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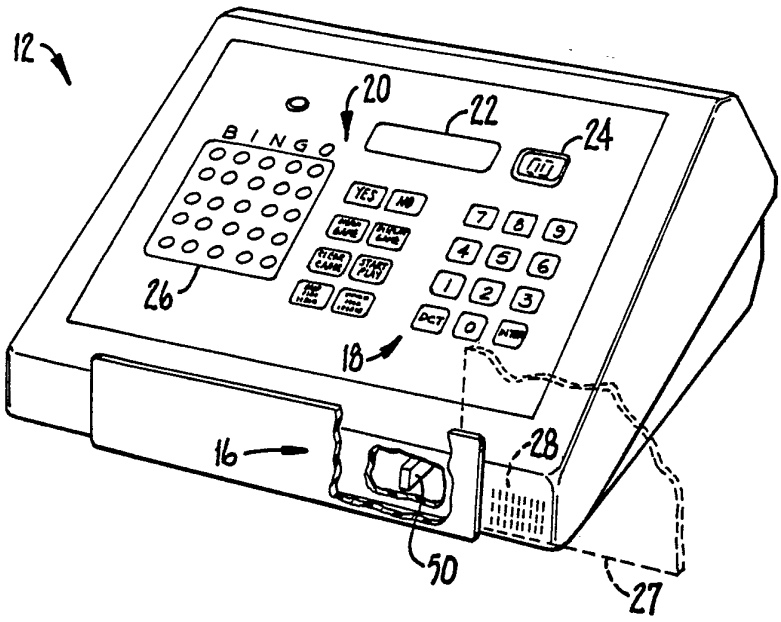

(57) Abstract

An electronic game monitor for use with a game card, the game card generally includes a matrix thereon. The game monitor comprises automatic matrix entry means (16) for receiving numerals which are positioned on a game card. The numerals, representing locations of the matrix, are depicted in a generally bar code-like fashion. The game monitor also comprises central controlling means (14) for controlling the operation of the game monitor, the game monitor being operable with the numerals of at least two of the game cards. The game monitor further comprises keyboard means (18) for entering alphanumerics, the keyboard means (18) includes a plurality of keys. Display means (20) are provided for displaying alphanumerics and game configurations. Moreover, the automatic matrix entry means (16) further comprises a bar-code reader (50) for receiving the numerals of the game cards, and barcode processing means (54) for transforming the numerals into a form usable by the game monitor.

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Description

GAME MONITOR

Technical Field

This invention relates to electronic games, and more particularly, to electronic game monitors.

Background Art

The recent popularity of games such as bingo, lotto and the like has heralded inventions such as those disclosed in Richardson, U.S. Pat. No. 4,365,810 and Gluz et al., U.S. Pat. No. 4,378,940. In general, the conventional bingo game is played with a standard set of bingo cards. Each card in that set of bingo cards, for example, 6000 cards in a set, consists of a plurality of numerals which are positioned in a matrix. The standard bingo card is a 5 X 5 matrix. In addition, the position or sequence of numerals on a bingo card has been somewhat standardized. For example, a bingo card bearing the serial number "3254" would have the numeral "10" at position row 1-column 1, numeral "7" at row 2-column 1, numeral "5" at row 3-column 1, numeral "2" at row 3-column 1 and numeral "6" at row 5-column 1. Moreover, the numerals for each column are restricted to a certain range of the decimal number system. For example, only numbers from one to 15 are permitted to reside in one of the five positions for the first column. Similarly, the second column can only include numbers 16 to 30; the third column numbers 31 to 45; the fourth column numbers 46 to 60; and fifth column numbers 61 to 75.

When the bingo game is played at a gaming establishment, a player is generally playing with more than one bingo card. It is not uncommon for a player to be playing with ten cards. Consequently, it is in many instances difficult for a player to search and mark a called number on all of his cards in the allotted time.

It is, therefore, desirous to have a game monitor that is capable of tracking the called numbers and indicating to the player that a winning configuration (bingo) has been detected among his multitude of bingo cards. In addition, it is preferable that such a game monitor does not drastically alter the format or physical configuration of the existing game card so as to permit the continuing use of existing game cards and as not to disrupt players' familiarity with the existing game.

Disclosure of the Invention

In view of the prior art, it is a major object of the present invention to provide a game monitor that is capable of assisting a bingo player who is playing with a multitude of bingo cards.

It is another object of the present invention to provide a game monitor that substantially conforms to the format and physical configuration of existing bingo games.

In order to accomplish the above and still further objects, the present invention provides an electronic game monitor for use with a game card, the game card generally includes a matrix thereon. The game monitor comprises automatic matrix entry means for receiving numerals which are positioned on a game card. The numerals, representing locations of the matrix, are depicted in a generally bar code-like fashion. The game monitor also comprises central controlling means for controlling the operation of the game monitor, the game monitor being operable with the numerals of at least two of the game cards. The game monitor further comprises keyboard means for entering alphanumerics, the keyboard means includes a plurality of keys. Display means are provided for displaying alphanumerics and game configurations. Moreover, the automatic matrix entry means further comprises a barcode reader for receiving the numerals of the game cards, and barcode processing means for transforming the numerals into a form usable by the game monitor.

Other objects, features, and advantages of the present invention will appear from the following detailed description of the best mode of a preferred embodiment, taken together with the accompanying drawings.

Brief Description of the Drawings

Figure 1 is a partial, perspective view of the game monitor of the present invention;

Figure 2 is a simplified block diagram of the game monitor of Figure 1;

Figure 3 is a schematic view of the central controlling means of the game monitor of Figure 2;

Figure 4A is a schematic view of an aspect of the automatic matrix entry means of the game monitor of Figure 2;

Figure 4B is a schematic view of another aspect of the automatic matrix entry means of the game monitor of Figure 2;

Figure 5 is a schematic view of the keyboard means of the game monitor of Figure 2;

Figure 6A is a schematic view of an aspect of the display means of the game monitor of Figure 2;

Figure 6B is a schematic view of another aspect of the display means of the game monitor of Figure 2;

Figure 7 is a simplified flow diagram of the software for the game monitor of Figure 1;

Figure 8 is a flow diagram of the initialization routine of the software for the game monitor of Figure 7;

Figure 9 is a flow diagram of the RAM test routine of the software for the game monitor of Figure 7;

Figure 10 is a flow diagram of the idle routine of the software for the game monitor of Figure 7;

Figure 11 is a flow diagram of the card input routine of the software for the game monitor of Figure 7; and

Figures 12A-12E are flow diagrams of the play routine of the software for the game monitor of Figure 7.

Best Mode for Carrying Out the Invention

Referring to Figure 1, there is shown a game monitor, generally designated 12, for tracking numerals that are involved in games such as bingo, keno, etc. Each game is played with game cards each of which has a matrix of numerals thereon. More particularly, game monitor 12 comprises central controlling means 14, as best shown in Figure 2, for controlling the operation of game monitor 12, automatic matrix entry means 16 for entering the numerals of the matrix, keyboard means 18 for entering alphanumerics and instructions, and display means 20 for displaying messages.

In operation, conventional bingo cards having electro-optically readable bar codes on one of their surfaces are provided. Illustrated in Figure 1 is one such bingo card 27 that has a strip 28 of bar codes. The bar code used may be one of a number of conventional bar codes such as the universal product code (UPC) and other codes illustrated and described in D. Allais, Bar Code Symbology, February 16, 1982 (Interface Mechanisms, Inc.). In the preferred embodiment, the bar code employed is a type generally referred to as the "3 of 9 Code." Using such a coding system, numbers are represented by letters of the English alphabet. For example, the number "1" is represented by the letter "A", the number "2" by the letter "B", etc. This coding system is selected in light of the numbering structure of bingo. Numerals coded in the bar code fashion and in the "3 of 9 Code" format are merely exemplary.

In general, a conventional bingo card is a 5 X 5 matrix. The numerals for each column are restricted to a certain range of the decimal number system. For example, only numbers from one to 15 are permitted to reside in one of the five positions for the first column. Similarly, the second column can only include numbers 16 to 30; the third column numbers 31 to 45; the fourth column numbers 46 to 60; and fifth column numbers 61 to 75. Since the

numbers of each column other than the first column are multiples of the numbers of the first column, a coding system that employs 15 numbers is sufficient to represent all 75 numbers of a conventional bingo card. Thus, the "3 of 9 Code" is adequate in which the numbers one through 15 are represented by the letters "A" through "O". Since the bingo card positions are inputted serially in the preferred embodiment, i.e., column 1-row 1 is inputted first, continued to column 1-row 5, followed by column 2-row 1, continued to column 2-row 5, etc., conventional software is capable of providing the necessary multipliers for numbers of columns other than the first column. With the appropriate multiplier, the letter "C" represents the number "3" in column 1, the number "18" in column 2, the number "33" in column 3, the number "48" in column 4, and the number "63" in column 5.

Next, a bingo card 27 with such a strip 28 of bar code is scanned by automatic matrix entry means 16. Matrix entry means 16 in the preferred embodiment comprises an optical barcode reader 50, the CMM Machine Mount Scanner manufactured by Welch Allyn of Skaneateles Falls, New York. Central controlling means 14 in the preferred embodiment is capable of storing the matrices of up to 50 bingo cards. As each bingo number is being called out by an announcer, the player enters the corresponding numeral into central controlling means 14 via keyboard means 18. Central controlling means 14 compares that numeral with all of the numerals on bingo cards which have been automatically entered earlier. Wherever a match occurs, central controlling means 14 denotes and keeps track of that numeral. In addition, after the manual entry of each called-out number, central controlling means 14 scans each of the entered matrices to see if the manually-entered, called-out numbers occupy a sufficient number of positions such that a winning combination is present. For example, a winning combination may be numbers of a row, a column, a diagonal, the four corners, etc. If such a winning combi-

nation is detected, then the presence of that winning combination is outputted to display means 20.

For particular details of each of the subcomponents of game monitor 12, central controlling means 14, as best shown in Figure 3, comprises a central processing means 30 for controlling the routing of information, an input/output controlling means 32, a read-only memory device 34, and a random-access memory device 36. In addition, central controlling means 14 comprises an address latching means 38, a bi-directional data latching means 40, and a plurality of operating signal devices 42a through 42d. Inverters 44, 46 and 48 are also provided.

More particularly, central processing means 30 in the preferred embodiment is a 8085 microprocessor manufactured by Intel Corp. of Santa Clara, California. Microprocessor 30 includes a plurality of dual-function address/data inputs/outputs AD0 through AD7 which are in communication with read-only memory device 34, random-access memory device 36, address latching means 38, and data latching means 40. In addition, microprocessor 30 includes a plurality of address outputs A8 through A12 which are in communication with both memory device 34 and memory device 36. Moreover, microprocessor 30 includes a plurality of controlling outputs A13 through A15 each of which is in communication with an input of input/output controlling means 32. Further, microprocessor 30 includes a plurality of special function inputs and outputs such as interrupt (INTR), serial-in-data (SID), serial-out-data (SOD), dual-function input/output or memory (IO/M), write (WR), and read (RD). The INTR input is adapted to receive the bar code information from automatic matrix entry means 16. The receipt of the bar code information by microprocessor 30 is in an asynchronous fashion, i.e., the presence of a signal at the INTR input forces microprocessor 30 to start the reception of the bar code information from matrix entry means 16. Microprocessor 30 then converts this information, which is in the conventional ASCII format,

into a binary-coded decimal (BCD) format. The BCD-formatted bar code information is then stored in random-access memory device 36. The remaining inputs of microprocessor 30 are not used.

Input/output controlling means 32 in the preferred embodiment is a 74LS138 multiplexer manufactured by Texas Instruments Inc. of Dallas, Texas. Multiplexer 32 includes a plurality of inputs A, B and C each of which is in communication with one of microprocessor controlling outputs A13 through A15. In addition, multiplexer 32 includes a plurality of outputs Y0 through Y7 which are in communication with automatic matrix entry means 16, keyboard means 18, and display means 20. The output signals of multiplexer 32 are input/output select signals $\overline{IO}$ $\overline{SEL1}$ through $\overline{IO}$ $\overline{SEL8}$.

Read-only memory device 34 in the preferred embodiment is a 2732A programmable read-only memory (ROM) manufactured by Intel Corp. ROM 34 includes a plurality of addressing inputs A0 through A11 which are in communication with microprocessor 30 or address latching means 38, and a plurality of data outputs O0 through O7 which are in communication with microprocessor 30 or data latching means 40. In addition, ROM 34 includes special inputs such as output enable ($\overline{OE}$)and chip enable ($\overline{CE}$). The presence of a low signal at input $\overline{CE}$, which is transmitted from port A12 of microprocessor 30, enables the operation of ROM 34.

Random-access memory device 36 in the preferred embodiment is a 2128 random access memory (RAM) manufactured by Intel Corp. RAM 36 includes a plurality of address inputs A0 through A10 which are in communication with microprocessor 30 or address latching means 38, and a plurality of data outputs D0 through D7 which are in communication with microprocessor 30 or data latching means 40. RAM 36 includes special inputs such as output enable ($\overline{OE}$), chip enable ($\overline{CE}$)and write enable ($\overline{WE}$). A low signal at input $\overline{CE}$, a high signal as originally transmitted from port A12

of microprocessor 30 and subsequently inverted by inverter 44, enables the operation of RAM 36. Conversely, the high signal outputted by microprocessor 30 disables ROM 34.

Address latching means 38 in the preferred embodiment is a 74LS373 latch manufactured by Texas Instruments. Address latch 38 includes a plurality of inputs 1D through 8D which communicate with microprocessor 30 and another plurality of outputs 1Q through 8Q which communicate with ROM 34 and RAM 36. A special input, latch enable (LE), is provided.

Similarly, data latching means 40 in the preferred embodiment is a 74LS245 bi-directional bus transceiver or data latch manufactured by Texas Instruments. Data latch 40 includes a plurality of dual-function inputs/outputs B1 through B8 which are in communication with keyboard means 18 and display means 20. The signals which are in communication with these devices are designated DB0 through DB7. In addition, data latch 40 includes another plurality of dual-function inputs/outputs A1 through A8 which communicate with microprocessor 30, ROM 34 and RAM 36. Moreover, data latch 40 includes an enable (ENA) input and a bi-directional control input (DIR). A low signal at control input DIR would permit the flow of information from the B inputs/outputs of data latch 40 to its A inputs/outputs.

Last, the output signals of devices 42a through 42d and 48 are memory read ($\overline{\text{MEMR}}$), memory write ($\overline{\text{MEMW}}$), input/output read ($\overline{\text{I/O}}$ $\overline{\text{R}}$), input/output write ($\overline{\text{I/O}}$ $\overline{\text{W}}$) and (I/O W), respectively.

As for automatic matrix entry means 16, it comprises barcode reader 50, as describes previously, a barcode reader operating means 52 and a barcode processing means 54. Barcode reader 50 is capable of transforming a strip 28 of bar codes into usable digital information.

As best shown in Figure 4A, barcode operating means 52 is provided to enable barcode processing means 54 to transform the digital information from barcode reader 50

into usable data. Barcode operating means 52 in the preferred embodiment includes a flip-flop 56 and an OR gate 58. Flip-flop 56 in the preferred embodiment is a D-type flip-flop. The signals inputted into gate 58 are $\overline{IO}$ $\overline{SEL6}$ from multiplexer 32 and $\overline{IO}$ $\overline{W}$ of device 42d. The output of gate 58 is inputted into flip-flop 56. The other input of flip-flop 56 receives the SOD signal from microprocessor 30. The output of flip-flop 56 is defined as the "SERIAL IN" signal.

Although automatic matrix entry means 16 in the preferred embodiment is capable of reading and transforming bar code information, that capability is merely exemplary. Automatic matrix entry means 16 in alternative embodiments may be capable of reading other forms of coded numerals and transforming the coded numerals into usable digital information.

As best shown in Figure 4B, barcode processing means 54 includes a barcode microprocessor 60 and an indicator 62. Barcode microprocessor in the preferred embodiment is a LTS-III microprocessor manufactured by Welch Allyn. The SERIAL IN signal from flip-flop 56 activates a transistor 64 which in turn enables barcode reader 50 via lines EN and V+. The information sensed by barcode reader 50, the "3 of 9 Code" is then transmitted to microprocessor 60 via line DIG IN. Microprocessor 60 then transforms this digital information into a conventional ASCII format. The ASCII format utilizes the numerals one to 128 each of which represent a decimal number, a letter of the alphabet, or a symbol that generally appears on the keyboard of a conventional teletype machine. Microprocessor 60 then outputs the processed information to microprocessor 30 via output line OUT. The information on this line is serial data. An inverter 66 is provided to output a $\overline{SID}$ signal to the interrupt input INTR of microprocessor 30. The presence of the $\overline{SID}$ signal forces microprocessor 30 to start the reception of data from barcode microprocessor 60. Microprocessor 30 first converts the ASCII informa-

tion into binary-coded-decimal (BCD) format and then forwards this information to RAM 36 for storage. Further, indicator device 62 is provided to indicate the acceptance by game monitor 12 of a barcode. In the preferred embodiment, indicator device 62 is a beeper. Beeper 62 is activated by a transistor 68.

As for keyboard means 18, as best shown in Figure 5, a 4 X 5 switch array 70 is provided. In addition, keyboard means 18 comprises a row selection means 72, a column selection means 74, and column selection controlling means 76. More particularly, rows of switch array 70 are connected to row selection means 72 and columns of switch array 70 are similarly connected to column selection means 74. Row selection means 72 in the preferred embodiment is a 74LS173 register or polling latch manufactured by Texas Instruments. Polling latch 72 includes a plurality of data inputs 1D through 4D which are in communication with data latch 40, and a plurality of outputs 1Q through 4Q each of which is in communication with a row of switch array 70. In addition, polling latch 72 includes special inputs such as enable ($\overline{ENA}$) and clock (CLK). The operation of polling latch 72 is such that the data presented at inputs 1D through 4D would cause one of the outputs 1Q through 4Q to be low, and all others high.

Column selection means 74 in the preferred embodiment is a 74LS240 register or output latch manufactured by Texas Instruments. Output latch 74 comprises a plurality of inputs 1A1 through 2A1 each of which is in communication with a column of switch array 70, and a plurality of data outputs 1Y1 through 2Y1 which are in communication with data latch 40. The operation of output latch 74 is such that if a key of switch array 70 is depressed, a low signal would appear in one of the parallel data which are forward by output latch 74 to microprocessor 30. Microprocessor 30 than compares the received data with a conventional "look-up" table of the switch array matrix that is stored in ROM 34 to determine which key is depressed.

Last, column selection controlling means 76 in the preferred embodiment is an OR gate the inputs of which are the $\overline{I/O}$ $\overline{R}$ signal of device 42c and the $\overline{IO}$ $\overline{SEL2}$ signal of multiplexer 32.

As for display means 20, as best shown in Figure 1, it comprises three electro-optical display means--an alphanumeric communication display means 22, an keypad entry display means 24, and a positional display means 26. As shown in Figure 6A, alphanumeric display means 22 comprises a liquid crystal display (LCD) device 80. LCD 80 in the preferred embodiment is a LCM-522-1A dot matrix display module manufactured by Sanyo Semiconductor Corp. of Allendale, New Jersey. LCD 80 includes a plurality of inputs which are in communication with data latch 40. In addition, two NAND gates 82 and 84, and an inverter 86 are provided for controlling LCD 80. The input signals of gate 82 are the $\overline{IO}$ $\overline{SEL3}$ and $\overline{IO}$ $\overline{SEL5}$ signals from multiplexer 32. The output of gate 82 and the I/O W signal from device 42d are inputted into gate 84. Further, the output of inverter 86 and the $\overline{IO}$ $\overline{SEL3}$ signals are inputted into LCD 80. LCD 80 is capable of providing a visual instruction to the player. For example, LCD 80 is capable of displaying the serial number of the bingo card that has just been scanned, instructions such as "ENTER NUMBER", etc. The presence of an $\overline{IO}$ $\overline{SEL3}$ signal, presenting a low signal at input RS of LCD 80 indicates to LCD 80 that a command signal is to be presented. The absence of an $\overline{IO}$ $\overline{SEL3}$ signal, presenting a high signal at input RS, indicates that data are to be presented to LCD 80. In all instances, the presence of either the $\overline{IO}$ $\overline{SEL3}$ or $\overline{IO}$ $\overline{SEL5}$ signal in conjunction with the I/O W signal cause inverter 86 to output a signal that enables LCD 80 via input E.

Next, keypad entry display means 24 is provided to display the manually-entered, called-out numbers as they are being entered by the player. More particularly, keypad display means 24 comprises two light emitting devices 88a and 88b, as best shown in Figure 6B. Display devices

88a and 88b in the preferred embodiment are TIL311 integrated circuit displays manufactured by Texas Instruments. Each of display devices 88a and 88b includes a plurality of inputs A through D which are in communication with data latch 40, and an enable input ($\overline{EL}$). In addition, an OR gate 90 is provided to control the operation of keypad display means 24. The inputs of gate 90 are the $\overline{I/O}$ $\overline{W}$ signal from device 42d and the $\overline{IO}$ $\overline{SEL4}$ signal from multiplexer 32.

Last, positional display means 26 is provided for sequentially displaying the possible winning configurations to the player before and during the game and for displaying the winning configuration to the player if a bingo has occurred. More particularly, positional display means 26, as best shown in Figure 6B, comprises a plurality of shift registers 92a, 92b, 92c, and a flip-flop 92d. Each of shift registers 92a, 92b and 92c in the preferred embodiment is a 74LS164 serial-input, parallel-output shift register manufactured by Texas Instruments. Each shift register includes a plurality of outputs OA through OH each of which is connected to a light emitting diode (LED). Similarly, flip-flop 92d, a D-type flip-flop, includes an LED at its output Q. In addition, an OR gate 94 is provided to control the operation of the shift registers and the flip-flop. The inputs of gate 94 are the $\overline{I/O}$ $\overline{W}$ signal from device 42d and the $\overline{IO}$ $\overline{SEL7}$ signal from multiplexer 32.

As shown in Figure 7, the operation of game monitor 12 is best illustrated by the flow chart. After the activation of a power switch, not shown, ROM 34 is activated. This automatic activation has been pre-programmed into ROM 34. ROM 34 then outputs its eight lowest binary bits from outputs O0 through O7. These address instructions are forwarded to microprocessor 30.

After receiving these address instructions, microprocessor 30 begins the initialization (INIT) routine, as best shown by the flow chart in Figure 8. The initializa-

tion routine initializes the various units of game monitor 12. For initializing barcode microprocessor 60, microprocessor 30 forwards the appropriate signals such that a signal appears at the SERIAL IN output of flip-flop 56, as best shown in Figure 4A. Initialization signals are then forwarded to barcode microprocessor 60.

As for initializing alphanumeric display means 22, microprocessor 30 outputs an $\overline{IO}$ $\overline{SEL3}$ signal that is inputted to LCD 80 via input RS, permitting LCD 80 to accept command signals such as the initialization signals. These signals are then presented to inputs D0 through D7. In addition, the IO/M and $\overline{WR}$ outputs of microprocessor 30 are activated by the presence of a high and low signal, respectively. Inverter 46 in turn inverts the high signal of the IO/M port, indicating that microprocessor 30 is controlling an input/output operation. The low output of OR gate 42d, $\overline{I/O}$ $\overline{W}$, is inverted by inverter 48 before it is inputted to NAND gate 84. The output of NAND gate 84 is inverted by inverter 86, the output of which enables LCD 80 to receives signals at its inputs D0 through D7.

Similarly, the other components of display means 22 are initialized. For example, microprocessor 30 outputs the appropriate signals such that OR gate 90 outputs a low signal to the $\overline{EL}$ inputs of display devices 88a and 88b, as best shown in Figure 6B. Microprocessor 30 then outputs low data signals from its outputs AD0 through AD7, which are forwarded by data latch 40 on its DB0 through DB7 lines. These low signals are then received by inputs A through D of display devices 88a and 88b.

For initializing positional display means 26, microprocessor outputs the appropriate signals such that a low signal is outputted by OR gate 94, as best shown in Figure 6B. Microprocessor 30 then outputs a low SOD signal that is inputted into shift register 92a. This low signal then propagates through shifts registers 92a, 92b and 92c, and flip-flop 92d such that these devices are all initialized.

As best shown by the flow chart of Figure 9, RAM 36 is then initialized and tested (RAMTST). Microprocessor 30 first outputs a high signal at its output A12 which is then inverted by inverter 44. The presence of this low signal at input $\overline{CE}$ of RAM 36 enables RAM 36, that is, permitting RAM 36 to read or write. Conversely, ROM 34 is disabled by the high signal from output A12. Thus enabled, permitting RAM 36 to read any inputted data, microprocessor 30 now outputs data from outputs AD0 through AD7 and A8 through A10. These data, the eight lowest bits having passed through address latch 38, are received by inputs A0 through A10 of RAM 36. During this initialization mode, the data received by RAM 36 are test patterns and other information. The test patterns are then read back into microprocessor 30 which compares the patterns to determine whether RAM 36 is functioning properly.

As best shown by the flow chart of Figure 10, game monitor 12 is now in the idle mode (IDLE) after all initializations and testings have been completed. Keyboard means 18 is first tested to see whether the player has depressed the play mode ("START PLAY" key of switch array 70) or the card input mode ("START CARD READING" key). If the card input (CARDIN) routine has been selected, as best shown in Figure 11, barcode reader 50 is enabled to read the bar codes of bingo cards 27. In this routine, flip-flop 52 of Figure 4A is activated. Microprocessor 30 outputs the appropriate signals such that multiplexer 32 outputs a signal at $\overline{IO}$ $\overline{SEL6}$. In addition, microprocessor activates the IO/M and $\overline{WR}$ outputs to enable the production of the I/O W signal by inverter 48, and activates the SOD output. The presence of these signals causes flip-flop 52 to produce the SERIAL IN signal, which is inputted to barcode microprocessor 60. The presence of the SERIAL IN signal activates transistor 64 which in turn activates barcode reader 50 via lines EN and V+. As best shown in Figure 1, a bingo card 27 bearing a strip of bar code is moved across bar code reader 50. The bar code on the

bingo card, which is in the "3 of 9 Code" format, is then serially received by barcode microprocessor 60 via the DIG IN line. Barcode microprocessor 60 first converts this digital information into the ASCII format and then forwards it to microprocessor 30 in a serial fashion via the SID line. These data, representing the matrix of one bingo card 27, are first converted by microprocessor 30 into the BCD format. Microprocessor 30 then outputs this information to RAM 36 in a parallel fashion via outputs AD0 through AD7 and A8 through A10. When barcode microprocessor 60 has completed its reception of the bar code, beeper 62 is then activated, via transistor 68, to notify the player that the bar code information has been properly received by game monitor 12. In the event that the player scanned a bingo card that had already been scanned, the program returns to the beginning of the routine.

After receiving the bar code information from barcode entry means 54, microprocessor 30 then outputs the serial number of this bingo card to alphanumeric display means 22, Microprocessor 30 outputs the appropriate signals such that multiplexer 32 outputs an $\overline{IO}$ $\overline{SEL5}$ signal and inverter 48 outputs an I/O W signal. The absence of a low signal at input RS of LCD 80 permits LCD 80 to receive data from microprocessor 30 and to display alphanumerics. Thus, data are transmitted from microprocessor 30 to LCD 80 via data latch 40. In addition to the display of the serial number, LCD 80 may display messages such as "INPUT NEXT CARD", or a variety of messages. If 50 bingo cards have been received, barcode reader 50 is then disabled, and the program returns to the idle routine. If the player wishes to play with less than 50 bingo cards, he depresses the "END CARD READING" key of switch array 70 and the routine exits to the IDLE routine.

If the play mode key has been depressed by the player, the "START PLAY" key of switch array 70, then game monitor 12 goes into the play mode (PLAY), as best shown in Figures 12A through 12E. The first requirement of the

PLAY mode is that game monitor 12 can be activated only if two or more bingo cards have been received. The player, at this juncture, then selects the type of game he wishes to play, i.e., the conventional bingo game in which the winning configurations are the horizontals, verticals, diagonals and the corners, or some other form of the game. For example, the player would select this type of game by keying in the numerals "01" on the keys of switch array 70. This selection is verified by display devices 88a and 88b. In addition, the possible winning configurations are also displayed, sequentially, on positional display means 26. Additional alphanumeric messages may be displayed by LCD 80.

If the player is in the midst of a game and he wishes to clear a numeral stored in RAM 36 that has been called out, the program may be diverted to the routine shown in Figure 12D. In the preferred embodiment, one bit of a numeral stored in RAM 36 is set aside to indicate that that number had been called out. For example, the most significant bit of an eight-bit word may be used for this purpose. The numeral two may be stored at "0000 0010" in RAM 36. If this numeral had been called by the announcer, the most significant bit is changed to one, i.e., "1000 0010". In this routine, the most significant bit of that numeral is returned to zero and the routine returns to the IDLE routine. Clearing the most significant bit generally occurs in the situation where a player indicates that he has a bingo but in actuality, he had entered an incorrect number that is a member of the matrix. Thus, the most significant bit of the mistakenly-entered numeral is returned to zero. Similarly, if the player is not satisfied with the type of game he is playing, new games may be selected.

If the player is satisfied in all respects, the routine continues to the program shown in Figure 12B. As the player hears the announced number, he uses keypad means 18 to enter such numerals. These numerals are displayed in keypad display devices 88a and 88b. If the player entered

a numeral incorrectly, he may activate the "DELETE" key and routine diverts to the routine shown in Figure 12E. The incorrect numeral is then erased from RAM 36 and microprocessor 30 searches through RAM 36 to detect whether or not a match (bingo) exists. This routine then returns to the routine of Figure 12A. Similarly, if the player enters a number that microprocessor 30 has programmed to reject, e.g., the number "90" which is beyond the range permitted in this game, the routine also exits to the routine of Figure 12A.

If the entered numerals are correct and acceptable in all respects, then microprocessor 30 searches RAM 36 to detect whether a match exists and then checks to see whether all the numerals of a winning configuration have been called. If no winning configuration is detected, the routine returns to the routine of Figure 12A.

If a winning configuration is detected, then that configuration is displayed on positional display means 26. Microprocessor 30 outputs the appropriate signals such that multiplexer 32 outputs a $\overline{IO}$ $\overline{SEL7}$ signal and device 42d outputs the $\overline{I/O}$ $\vec{W}$ signal. Upon receipt of these signals, OR gate 94 outputs a signal that operates registers 92a, 92b and 92c, and flip-flop 92d. Microprocessor 30 then outputs a serial data on the SOD line which propagates through positional display means 26. For example, if the winning configuration is the vertical of column 1, then diodes D1 through D5 would be activated. If the winning configuration is the horizontal of row 1, then diodes 1, 6, 11, 16 and 21 would be activated. In addition, if more than one configuration is detected, then these winning configurations are displayed sequentially. The serial number of the winning bingo card is also displayed on LCD 80.

The routine then awaits instructions from the player to begin again the play mode. For example, clear the most significant bits of all entries in RAM 36, causing the program to exit to the routine of Figure 12D. Or, delete

a called-out numeral from RAM 36, causing the program to exit to the routine of Figure 12E. Or, changing the type of game being played, as illustrated in Figure 12C.

It will be apparent to those skilled in the art that various modifications may be made within the spirit of the invention and the scope of the appended claims. For example, instead of using a strip of bar codes, a strip of conventional magnetic tape may be substituted. In this alternative embodiment, the numerals of a bingo card are coded and written onto the magnetic tape. The magnetic tape is then positioned onto the bingo card. The coding of the numerals may be one of several conventional coding methods. In this embodiment, a magnetic tape reader is substituted for barcode reader 50, a magnetic reader operating means is substituted for barcode operating means 52, and matrix processing means is substituted for barcode processing means 54. The magnetic tape reader is capable of transforming the coded numerals into digital data for further processing by microprocessor 60 of automatic matrix entry means 16.

Claims

1. An electronic game monitor for use with a game card, said game card generally includes a matrix of numerals thereon, said game monitor comprising

automatic matrix entry means for receiving coded numerals which are positioned on said game card, said coded numerals, representing said matrix numerals, are depicted in a generally coded fashion;

central controlling means for controlling the operation of said game monitor, said game monitor being operable with said coded numerals of at least two of said game cards;

keyboard means for entering alphanumerics, said keyboard means includes a plurality of keys; and

display means for displaying alphanumerics and game configurations,

said automatic matrix entry means further comprising

a coded-numeral reader for receiving said coded numerals on said game cards, and

matrix processing means for transforming said coded numerals into a form usable by said game monitor.

2. The electronic game monitor as claimed in Claim 1, wherein said central controlling means further comprises

central processing means for controlling the routing of address and data information,

input/output controlling means for generating control signals which are used to control said automatic matrix entry means, said keyboard means and said display means,

a read-only memory device for storing pre-programmed information and instructions, and

a random-access memory device for storing data information.

3. The electronic game monitor as claimed in Claim 1, wherein said keyboard means further comprises

a switch array, said switch array having a plurality of rows and a plurality of columns,

row selection means for selecting one of said rows, and

column selection means for selecting one of said columns, whereby

a location of said switch array is sense, indicating the selection of one of said keys.

4. The electronic game monitor as claimed in Claim 1, wherein said display means further comprises

alphanumeric communication display means for displaying alphanumeric messages,

keypad entry display means for displaying numerals entered via said keyboard means, and

positional display means for displaying said game configurations.

5. The electronic game monitor as claimed in Claim 1, 2, 3 or 4, wherein

said coded numerals are written on a magnetic tape, and

said coded-numeral reader is adapted for reading said coded numerals which are written on said magnetic tape.

6. An electronic game monitor for use with a game card, said game card generally includes a matrix of numerals thereon, said game monitor comprising

automatic matrix entry means for receiving coded numerals which are positioned on a game card, said coded numerals, representing said matrix numerals, are depicted in a generally coded fashion, said automatic matrix entry means comprising

a coded-numeral reader for reading said coded numerals on said game cards, and

matrix processing means for transforming said coded numerals into a form usable by said game monitor;

central controlling means for controlling the operation of said game monitor, said game monitor being operable with said coded numerals of at least two of said game cards, said central controlling means comprising

central processing means for controlling the routing of address and data information,

input/output controlling means for generating control signals which are used to control said automatic matrix entry means, said keyboard means and said display means,

a read-only memory device for storing pre-programmed information and instructions, and

a random-access memory device for storing data information;

keyboard means for entering alphanumerics, said keyboard means includes a plurality of keys, said keyboard means comprising

a switch array, said switch array having a plurality of rows and a plurality of columns,

row selection means for selecting one of said rows, and

column selection means for selecting one of said columns, whereby a location of said switch

array is sensed, indicating the selection of one of said keys; and

display means for displaying alphanumerics and game configurations, said display means comprising

alphanumeric communication display means for displaying alphanumeric messages,

keypad entry display means for displaying numerals entered via said keyboard means, and

positional display means for displaying said game configurations.

7. The electronic game monitor as claimed in Claim 1 or 6, wherein said automatic matrix entry means further comprises

matrix operating means for controlling said matrix processing means.

8. The electronic game monitor as claimed in Claim 7, wherein

said coded numerals are written on a magnetic tape, and

said coded-numeral reader is adapted for reading said coded numerals which are written on said magnetic tape.

9. The electronic game monitor as claimed in Claim 1 or 6, wherein said barcode processing means comprises

matrix microprocessor means, and

an indicator means for indicating the acceptance of said coded numerals of said game card.

10. The electronic game monitor as claimed in Claim 9, wherein

said coded numerals are written on a magnetic tape, and

said coded-numeral reader is adapted for reading said coded numerals which are written on said magnetic tape.

11. The electronic game monitor as claimed in Claim 2 or 6, wherein said central controlling means further comprises

address latching means for facilitating the transfer of said address information between said central processing means and said read-only memory device and said random-access memory device, and

data latching means for facilitating the transfer of said data information between said central processing means and said keyboard means and said display means.

12. The electronic game monitor as claimed in Claim 11, wherein

said coded numerals are written on a magnetic tape, and

said coded-numeral reader is adapted for reading said coded numerals which are written on said magnetic tape.

13. The electronic game monitor as claimed in Claim 12, wherein

said central processing means comprises microprocessor means, and

said input/output controlling means comprises multiplexer means.

14. The electronic game monitor as claimed in Claim 3 or 6, wherein

said row selection means comprises a latch register means, and

said column selection means comprises a latch register means.

15. The electronic game monitor as claimed in Claim 14, wherein

said coded numerals are written on a magnetic tape, and

said coded-numeral reader is adapted for reading said coded numerals which are written on said magnetic tape.

16. The electronic game monitor as claimed in Claim 4 or 6, wherein

said alphanumeric communication display means comprises a liquid crystal display device,

said keypad entry display means comprises a plurality of light emitting display devices, and

said positional display means comprises a plurality of light emitting diodes.

17. The electronic game monitor as claimed in Claim 16, wherein

said coded numerals are written on a magnetic tape, and

said coded-numeral reader is adapted for reading said coded numerals which are written on said magnetic tape.

18. An electronic game monitor for use with a game card, said game card generally includes a matrix thereon, said game monitor comprising

automatic matrix entry means for receiving numerals which are positioned on said game card, said numerals, representing locations of said matrix, are depicted in a generally bar code-like fashion;

central controlling means for controlling the operation of said game monitor, said game monitor being operable with said numerals of at least two of said game cards;

keyboard means for entering alphanumerics, said keyboard means includes a plurality of keys; and

display means for displaying alphanumerics and game configurations,

said automatic matrix entry means further comprising

a barcode reader for receiving said numerals on said game cards, and

barcode processing means for transforming said numerals into a form usable by said game monitor.

19. The electronic game monitor as claimed in Claim 18, wherein said central controlling means further comprises

central processing means for controlling the routing of address and data information,

input/output controlling means for generating control signals which are used to control said automatic matrix entry means, said keyboard means and said display means,

a read-only memory device for storing pre-programmed information and instructions, and

a random-access memory device for storing data information.

20. The electronic game monitor as claimed in Claim 18, wherein said keyboard means further comprises

a switch array, said switch array having a plurality of rows and a plurality of columns,

row selection means for selecting one of said rows, and

column selection means for selecting one of said columns, whereby

a location of said switch array is sense, indicating the selection of one of said keys.

21. The electronic game monitor as claimed in Claim 18, wherein said display means further comprises

alphanumeric communication display means for displaying alphanumeric messages,

keypad entry display means for displaying numerals entered via said keyboard means, and

positional display means for displaying said game configurations.

22. An electronic game monitor for use with a game card, said game card generally includes a matrix thereon, said game monitor comprising

automatic matrix entry means for receiving numerals which are positioned on a game card, said numerals, representing locations of said matrix, are depicted in a generally bar code-like fashion, said automatic matrix entry means comprising

a barcode reader for reading said numerals on said game cards, and

barcode processing means for transforming said numerals into a form usable by said game monitor;

central controlling means for controlling the operation of said game monitor, said game monitor being operable with said numerals of at least two of said game cards, said central controlling means comprising

central processing means for controlling the routing of address and data information,

input/output controlling means for generating control signals which are used to control said automatic matrix entry means, said keyboard means and said display means,

a read-only memory device for storing preprogrammed information and instructions, and

a random-access memory device for storing data information;

keyboard means for entering alphanumerics, said keyboard means includes a plurality of keys, said keyboard means comprising

a switch array, said switch array having a plurality of rows and a plurality of columns,

row selection means for selecting one of said rows, and

column selection means for selecting one of said columns, whereby a location of said switch

array is sensed, indicating the selection of one of said keys; and

display means for displaying alphanumerics and game configurations, said display means comprising

alphanumeric communication display means for displaying alphanumeric messages,

keypad entry display means for displaying numerals entered via said keyboard means, and

positional display means for displaying said game configurations.

23. The electronic game monitor as claimed in Claim 18 or 22, wherein said automatic matrix entry means further comprises

barcode operating means for controlling said barcode processing means.

24. The electronic game monitor as claimed in Claim 18 or 22, wherein said barcode processing means comprises

barcode microprocessor means, and

an indicator means for indicating the acceptance of said numerals of said game card.

25. The electronic game monitor as claimed in Claim 18 or 22, wherein said central controlling means further comprises

address latching means for facilitating the transfer of said address information between said central processing means and said read-only memory device and said random-access memory device, and

data latching means for facilitating the transfer of said data information between said central processing means and said keyboard means and said display means.

26. The electronic game monitor as claimed in Claim 25, wherein

said central processing means comprises microprocessor means, and

said input/output controlling means comprises multiplexer means.

27. The electronic game monitor as claimed in Claim 20 or 22, wherein

said row selection means comprises a latch register means, and

said column selection means comprises a latch register means.

28. The electronic game monitor as claimed in Claim 21 or 22, wherein

said alphanumeric communication display means comprises a liquid crystal display device,

said keypad entry display means comprises a plurality of light emitting display devices, and

said positional display means comprises a plurality of light emitting diodes.

AMENDED CLAIMS
[received by the International Bureau on 7 July 1986 (07.07.86);
original claims 1-28 replaced by new claims 1-28 (11 pages)]

1. An electronic game monitor for use with an imperforate, conventional, dimensionally unaltered game card, said game card generally includes a matrix of numerals thereon presented in a conventional manner and a set of machine-readable coded numerals representative of said matrix numerals, said coded numerals being depicted in a generally coded fashion, said game monitor comprising

central controlling means for controlling the operation of said game monitor, said game monitor being operable with said coded numerals of at least two of said game cards, wherein said central controlling means generates a plurality of control signals;

automatic matrix entry means for accepting said game card and reading said coded numerals of said game card, said automatic matrix entry means being responsive to said control signals, wherein said automatic matrix entry means comprises

a coded-numeral reader for reading said coded numerals of said game card, and

matrix processing means for transforming said coded numerals into a form usable by said game monitor;

keyboard means for entering alphanumerics, said keyboard means being responsive to said control signals, wherein said keyboard means includes a plurality of keys; and

display means for displaying alphanumerics and game configurations, said display means being responsive to said control signals.

2. The electronic game monitor as claimed in Claim 1, wherein said central controlling means further comprises

central processing means for controlling the routing of address and data information,

input/output controlling means for generating said control signals,

a read-only memory device for storing pre-programmed information and instructions, and

a random-access memory device for storing data information.

3. The electronic game monitor as claimed in Claim 1, wherein said keyboard means further comprises

a switch array, said switch array having a plurality of rows and a plurality of columns,

row selection means for selecting one of said rows, and

column selection means for selecting one of said columns, whereby

a location of said switch array is sensed, indicating the selection of one of said keys.

4. The electronic game monitor as claimed in Claim 1, wherein said display means further comprises

alphanumeric communication display means for displaying alphanumeric messages,

keypad entry display means for displaying numerals entered via said keyboard means, and

positional display means for displaying said game configurations.

5. The electronic game monitor as claimed in Claim 1, 2, 3 or 4, wherein

said coded numerals are written on a magnetic tape, and

said coded-numeral reader is adapted for reading

said coded numerals which are written on said magnetic tape.

6. An electronic game monitor for use with an imperforate, conventional, dimensionally unaltered game card, said game card generally includes a matrix of numerals thereon presented in a conventional manner and a set of machine-readable coded numerals representative of said matrix numerals, said coded numerals being depicted in a generally coded fashion, said game monitor comprising

central controlling means for controlling the operation of said game monitor, said game monitor being operable with said coded numerals of at least two of said game cards, said central controlling means comprises

central processing means for controlling address and data information so as to properly route said address and data information,

input/output controlling means for generating a plurality of control signals,

a read-only memory device for storing pre-programmed information and instructions, and

a random-access memory device for storing data information;

automatic matrix entry means for accepting said game card and reading said coded numerals of said game card, said automatic matrix entry means being responsive to said control signals, wherein said automatic matrix entry means comprises

a coded-numeral reader for reading said coded numerals of said game cards, and

matrix processing means for transforming said coded numerals into a form usable by said game monitor;

keyboard means for entering alphanumerics, said keyboard means being responsive to said control signals, wherein said keyboard means includes a plurality of keys, further wherein said keyboard means comprises

a switch array, said switch array having a plurality of rows and a plurality of columns,

row selection means for selecting one of said rows, and

column selection means for selecting one of said columns, whereby a location of said switch array is sensed which is an indication that one of said keys has been selected; and

display means for displaying alphanumerics and game configurations, said display means being responsive to said control signals, wherein said display means comprises

alphanumeric communication display means for displaying alphanumeric messages,

keypad entry display means for displaying numerals entered via said keyboard means, and

positional display means for displaying said game configurations.

7. The electronic game monitor as claimed in Claim 1 or 6, wherein said automatic matrix entry means further comprises

matrix operating means for controlling said matrix processing means.

8. The electronic game monitor as claimed in Claim 7, wherein

said coded numerals are written on a magnetic tape, and

said coded-numeral reader is adapted for reading

said coded numerals which are written on said magnetic tape.

9. The electronic game monitor as claimed in Claim 1 or 6, wherein said matrix processing means comprises

matrix microprocessor means, and

an indicator means for indicating the acceptance of said coded numerals of said game card.

10. The electronic game monitor as claimed in Claim 9, wherein

said coded numerals are written on a magnetic tape, and

said coded-numeral reader is adapted for reading said coded numerals which are written on said magnetic tape.

11. The electronic game monitor as claimed in Claim 2 or 6, wherein said central controlling means further comprises

address latching means for facilitating the transfer of said address information between said central processing means and said read-only memory device and said random-access memory device, and

data latching means for facilitating the transfer of said data information between said central processing means and said keyboard means and said display means.

12. The electronic game monitor as claimed in Claim 11, wherein

said coded numerals are written on a magnetic tape, and

said coded-numeral reader is adapted for reading said coded numerals which are written on said magnetic tape

13. The electronic game monitor as claimed in Claim 12, wherein

said central processing means comprises microprocessor means, and

said input/output controlling means comprises multiplexer means.

14. The electronic game monitor as claimed in Claim 3 or 6, wherein

said row selection means comprises a latch register means, and

said column selection means comprises a latch register means.

15. The electronic game monitor as claimed in Claim 14, wherein

said coded numerals are written on a magnetic tape, and

said coded-numeral reader is adapted for reading said coded numerals which are written on said magnetic tape.

16. The electronic game monitor as claimed in Claim 4 or 6, wherein

said alphanumeric communication display means comprises a liquid crystal display device,

said keypad entry display means comprises a plurality of light emitting display devices, and

said positional display means comprises a plurality of light emitting diodes

17. The electronic game monitor as claimed in Claim 16, wherein

said coded numerals are written on a magnetic tape, and

said coded-numeral reader is adapted for reading said coded numerals which are written on said magnetic tape.

18. An electronic game monitor for use with an imperforate, conventional, dimensionally unaltered game card, said game card generally includes a matrix of numerals thereon presented in a conventional manner and a set of machine-readable coded numerals representative of said matrix numerals, said coded numerals being depicted in a generally barcode-like fashion, said game monitor comprising

central controlling means for controlling the operation of said game monitor, said game monitor being operable with said coded numerals of at least two of said game cards, wherein said central controlling means generates a plurality of control signals;

automatic matrix entry means for accepting said game card and reading said coded numerals of said game card, said automatic matrix entry means being responsive to said central signals, wherein said automatic matrix entry means comprises

a barcode reader for reading said coded numerals of said game card, and

barcode processing means for transforming said coded numerals into a form usable by said game monitor;

keyboard means for entering alphanumerics, said keyboard means being responsive to said control signals, wherein said keyboard means includes a plurality of keys; and

display means for displaying alphanumerics and game configurations, said display means being responsive to said control signals.

19. The electronic game monitor as claimed in Claim 18, wherein said central controlling means further comprises

central processing means for controlling the routing of address and data information,

input/output controlling means for generating said control signals,

a read-only memory device for storing pre-programmed information and instructions, and

a random-access memory device for storing data information.

20. The electronic game monitor as claimed in Claim 18, wherein said keyboard means further comprises

a switch array, said switch array having a plurality of rows and a plurality of columns,

row selection means for selecting one of said rows, and

column selection means for selecting one of said columns, whereby

a location of said switch array is sensed, indicating the selection of one of said keys.

21. The electronic game monitor as claimed in Claim 18, wherein said display means further comprises

alphanumeric communication display means for displaying alphanumeric messages,

keypad entry display means for displaying numerals entered via said keyboard means, and

positional display means for displaying said game configurations.

22. An electronic game monitor for use with an imperforate, conventional, dimensionally unaltered game card, said game card generally includes a matrix of numerals thereon presented in a conventional manner and a set of machine-readable coded numerals representative of said matrix numerals, said coded numerals being depicted in a generally barcode-like fashion, said game monitor comprising

central controlling means for controlling the operation of said game monitor, said game monitor being operable with said coded numerals of at least two of said game cards, said central controlling means comprises

central processing means for controlling address and data information so as to properly route said address and data information,

input/output controlling means for generating a plurality of control signals,

a read-only memory device for storing pre-programmed information and instructions, and

a random-access memory device for storing data information;

automatic matrix entry means for accepting said game card and reading said coded numerals of said game card, said automatic matrix entry means being responsive to said control signals, wherein said automatic matrix entry means comprises

a barcode reader for reading said coded numerals of said game cards, and

barcode processing means for transforming said coded numerals into a form usable by said game monitor;

keyboard means for entering alphanumerics, said keyboard means being responsive to said control signals,

wherein said keyboard means includes a plurality of keys, further wherein said keyboard means comprises

a switch array, said switch array having a plurality of rows and a plurality of columns,

row selection means for selecting one of said rows, and

column selection means for selecting one of said columns, whereby a location of said switch array is sensed which is an indication that one of said keys has been selected; and

display means for displaying alphanumerics and game configurations, said display means being responsive to said control signals, said display means comprises

alphanumeric communication display means for displaying alphanumeric messages,

keypad entry display means for displaying numerals entered via said keyboard means, and

positional display means for displaying said game configurations.

23. The electronic game monitor as claimed in Claim 18 or 22, wherein said automatic matrix entry means further comprises

barcode operating means for controlling said barcode processing means.

24. The electronic game monitor as claimed in Claim 18 or 22, wherein said barcode processing means comprises

barcode microprocessor means, and

an indicator means for indicating the acceptance of said numerals of said game card.

25. The electronic game monitor as claimed in Claim 18 or 22, wherein said central controlling means further comprises

address latching means for facilitating the transfer of said address information between said central processing means and said read-only memory device and said random-access memory device, and

data latching means for facilitating the transfer of said data information between said central processing means and said keyboard means and said display means.

26. The electronic game monitor as claimed in Claim 25, wherein

said central processing means comprises microprocessor means, and

said input/output controlling means comprises multiplexer means.

27. The electronic game monitor as claimed in Claim 20 or 22, wherein

said row selection means comprises a latch register means, and

said column selection means comprises a latch register means.

28. The electronic game monitor as claimed in Claim 21 or 22, wherein

said alphanumeric communication display means comprises a liquid crystal display device,

said keypad entry display means comprises a plurality of light emitting display devices, and

said positional display means comprises a plurality of light emitting diodes.

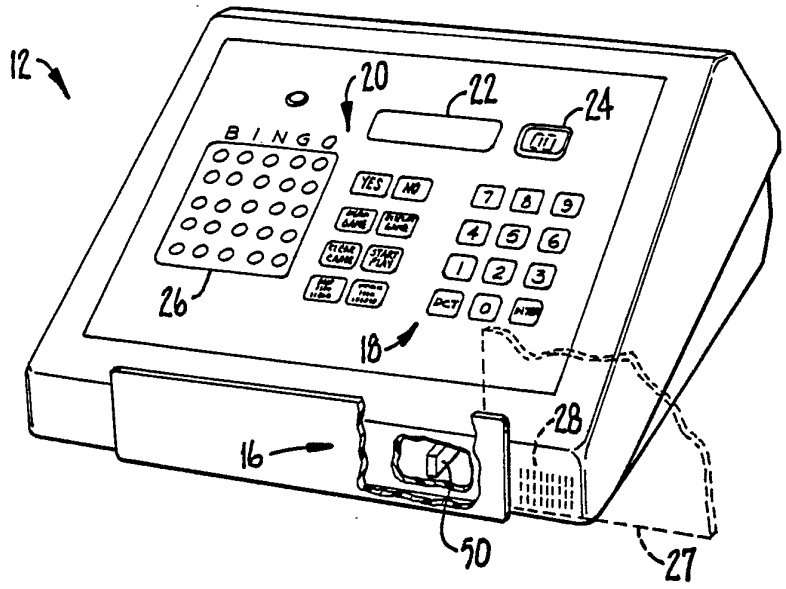

12
20
22
24
BINGO
YES
NO
7 8 9
4 5 6
1 2 3
CLR
0
ENTER
26
18
16
28
50
27

FIG._1.

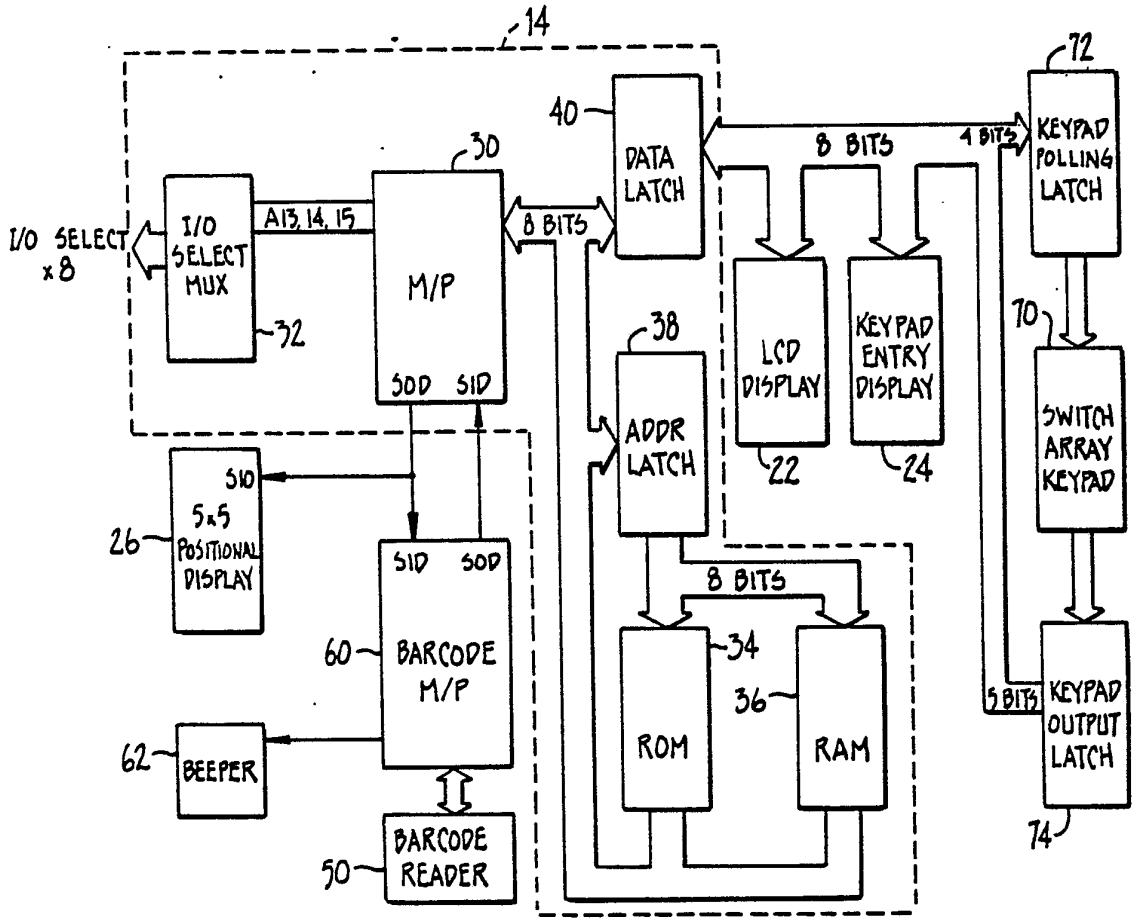
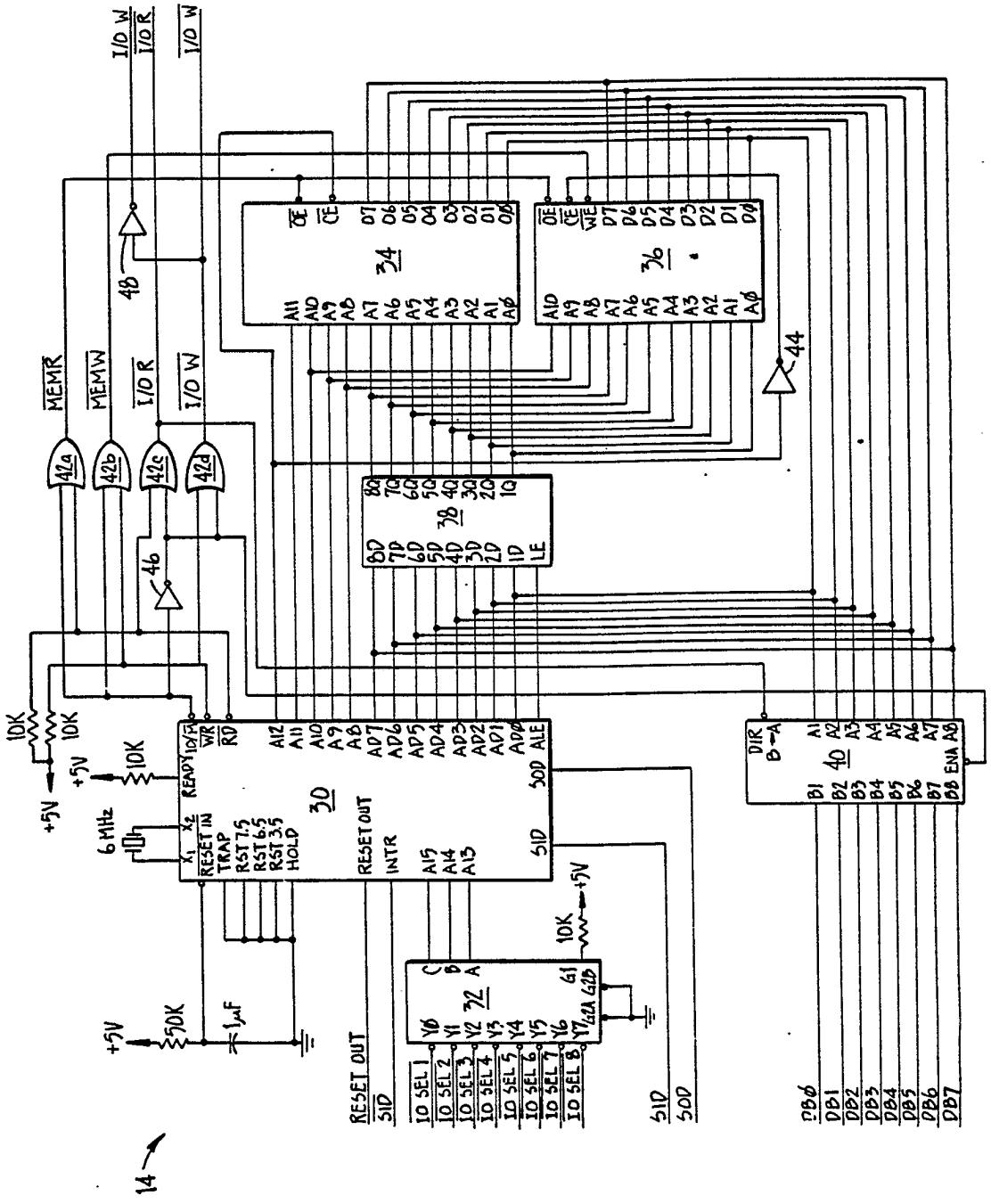

14
72
40
DATA LATCH
8 BITS
4 BITS
KEYPAD POLLING LATCH
30
I/O SELECT x8
I/O SELECT MUX
A13, 14, 15
M/P
8 BITS
32
SDD SID
38
ADDR LATCH
LCD DISPLAY
KEYPAD ENTRY DISPLAY
22
24
70
SWITCH ARRAY KEYPAD
SID
5x5 POSITIONAL DISPLAY
26
SID SOD
60
BARCODE M/P
8 BITS
34
36
ROM
RAM
5 BITS
KEYPAD OUTPUT LATCH
74
62
BEEPER
BARCODE READER
50

FIG._2.

FIG._3.


I/O W
I/O R
I/O W
MEMR
MEMW
I/O R
I/O W
48
46
44
42a
42b
42c
42d
34
36
38
30
40
32
41
42A 42B
10K
+5V
6 MHz
50K
1μF
RESET IN
TRAP
RST 7.5
RST 6.5
RST 3.5
HOLD
RESET OUT
INTR
READY
WR
RD
ALE
SOD
SID
DIR
B-A
ENA
IO SEL 1
IO SEL 2
IO SEL 3
IO SEL 4
IO SEL 5
IO SEL 6
IO SEL 7
IO SEL 8
DB0
DB1
DB2
DB3
DB4
DB5
DB6
DB7
14

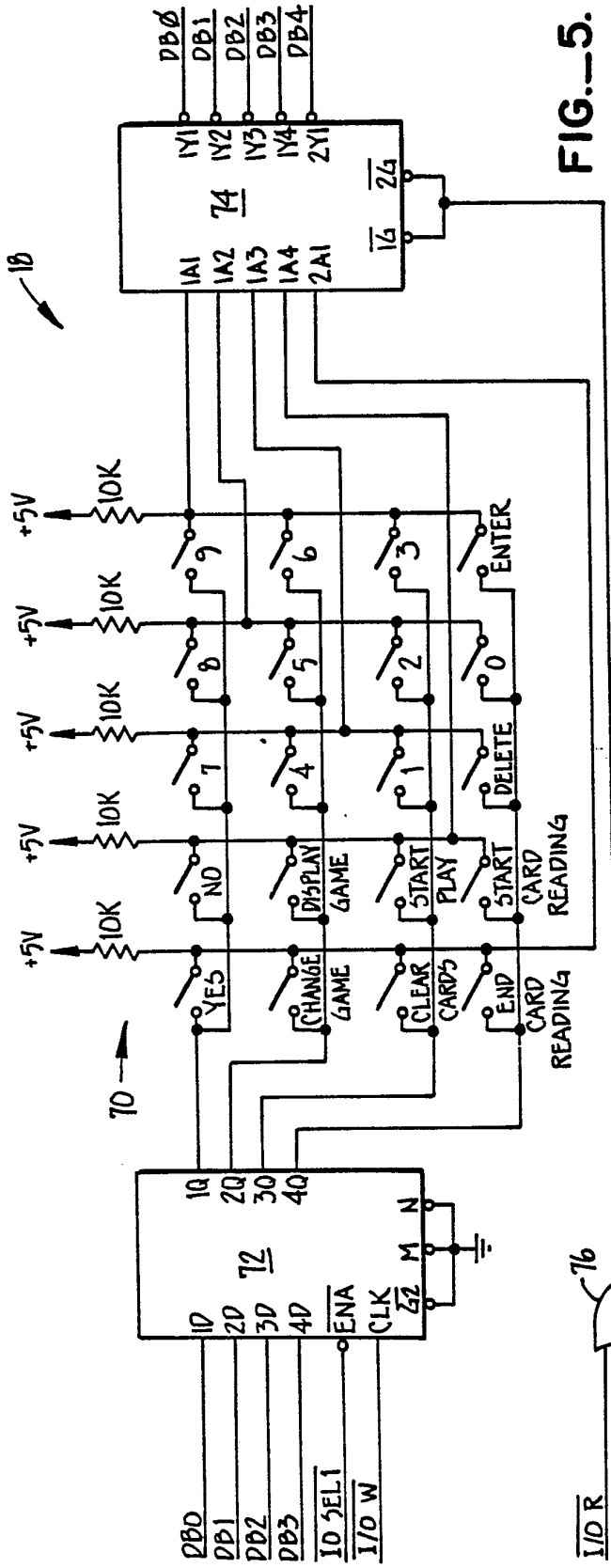

DB0
DB1
DB2
DB3
DB4
74
1Y1
1Y2
1Y3
1Y4
2Y1
1A1
1A2
1A3
1A4
2A1
18
+5V
10K
9
6
3
ENTER
8
5
2
0
7
4
1
DELETE
NO
DISPLAY GAME
START PLAY
START CARD READING
YES
CHANGE GAME
CLEAR CARDS
END CARD READING
70
72
1Q
2Q
3Q
4Q
1D
2D
3D
4D
ENA
CLK
G2
M
N
DB0
DB1
DB2
DB3
ID SEL 1
I/O W
76
I/O R
ID SEL 2

FIG._5.

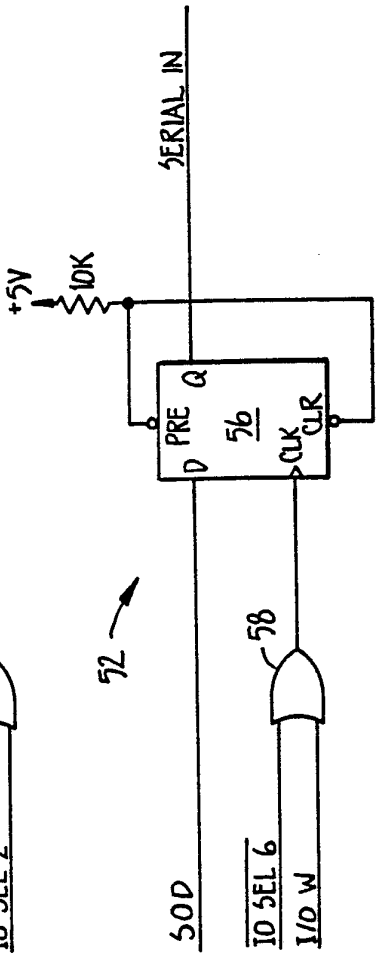
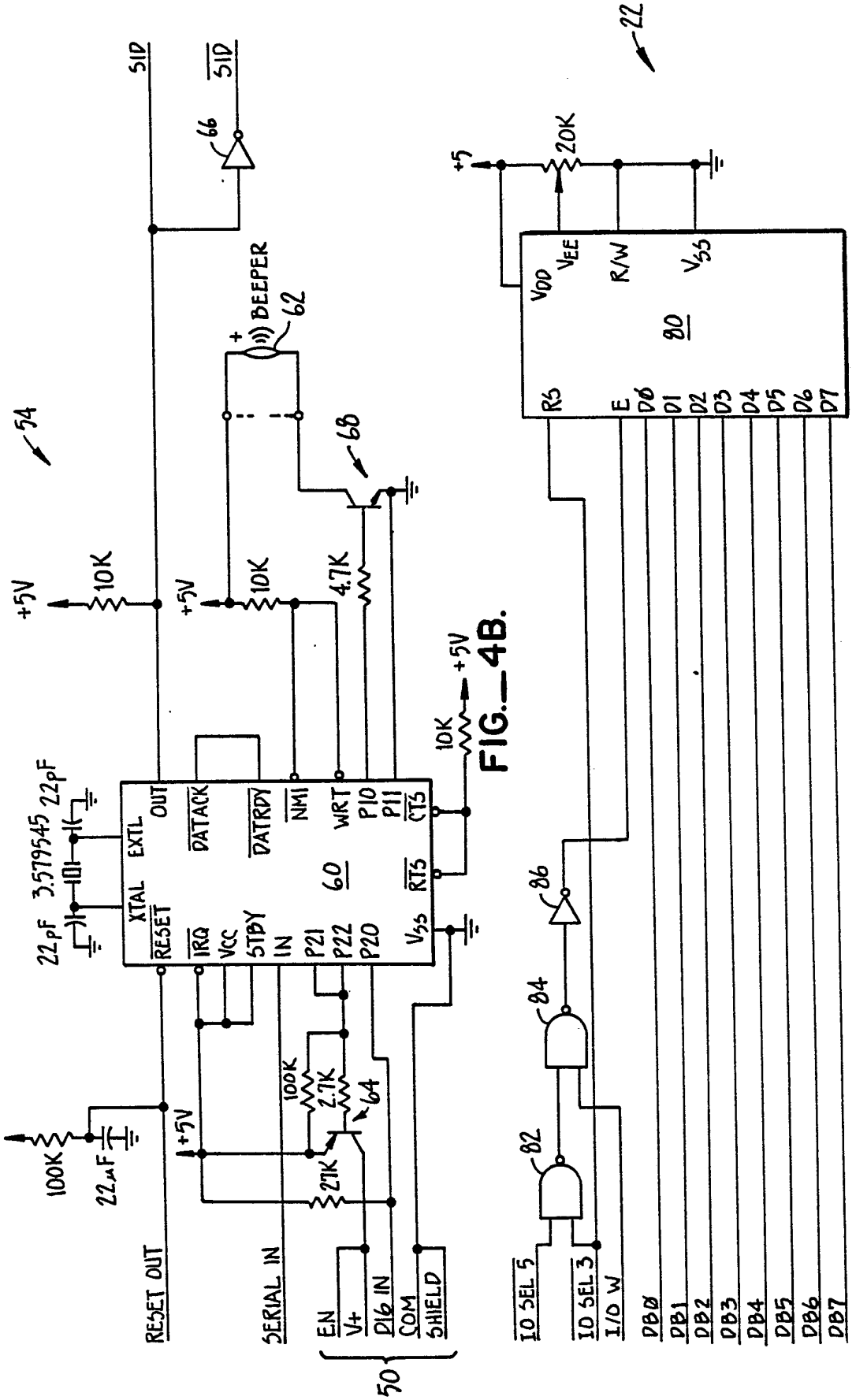

SERIAL IN
+5V
10K
PRE
Q
D
56
CLK
CLR
52
58
SOD
ID SEL 6
I/O W

FIG._4A.


54
SID
SID
66
BEEPER
62
68
+5V
10K
10K
4.7K
+5V
+5V
10K
22pF
3.579545
22pF
100K
22μF
100K
2.7K
64
27K
+5V
XTAL
EXTL
RESET
IRQ
VCC
STBY
IN
P21
P22
P20
OUT
DATACK
DATRDY
NMI
WRT
P10
P11
CTS
RTS
60
RESET OUT
SERIAL IN
EN
V+
D16 IN
COM
SHIELD
50
FIG._4B.
22
+5
20K
VDD
VEE
R/W
VSS
80
RS
E
D0
D1
D2
D3
D4
D5
D6
D7
86
84
82
IO SEL 5
IO SEL 3
I/O W
DB0
DB1
DB2
DB3
DB4
DB5
DB6
DB7
FIG._6A.

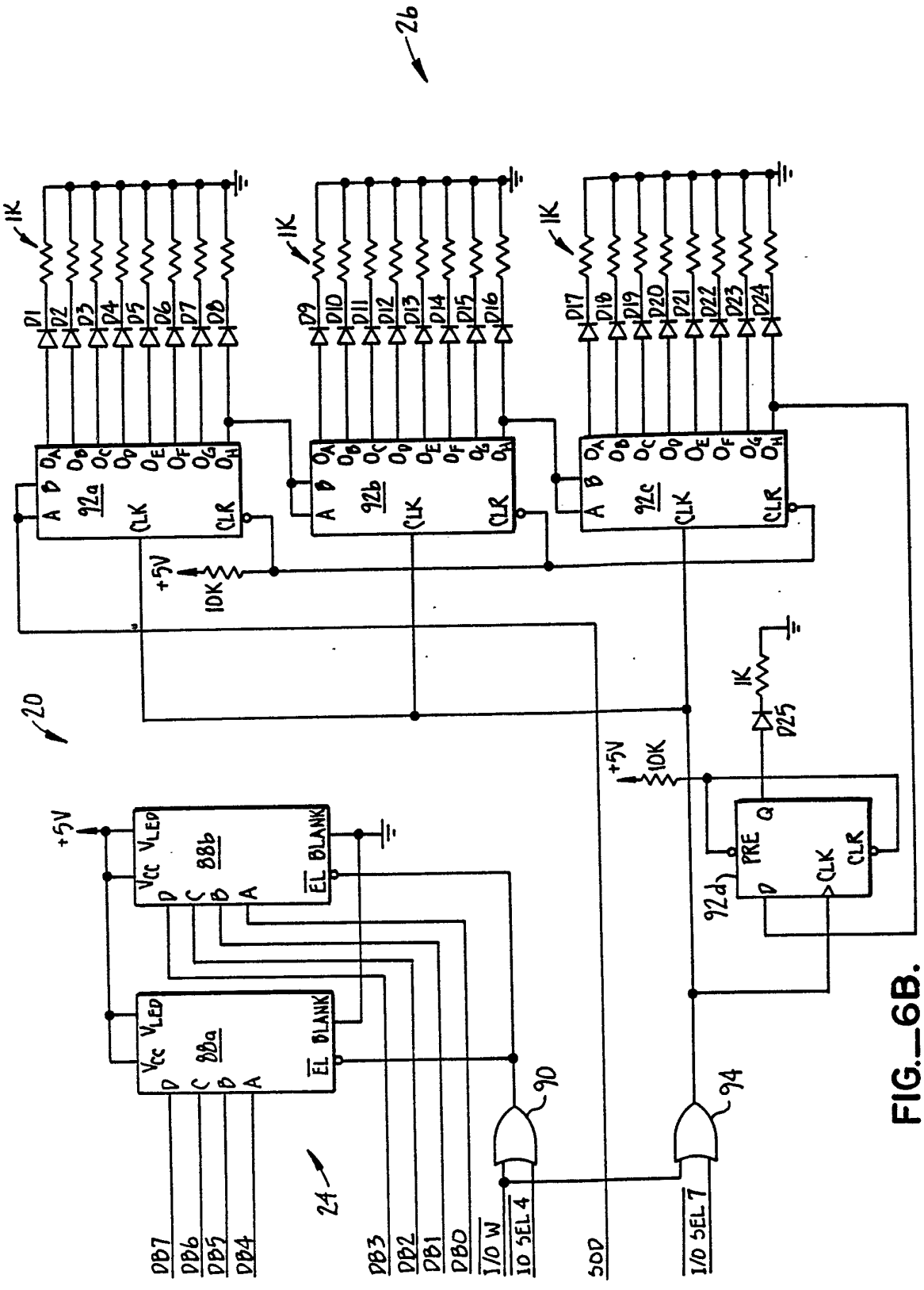

26
1K
D1
D2
D3
D4
D5
D6
D7
D8
D9
D10
D11
D12
D13
D14
D15
D16
D17
D18
D19
D20
D21
D22
D23
D24
92a
92b
92c
92d
CLK
CLR
+5V
10K
20
D25
PRE
Q
D
88b
88a
VLED
Vcc
EL BLANK
24
90
94
DB7
DB6
DB5
DB4
DB3
DB2
DB1
DB0
I/O W
I/O SEL 4
I/O SEL 7
SOD

FIG._6B.

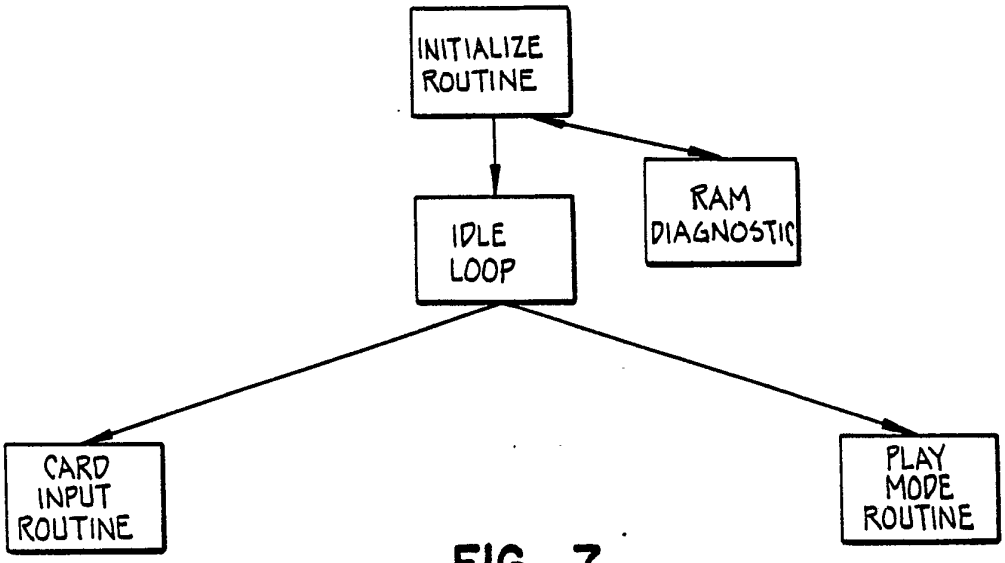


FIG._7.

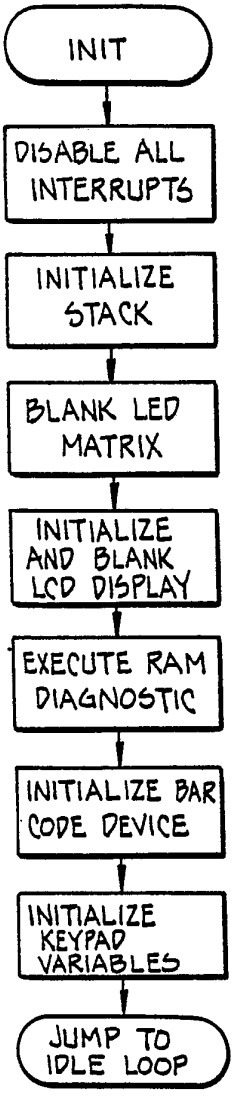


FIG._8.

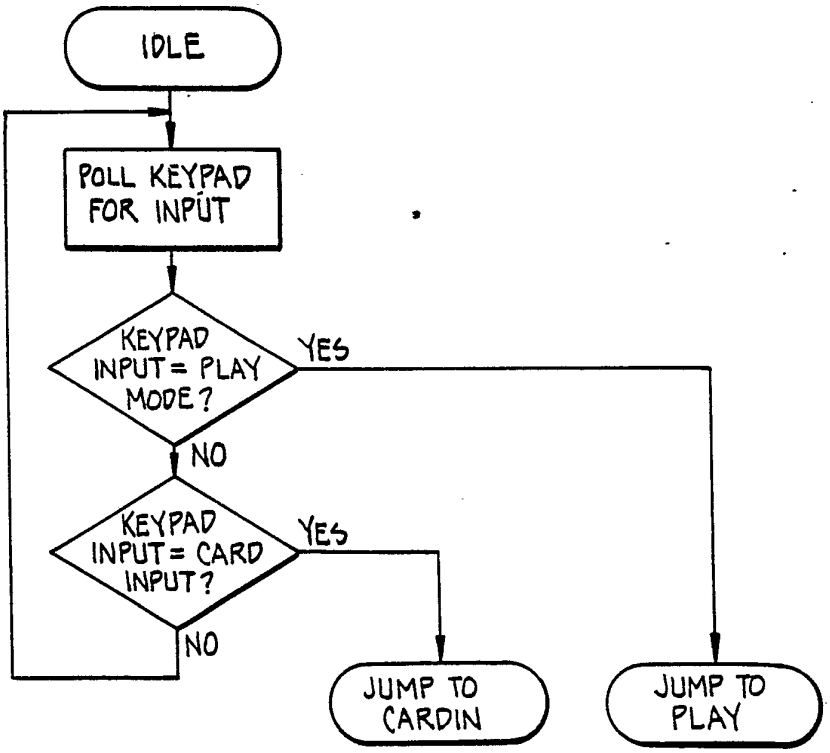


FIG._10.

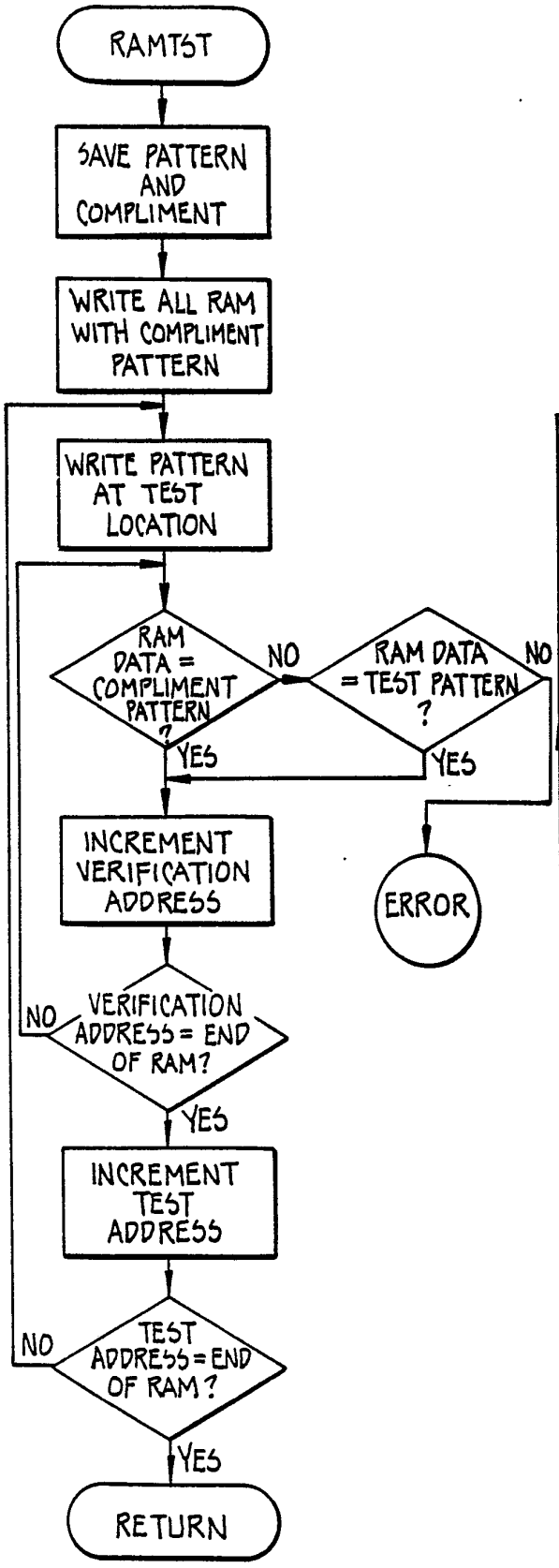

RAMTST
SAVE PATTERN AND COMPLIMENT
WRITE ALL RAM WITH COMPLIMENT PATTERN
WRITE PATTERN AT TEST LOCATION
RAM DATA = COMPLIMENT PATTERN ?
NO
RAM DATA = TEST PATTERN ?
NO
YES
YES
ERROR
INCREMENT VERIFICATION ADDRESS
NO
VERIFICATION ADDRESS = END OF RAM?
YES
INCREMENT TEST ADDRESS
NO
TEST ADDRESS = END OF RAM?
YES
RETURN

FIG._9.

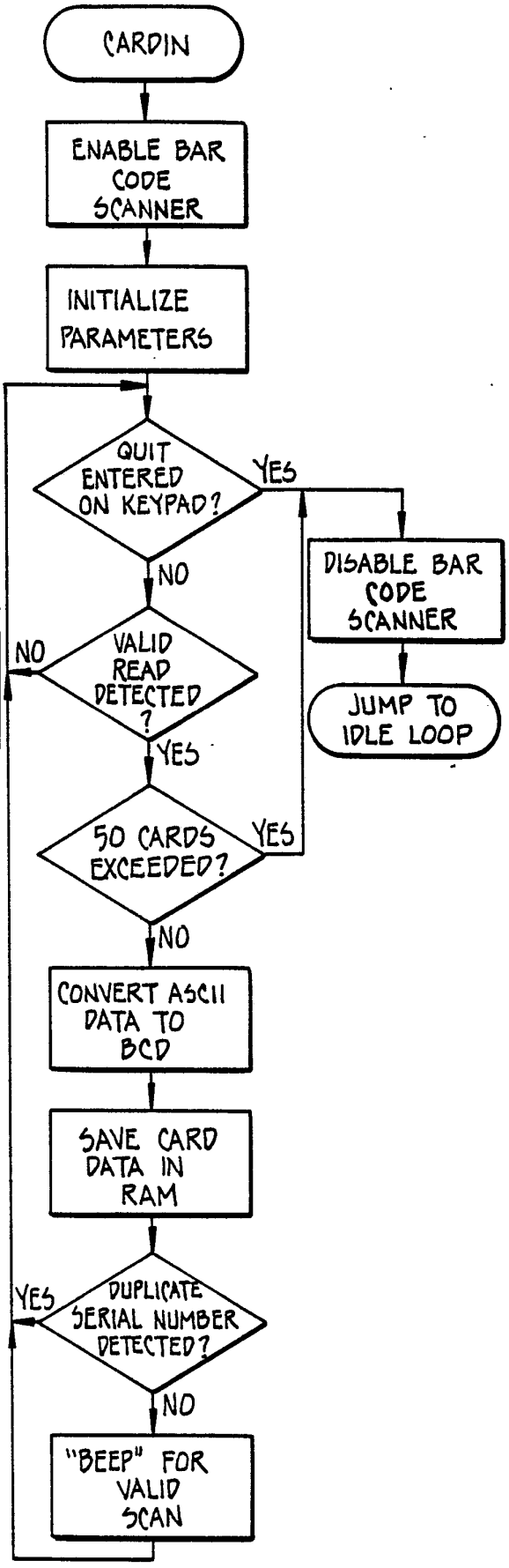

CARDIN
ENABLE BAR CODE SCANNER
INITIALIZE PARAMETERS
QUIT ENTERED ON KEYPAD?
YES
NO
DISABLE BAR CODE SCANNER
JUMP TO IDLE LOOP
NO
VALID READ DETECTED ?
YES
50 CARDS EXCEEDED?
YES
NO
CONVERT ASCII DATA TO BCD
SAVE CARD DATA IN RAM
YES
DUPLICATE SERIAL NUMBER DETECTED?
NO
"BEEP" FOR VALID SCAN

FIG._11.

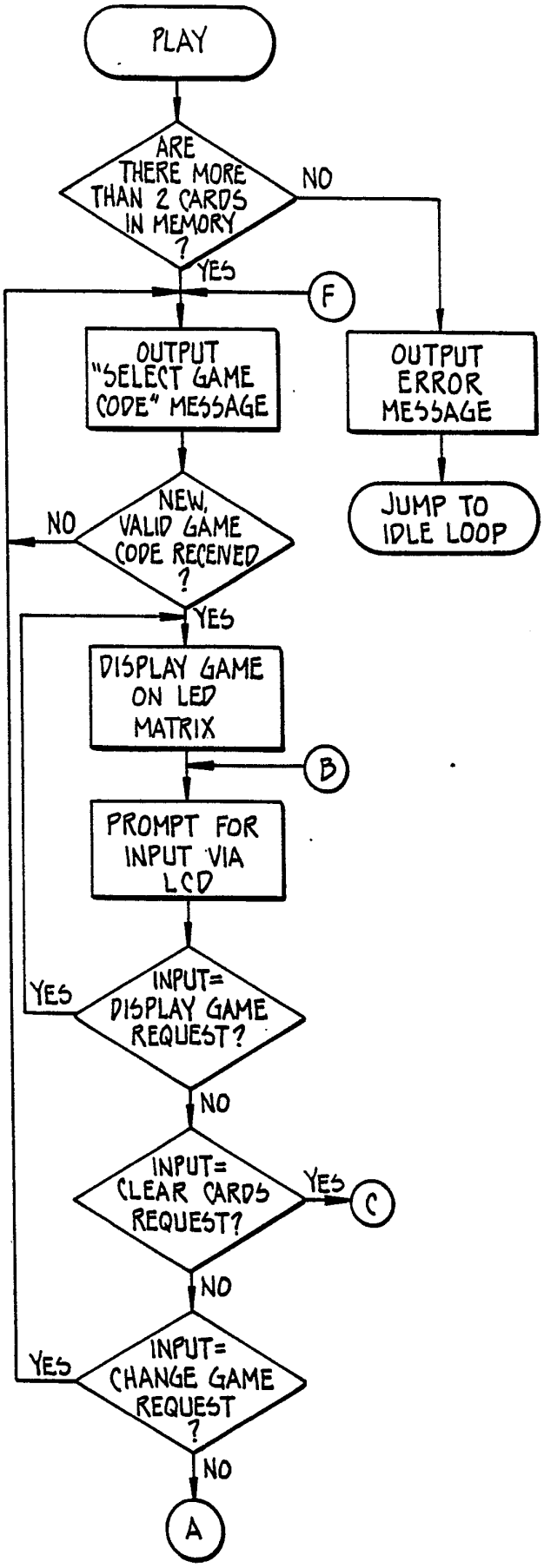


FIG._12A.

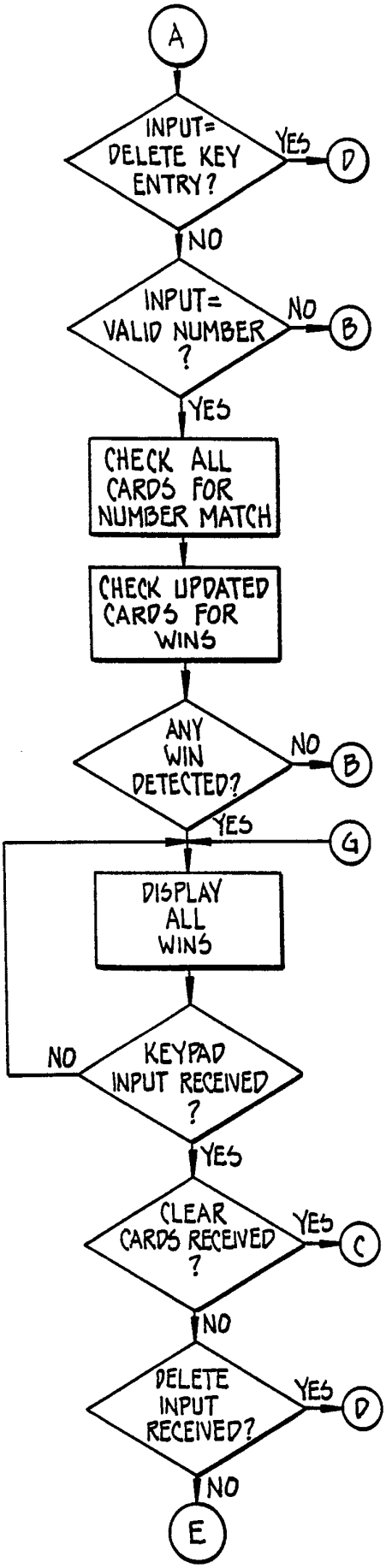


FIG._12B.

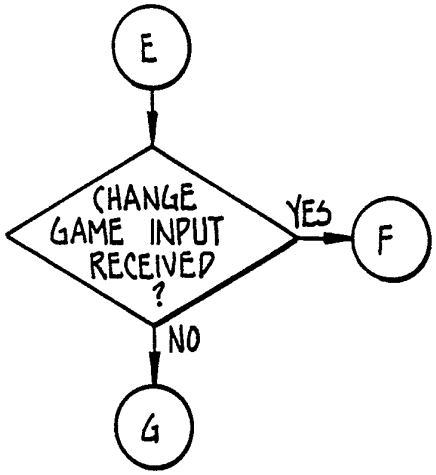


FIG._12C.

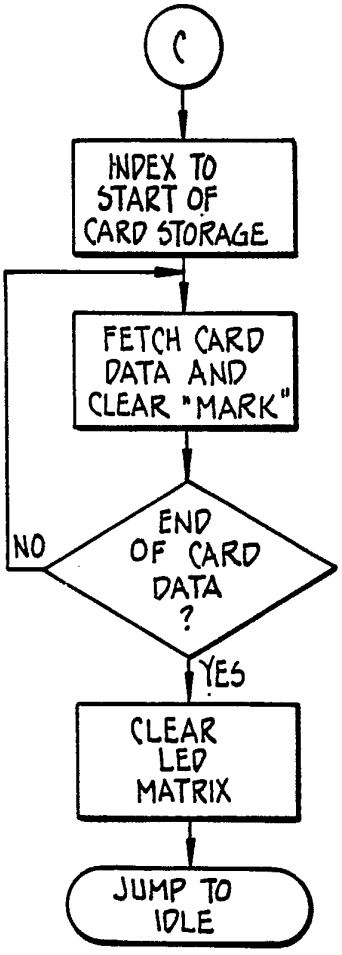


FIG._12D.

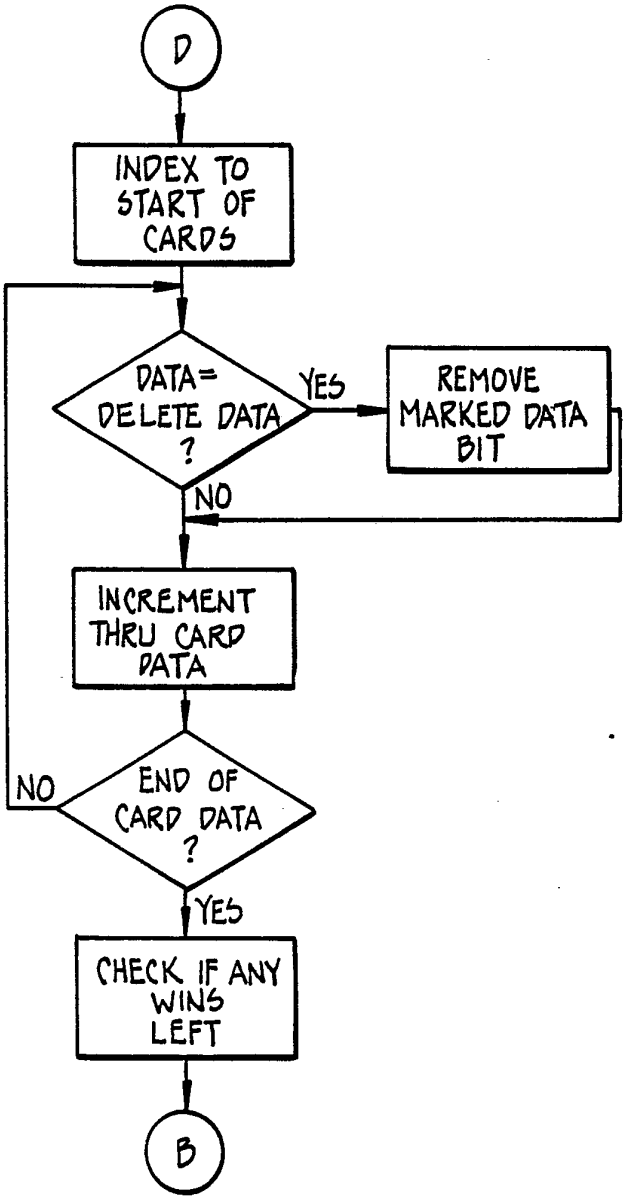


FIG._12E.

INTERNATIONAL SEARCH REPORT

International Application No PCT/US86/00358

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [3]

According to International Patent Classification (IPC) or to both National Classification and IPC

INT. CL. [4] A63F 3/06, A63F 9/00, G06F 7/00
U.S. CL. 364/410, 273/269, 237, 138A, 139

II. FIELDS SEARCHED

Minimum Documentation Searched [4]

Classification System	Classification Symbols
U.S.	364/410 273/269, 237, 138A, 139

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [5]

III. DOCUMENTS CONSIDERED TO BE RELEVANT [14]

Category *	Citation of Document, [16] with indication, where appropriate, of the relevant passages [17]	Relevant to Claim No. [18]
A	US, A, 4,121,830, (Buckley), October 1978	
A	US, A, 4,332,389, (Loyd, Jr. et al.) June 1, 1982	
A	US, A, 4,436,308, (Rose et al.) March 13, 1982	
A	US, A, 4,365,810, (Richardson), December 28, 1982	
A	US, A, 4,475,157, (Bolan), October 2, 1984	
Y	US, A, 4,378,940, (Gluz et al), April 5, 1983	1-28
Y	US, A, 4,455,025, (Itkis), June 19, 1984.	1-28

* Special categories of cited documents: [15]

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search [2]	Date of Mailing of this International Search Report [2]
17 April 1986	06 MAY 1986
International Searching Authority [1]	**Signature of Authorized Officer** [20]
ISA/US	Kim Bui Kim Thanh Bui

Form PCT/ISA/210 (second sheet) (October 1981)