum products and the like.

The present invention is particularly directed to a decoding system and apparatus substantially minimizing the number of components while maintaining highly reliable security and versatility in control. Generally, in accordance with the present invention, the customers are divided into a plurality of groups, each of which will have common code characteristics. In addition, an individual code uniquely applied to each of the grouped codes is provided to distinguish between the members of the several groups. The various groups can be provided with completely distinct code combinations taken from a relatively greater number of permissible combinations in the decoding system. Similarly, the distinguishing characteristics within each group are selected in connection with a decoding system offering a greater number than those actually employed. The two decoding units are interconnected in a control circuit to control the output, preferably through a plug board system for individually controlling customer connections. The plug board system preferably includes a plurality of lines with one group of lines connected to the first decoding unit and a second group of lines connected to the second decoding unit. The lines related to several permessive code combinations are selectively interconnected by diodes or the like to complete circuits to an output load. Preferably, the plug board system will physically include a support for the interconnecting lines having an opening in the support means for releasably inserting or holding a diode pin. When a pin is inserted, the intersection is completed and a card with the corresponding code combination is permissive and will provide an output operation. To break the circuit for the corresponding permissive code combination, the single related diode pin is removed and the control circuit for the corresponding customer broken. As a result, that particular customer will no longer be authorized nor capable of withdrawing products.

Additionally, other disconnected means are preferably provided in each of the group lines to disconnect each of the groups from the control system, if desired.

The present invention thus provides a system generating a large code identification capacity with a practical and economical means of inserting and removing selected customers from the control circuit.

The drawings furnished herewith illustrate preferred constructions of the present invention and clearly disclose the features and the advantages heretofore discussed as well as others which will be clear from the following description of the drawings.

In the drawings:

FIG. 1 is a diagrammatic block diagram of a readout system employing a punched card control in accordance with the present invention;

FIG. 2 is a schematic circuit diagram of the control circuit shown in block diagram in FIG. 1; and

FIG. 3 is a partial schematic diagram of a portion of FIG. 2 showing an alternative construction of the readout or decoder circuit shown in FIG. 2.

Referring to the drawings and particularly to FIG. 1, a control system is shown including a card reader or decoder **1** interconnected in circuit with a decoding unit **2** for controlling operation of a single output relay **3**.

The decoder **1** is adapted to selectively receive any one of a plurality of similar circuit code cards **4** and (provide an output and energization of relay **3** in response to only certain authorized code cards which carry a permissive code combination. In the illustrated embodiment of the invention, the code reader and each of the code cards **4** includes fifty-eight code bit locations disposed in intersecting rows and columns for producing code combinations for operating or energizing of relay **3** through the decoding circuit **2**. Each of the code locations or positions of card **4** may or may not be provided with a perforation and a code is encoded on the card **4** by providing perforations at all but selected locations, thereby leaving a continuous plate or card portion at the other locations, as shown in FIG. 1. The card reader may be of any suitable variety for decoding punched card **4** and is shown having switch pins **5** aligned with each of the code locations. The pins **5**, in alignment with the perforations, project through the perforations without actuating a decoding means such as a switch, shown in FIG. 2 and hereinfater discussed, whereas those pins aligned with a continuous location are depressed and actuate corresponding switches. However, as other suitable systems might be employed, the details do not form a part of the present invention and consequently no further description thereof is given except in connection with FIG. 2.

Generally, the present invention provides a three digit code system which, for purposes of discussion, has each code identified with three positions of the decimal system and thus each code includes hundred, ten and units positions. The code card **4** and reader **1** are divided into a plurality of different control and code reading sections for each position, as shown diagrammatically in phantom outline in FIGS. 1 and 2. Corresponding sections in the FIGS. 1 and 2 are similarly numbered to show the relationship between the block diagram and the schematic circuit.

A hundreds decoding section **6** is provided including 46 of the possible 58 locations in the code card **4**. Two of the code bit locations constitute a one hundreds parity check section **7** for providing an additional interlock or control circuit in the code system. Thus, the parity check section **7** includes either of two outputs and may be designated as even or odd, with the even location related to all permissive codes having an even hundreds digit and the odd location similarly related to all permissive codes having an odd hundreds digit.

A tens coding section **8** including four code bit locations and a two-bit tens parity check **9** which may also be an even or odd type relation to the tens code number section are provided.

Finally, a units code section **10** including four bits or locations is provided. The several sections actuate suitable switching means such as heretofore discussed to control the several circuits or branches of the decoding circuit **2** which is similarly divided as presently described.

With the 58 bits, divided as noted above, in excess of 10,000 code combinations are permissible. Thus, the 46 code numbers in the hundreds position will provide 1,035 possible combinations. This is multiplied by the individual or the ten different outputs provided by the four bits of the tens unit or section providing in excess of the 10,000. Additionally, each parity check provides a further increase in each of the combinations.

The decoding circuit **2** includes a one hundreds decoding circuit **11** connected to sections **6** and **7** of the card reader **1**. The decoding section **11** includes ten "AND" circuits **12** connected to sections **6** and **7**. Each of the "AND" circuits includes three inputs, two of which are connected by suitable lines to sections **6** and the third of which is connected to the parity check section **7**. Each "AND" circuit **12** produces an output signal only if input signals are simultaneously applied at the three corresponding inputs. The output of the "AND" circuits are interconnected through a plug board **13** to related output line of a tens decoding circuit **14** which is connected to sections **8** and **9** at the card reader **1**.

Generally, the plug board **13** includes a matrix or coordinate array of intersecting apertured conducting columns and rows **15** and **16**, respectively, each of which includes ten holes. Each column **15** includes a line connected to one of the "AND" circuits **12** and each row **16** includes a line connected to one of the output lines of circuit **14**. Diode pins **17** are selectively placed within the holes of column **15** and row **16** and as more fully described hereinafter, will complete a circuit between the lines in the intersecting horizontal rows and vertical columns to complete the circuit between the hundreds decoding circuit **11** and the tens decoding circuit **14**.

Generally, group interlock switches **18** of a normally closed variety are also interconnected in the lines between the output of the "AND" circuits **12** and the plug board **13** to allow group disconnection. Each of the "AND" circuits represents a group of ten possible permissive codes or customers, each of which is separately identified by the respective coding of the input lines from the tens decoding circuit **14**. Opening of any switch **18** disconnects the complete related group. On the other hand, removal of a diode pin **17** removes only one particular customer in the group related to the corresponding input line from the corresponding "AND" circuit **12**.

A units decoding circuit **19** generally will be constructed similar to circuit **14**. Inputs of circuit **19** are connected to the code card reader **1** corresponding to the section **10** which includes four bits interconnected through a suitable binary type coding. Its output, however, is merely for record or identifying purposes and has not been shown interconnected as a part of the actual code or security portion of the system. Its output as shown is therefore connected directly to a recording device **20** which is also connected, as shown by a dashed coupling line, to the output of the tens and hundreds circuits **11** and **14** to complete the recording identification.

Generally, the circuit as shown in FIG. 1 will operate as follows. A code card **4** is placed in the decoder or card reader **1**. The apertures in the card **4** are aligned with the corresponding pins **5** in the decoder **1**. In practice, only a small portion of the total permissible combinations will, of course, be employed to provide a high degree of security. Further, as subsequently described, the hundreds section **6** of a card **4** can include continuous portions from other than the related permissive code to prevent visual decoding of the card. Thus, each "AND" circuit requires three inputs and the card **4** may therefore be coded to provide three inputs to a proper circuit and less than three inputs to one or more other "AND" circuits.

The one hundreds coding section **6** will actuate at least two circuit controlling switches or the like and apply a pair of signals to the corresponding "AND" circuit. Simultaneously, the proper parity check bit of section **7** transmits a corresponding third signal to the proper "AND" circuit **12**. As a result, an output circuit from circuit **12** is completed to the plug board **13** and particularly to the corresponding column **15**.

Similarly, the tens coding section **8** and parity check section **9** of card **4** provide a proper input to the tens decoding circuit **14** and actuate it to complete an output to the desired line **31** of row **16**. The diode pin **17** connects the proper column **15** and **16** and relay **3** is energized to close its related contacts **3–1**. Simultaneously, the units decoding circuit **19** is actuated by the units coding section **10** to actuate the recorder **20** in cooperation with the output of the tens decoding circuit **14** and the output of the hundreds decoding circuit **11** to provide a complete customer identification.

Referring particularly to FIG. 2, a schematic circuit diagram employing relays and switches has been shown to clearly illustrate one embodiment of the invention. In actual practice, the "AND" circuits and the decoding cir-

cuits may be formed of suitable solid state control and switching devices to provide a similar control and function. The illustrated relay system is given for purposes of simplicity and clarity of explanation.

In FIG. 2, the security portion of card reader **1** is schematically shown with the several security sections **6** through **9** distributed and located to more clearly illustrate the circuit diagram with the various sections shown in appropriately labeled dotted outline. Identification of section **10** and circuit **19** are similar to section **8** and circuit **14** and have not been duplicated in FIG. 2.

The hundreds coding section **6** includes a plurality of paired switches **21** and **22**, one for each of the "AND" circuits **11**.

In the illustrated embodiment of the invention, the "AND" circuits **11** therefore requires use of twenty switches paired as switches **21** and **21'** and a corresponding 20 of the possible 46 code bits. As a result, only a very few of the total possible combinations are necessarily employed and provide a very high degree of security. The particular bits which are operated depend upon the wiring of switches at selected locations into the circuit.

The selected switches **21** and **21'** have their one side connected to a power line **22**, shown in the drawing as a lead to the connected to the positive side of a D.C. power source, not shown. The switches **21** and **21'** are respectively connected in series with a corresponding relay **23** and **24** having the opposite ends thereof interconnected in common. The pair of relays **23** and **23–1** is returned to an even numbered common parity line **25** or an odd numbered common parity line **26**, in accordance with the hundreds digit being either even or odd. Thus, in the illustrated embodiment of the invention, the first position is considered to be a zero position and consequently is returned with the positions 2, 4, 6 and 8 to the even numbered common line **25** whereas the corresponding circuit for the digits 1, 3, 5, 7 and 9 are returned to the line **26**. The lines **25** and **26** are returned and connected to a common power line **27** constituting the opposite side of the D.C. power connection and shown in the drawing as a grounded return in accordance with conventional illustrations. The even number related line **25** is returned through an even numbered related parity switch **28** connected between lines **25** and **27** and the odd number related line **26** is similarly connected through an odd parity switch **29**.

Consequently, if the code card **4** inserted into the reader **1** includes the proper code bits or perforations, a pair of related switches **21** and **21'** will be actuated and simultaneously a proper parity switch **28** or **29** will be actuated to complete the circuit through the relays **23** and **24**. Relays **23** and **24** control the corresponding contacts **23–1** and **24–1** and constitute a dual input control, generally as heretofore discussed with respect to FIG. 1. This, then, indicates that a proper card **4** having a permissive code encoded therein is in the reader **1** and a signal is transferred through the relay contacts **23–1** and **24–1** to the plug board **13** and particularly to the appropriate column **15**. The contacts **23–1** and **24–1** are connected in series between the D.C. power line **22** and a corresponding column **15** in the code circuit of board **13**.

Referring particularly to FIG. 2, the circuit of board **13** is shown including **10** vertical or column lines **30** and similarly 10 perpendicularly related row lines **31** defining an intersecting matrix or array of 100 points of intersection. Each of the intersections is adapted to be interconnected through a diode **32**, which as shown in FIG. 1, preferably forms the operative componend of a diode pin **17**. Thus, each of the column lines **30** which are connected respectively to the related "AND" circuits **11** are selectively connected to one or more of the row lines **31**. Assuming a proper closure of the switches **21** and **21'** in the hundreds position of the code reader section **6**, power is transferred to the proper column lines **30** and therefrom to all row lines **31** which are connected to that line **30** by diodes **32**. A single circuit is completed through the tens decoding circuit **14** as follows.

The circuit **14** is shown as a binary decoding tree system including four operating relays **33**, **34**, **35** and **36** related respectively to four binary positions and accordingly related to the decimal digits 1, 2, 4 and 8.

In the illustrated embodiment of the invention, relay **33** is coded to the first binary position and is a single pole, double throw relay having a pair of contacts **33–1** and **33–2** including a common pole for operating the same.

The relay **34** is related to the second binary position and is a double pole, double throw relay having contacts **34–1** and **34–2** with a common operating pole and contacts **34–3** and **34–4** with a common operating pole.

Similarly, relay **35** for the third position is a four pole, double throw relay having contacts **35–1** through **35–8** with adjacent contacts having a common pole and relay **36** for the fourth position is an eight pole, double throw relay having contacts **36–1** through **36–16** with adjacent numbered contacts having a common operating pole.

In FIG. 2, a pair of parity switches **37** and **38** are interconnected in the circuit **14** between the contacts **33–1** and **33–2** of relay **33** and the common poles of contacts **34–1** through **34–4** or relay **34**, as presently described. Switchces **37** and **38** are single pole, single throw switches having a normally open position and each is related to a corresponding bit or location in the section **9** of code card reader **1** such that one or the other of the switches must be closed to complete the decoding circuit **2**. Switches **37** and **38** thus provide further combinations of operating codes for circuit **2**.

The relay contacts **33–1** constitute one end or apex of the tree circuit and the sixteen contacts of eight pole relay **36** constitutes the opposite end or base of the tree circuit. The double pole relay **33** has its contacts **33–1** interconnected through its common pole to relay **3** via a lead **39** and in series with the parity switch **37** to the common pole of the relay contacts **34–1** and **34–2** of relay **34**. Relay contacts **33–2** are similarly connected in series through parity switch **38** to the relay contacts **34–3** and **34–4** of relay **34**. This, then, provides two pairs of switches one to each side of the relay contacts **33**. These are interconnected to the 16 contacts of relay **36** through the four pole relay **35**. The common pole of relay **35** for contacts **35–1** and **35–2** is connected to the contacts **34–1** or relay **34** and the related contacts **35–1** are connected to the common pole of the contacts **36–1** and **36–2** and the contacts **35–2** are connected to the common pole of contacts **36–3** and **36–4**. Relay contacts **35–3** and **35–4** are similarly connected between the contacts **34–2** and the relay contacts **36–5**, **36–6**, **36–7** and **36–8**, respectively, and so on to complete the circuit. Ten of the relay contacts **36–1** through **36–16** are connected one each to each of the input row lines **31** of plug board **13**. The use of ten outputs of the possible **16** combinations provided by the binary system in circuit **14** provides the further security of the total system. To complete a circuit to relay **3**, each of the relays **33** through **36** must be properly actuated. For example, if relay **33** is in its normal position, the parity switch **37** must first be actuated in order to complete the circuit. If parity switch **38** is actuated, the circuit will remain broken at relay contacts **33–2**. Relay **34** may or may not be energized. If it is not energized and is held in the normal position, the circuit must be completed through the relay contacts **35–1** or **35–2** of relay **35**. Similarly, operation of relay **35** and relay **36** restricts the circuit to the corresponding contacts until contact must be made through the proper lead interconnecting the circuit **14** to the row line **31** of the plug board circuit **13**. Relays **33** through **36** are individually actuated through the decoding section **8** which includes four bits, one for each of the relays. In FIG. 2, the four related bits are shown as corresponding switches **40**, **41**, **42** and

43 connected respectively with the four binary positions and the related decimal digits 1, 2, 4 and 8.

The operation of the schematic circuit shown in FIG. 2 may be summarized as follows applying the circuit for a permissive code number 081. The code card 4 will have to provide continuous portions aligned with pins 17 for the pair of switches 21 and 21' related to the zero digit close in the hundreds position. The code card 4 will also have to carry a continuous position for the even parity digit to close the even parity switch 28. The associated relays 23 and 24 will then be energized to close contacts 23–1 and 24–1 of the "AND" circuit for the zero number in the hundreds position. Closed contacts 23–1 and 24–1 completes the circuit from the power line 22 to the zero hundred column 30, shown to the left in FIG. 2, of the circuit of the plug board 13. As a permissive code number is 081, a diode 32 will connect the zero column line 30 to the digit one row line 31 and thereby transfer the positive polarity to the connecting line shown as the second from the bottom in FIG. 2, to the relay contact 36–12 of the circuit 14. To provide a circuit through the tens coded circuit 14 for the code digit "8", relays 33, 35 and 36 must be energized and the odd parity switch 38 must be closed. The switches 40, 42 and 43 must be closed by card 4 while switch 41 remains open. In this position, the circuit 14 is completed from contact 36–12 and the related common pole contacts 35–6 and its common pole to the normally closed contacts 34–3, the odd parity switch 38 and the normally open contacts 33–2 to the output line 39.

Similarly, other permissive codes are set in the system by wiring of the appropriate switches 21 and 21', and the contacts of relay 36 into the circuit. If the code card 4 does not carry a corresponding code enclosed thereon, a release or operation of the relay 39 cannot be obtained.

In the illustrated embodiment, the plug board 13 permits ready control of insertion and removal of up to 100 permissive code combinations or customer authorization by insertion and removal of the proper pin 17. Thus, removal of a diode pin 17 breaks the circuit between the corresponding column line 31 and the row line 31, thereby breaking the circuit for that individual customer.

Additionally, the group switches 18 permit disconnection of a column 30 to prevent transfer of power to all ten row lines 31 and thereby automatically disconnect all of the corresponding ten permissive codes or customers.

The circuit thus provides a very substantial capacity so far as possible combinations are concerned to provide maximum security and more important provide a convenient means for selectively controlling the connection into circuit of any one of one hundred customers with a minimum number of components.

FIG. 3 illustrates one possible alternative embodiment of an "AND" circuit and corresponding elements in FIGS. 2 and 3 are similarly numbered for purposes of clarity and simplicity of explanation. Only a fragmentary portion of FIG. 2 is repeated in FIG. 3 in sufficient detail to clearly illustrate the changes and operation of the modified circuit.

In FIG. 3, a single relay 44 replaces the pair of relays 23 and 24 of FIG. 2. This single relay is connected to the appropriate common line 25 or 26 through the corresponding partiy switch 28 or 29. The opposite side of the relay 44 is connected to the power line 22 in series parallel with a pair of the switches 21 and 21'. In FIG. 3, individual resistors 45 and 46 are inserted one each in series with the switches 21 and 21'. The resistors 45 and 46 are such that closure of a single switch 21 or 21' will not provide sufficient current to operate the relay. However, closure of both switches 21 and 21' will effect energization of the corresponding relay 44 closing of the related contacts 44–1 which connects power line 22 to the corresponding column line 30 of the plug board circuit, generally as in FIG. 2. In all other respects, the embodiment of the invention fragmentarily shown in FIG. 3 may correspond to that of FIG. 2 and no further description thereof is given.

The present invention thus provides a very high capacity, high security coding system having a minimum number of components with a minimizing of the initial cost and maintenance of the system.

Various modes of carrying out the invention are contemplated as being within the scope of the following claims particularly pointing out and distinctly claiming the subject matter which is regarded as the invention.

I claim:

1. A coded readout apparatus for selectively establishing an output signal in response to selected combinations of a substantial number of combinations, each of said combinations including at least a first multiple bit input and a second distinct multiple bit input which comprises

a plurality of decoding means, each requiring a plurality of inputs, each decoding means connected to respond to only one of said first multiple bit input and being related thereby to a different selected group of said combinations and establishing an individual output means in response to receipt of said first multiple bit input for each related group,

separate multi-output decoding means having a plurality of inputs connected to said second multiple bit input for each of said selected combinations and establishing a different output means for any one of said groups,

circuit means selectively connecting each of the first output means to each of said second output means whereby a circuit path is established only in response to each of said selected combinations, and each circuit path is different from all other circuit paths, and

controlled means connected to said circuit means and operated upon completion of any one of said circuit paths.

2. The coded readout apparatus of claim 1, having separate group related means connected to the first named decording means for selectively operably disconnecting each of the selected groups.

3. The coded readout apparatus of claim 1 having

interlock circuit means including separate control lines connecting each output means of the first decoding means to the corresponding plurality of output means of the multiple-output decoding means and including a switch means in each of said lines for selectively opening each individual line to permit selective disconnection of a given group associated with a control line, and said controlled means being connected to respond to power transmission through said last named means.

4. A coded readout for selectively generating an output control signal in response to selected permissive combinations of a substantial number of indicia combinations, which comprises

a plurality of "AND" logic members each of which has at least three input means and an output means and each of which is related to a unique group of said permissive combinations,

a decoding unit having a plurality of output means connected one each to each of said input means whereby each "AND" logic member is biased "on" by outputs at the related output means,

a second decoding unit having at least two output means, each connected to different groups of the "AND" logic members and in common to the corresponding third input means,

a third decoding unit having a plurality of output means, and

means including at least two groups of circuit lines, one group of which corresponds to the number of logic members and the other of which corresponds to the output means of the third decoding unit with corresponding lines connected to the output means

of the logic members and the output means of the third decoding unit and having said circuit lines selectively connected to complete the encoding of said permissive combinations.

5. A coded readout for selectively generating an output control signal in response to selected permissive combinations of a substantially greater number of indicia combinations, which comprises

a plurality of "AND" logic members each of which has at least three input means and an output means and each of which is related to a unique group of said permissive combinations having at least one common indicia,

a decoding unit having a plurality of selectively actuable switching means connected to two of said input means whereby each "AND" logic member may be biased "on" by certain dual combinations of switching means,

a "parity" circuit check input means, one for each selected group of logic members and connected to the corresponding third input means,

a second decoding unit having a plurality of selectively actuable switching means and having a plurality of output means in response to different combinations of the switching means,

a plug board having two groups of intersecting circuit lines selectively connected at the points of intersection, one group of which corresponds at the number of logic members and the other of which corresponds to the output means of the second decoding unit with corresponding lines connected to the output means of the logic members and the output means of the second decoding unit, and

output means responsive to a completed circuit through the plug board and the decoding units.

6. The coded readout apparatus of claim 1 wherein said circuit means includes two groups of lines connected respectively one group to each of the output means of the two decoding means and having switch means selectively interconnecting related lines of the two groups in accordance with the permissive combinations.

7. A coded readout apparatus for selectively establishing an output signal in response to selected permissible combinations of a substantial number of combinations, which comprises

decoding means requiring a plurality of inputs, each decoding means being related to a selected group of said permissible combinations and having separate output means for each group,

separate multi-output decoding means for each of said permissible combinations and establishing output means common to all of said groups in response to inputs which are distinct from those producing a response in said first named decoding means,

interlock means including a circuit matrix of perpendicularly intersecting circuit lines to form two input line groups, one of said line groups being connected one each to each output means of the first named decoding means and the other of said line groups being connected one each to each output means of the second named decoding means, and diode means selectively connected to the corresponding lines at each insertion point to open and break the circuit at that point.

8. The readout apparatus of claim 7 wherein said intersecting lines are carried on opposite sides of a plug board having openings at each point of intersection, and pins releasably insertable within the opening and including said diode means connecting said lines to complete the circuit therethrough.

9. A coded readout device for selectively establishing an output signal in response to permissive combinations of a substantial number of combinations, which comprises

first decoding means for a portion of said combinations and having a plurality of output terminal means,

second decoding means for a second portion of said combinations and having output terminal means, and

interlocking means including two groups of lines connected respectively to the output terminal means and having switch means selectively interconnecting related lines of the two groups in accordance with the permissive combinations,

said interlock means including a board with said lines secured thereto in a matrix of intersection lines with an opening at each intersection, and diode pin selectively insertable in said openings to complete the connection of the corresponding lines.

References Cited

UNITED STATES PATENTS

2,714,201	7/1955	Whitehead	235—61.7
3,184,714	5/1965	Brown et al.	235—61.7 X
3,221,304	11/1965	Enikeieff et al.	340—149
3,255,339	6/1966	Rausing	235—61.7
3,033,449	5/1962	Quinn et al.	235—61.11
3,204,221	8/1965	Sierra	235—61.7
3,217,293	11/1965	Metz	235—61.7

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U.S. Cl. X.R.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,420,987 January 7, 1969

Timothy H. Houle

It is certified that error appears in the above identified patent and that said Letters Patent are hereby corrected as shown below:

Column 3, line 2, "(provide" should read -- provide --. Column 5, line 55, after "proper" insert -- code --. Column 7, line 34, "enclosed" should read -- encoded --; line 44, after "column" insert -- line --. Column 8, line 40, "decording" should read -- decoding --.

Signed and sealed this 24th day of March 1970.

(SEAL)
Attest:

Edward M. Fletcher, Jr.
Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patents