April 15, 1969 A. BECKER ET AL 3,438,628

ELECTRICAL GAME APPARATUS

Filed Feb. 16, 1966 Sheet 1 of 4

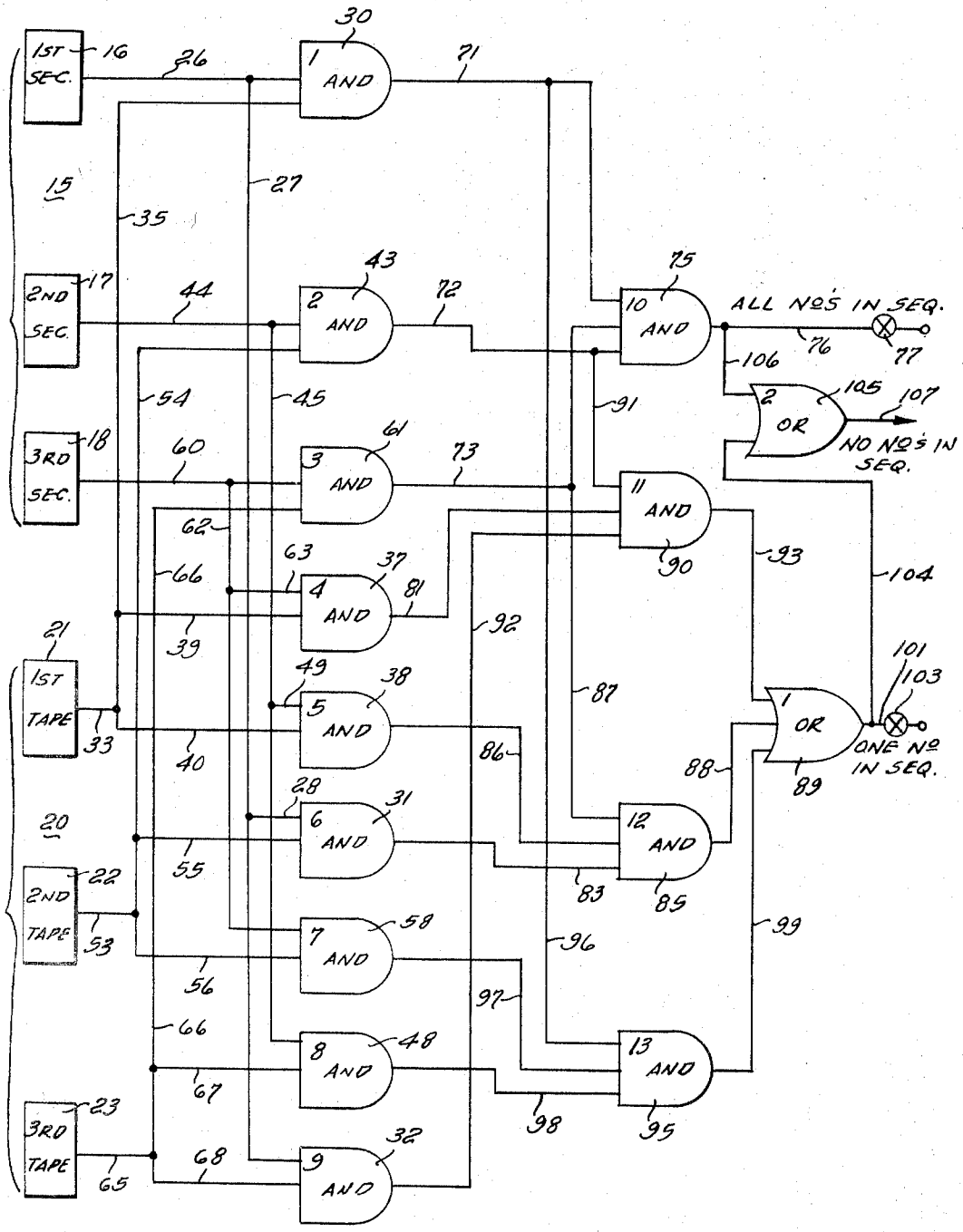


FIG. 1

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ELECTRICAL GAME APPARATUS

Filed Feb. 16, 1966 Sheet 2 of 4

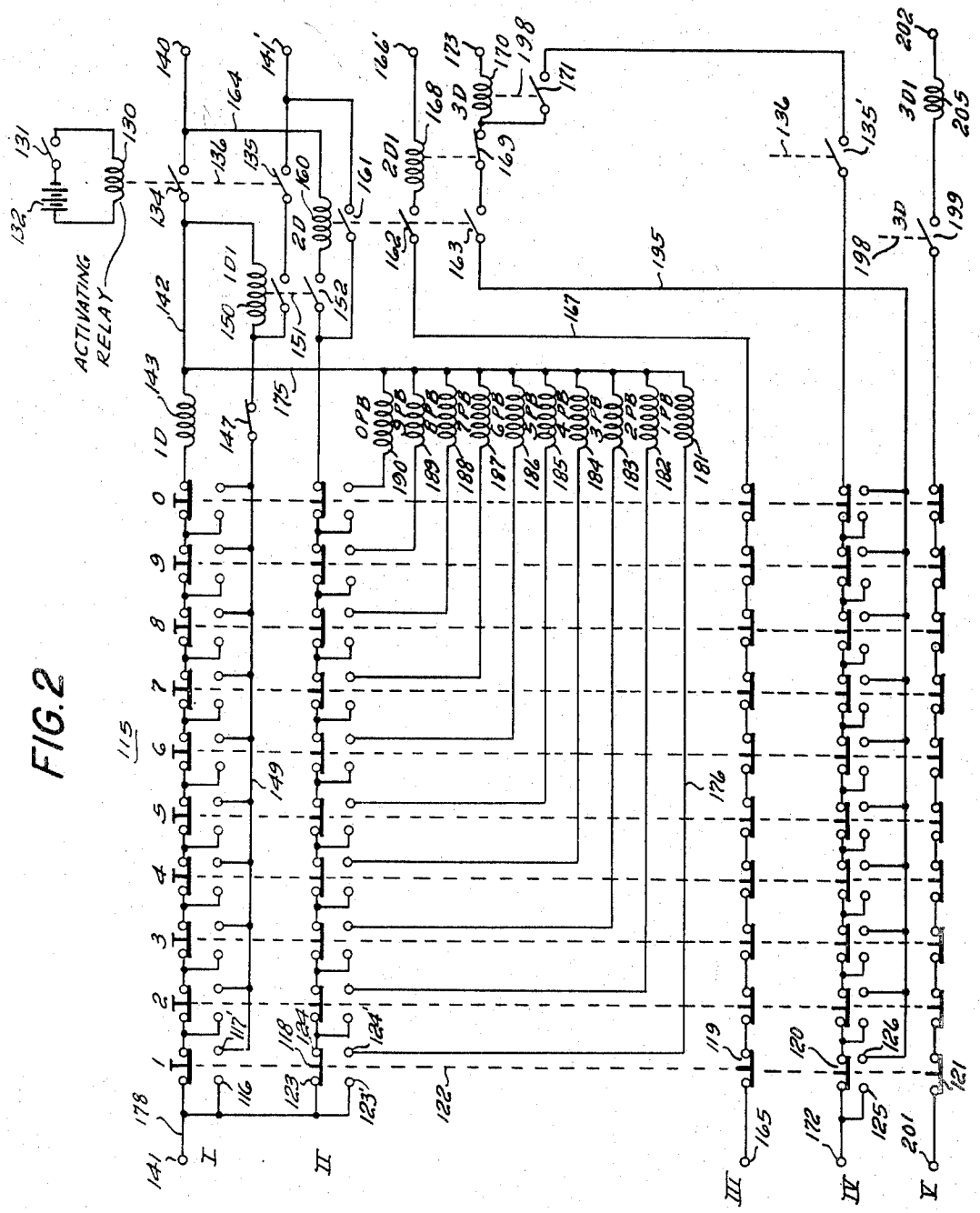


FIG. 2

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ELECTRICAL GAME APPARATUS

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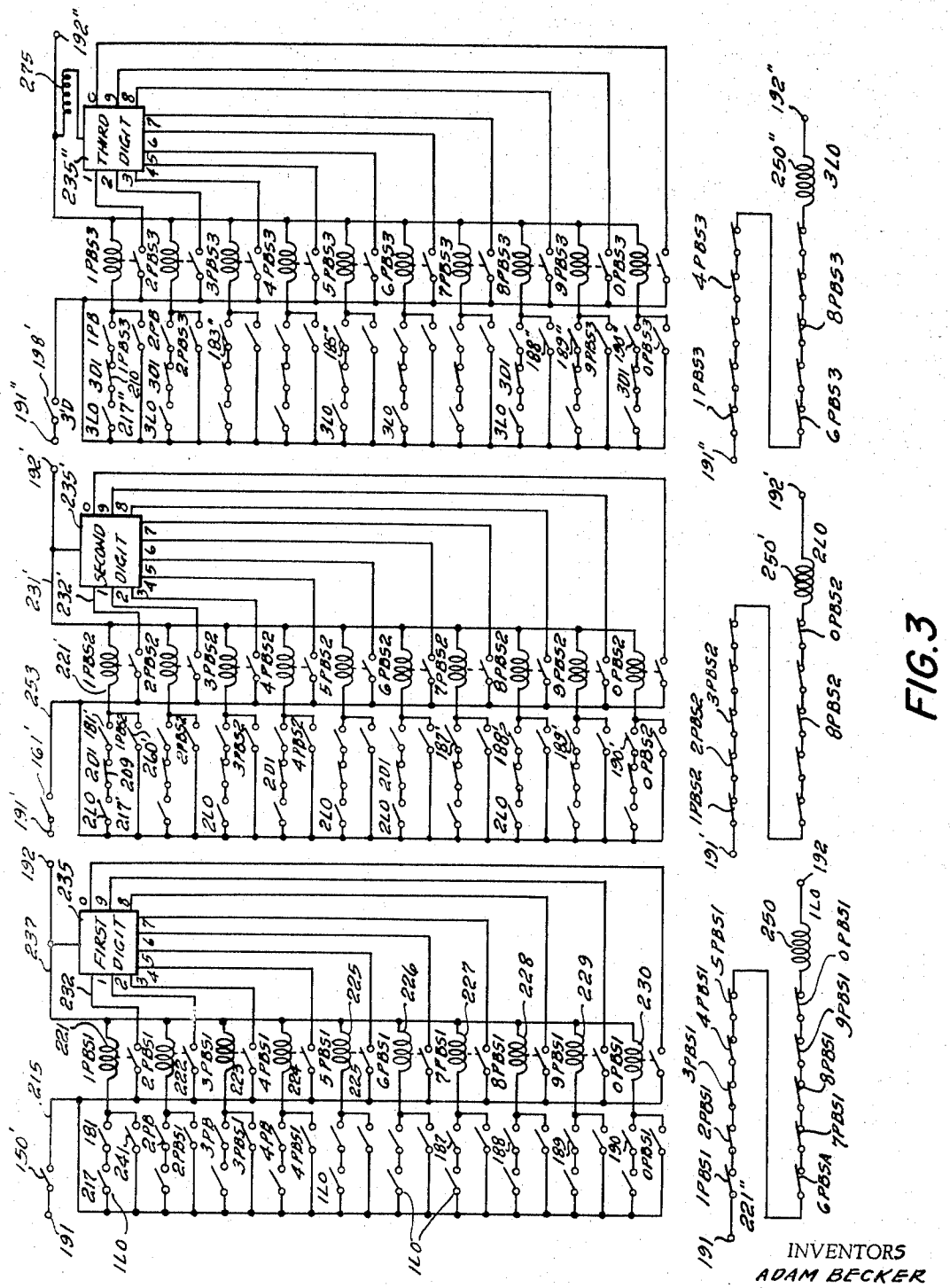


FIG. 3

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ELECTRICAL GAME APPARATUS

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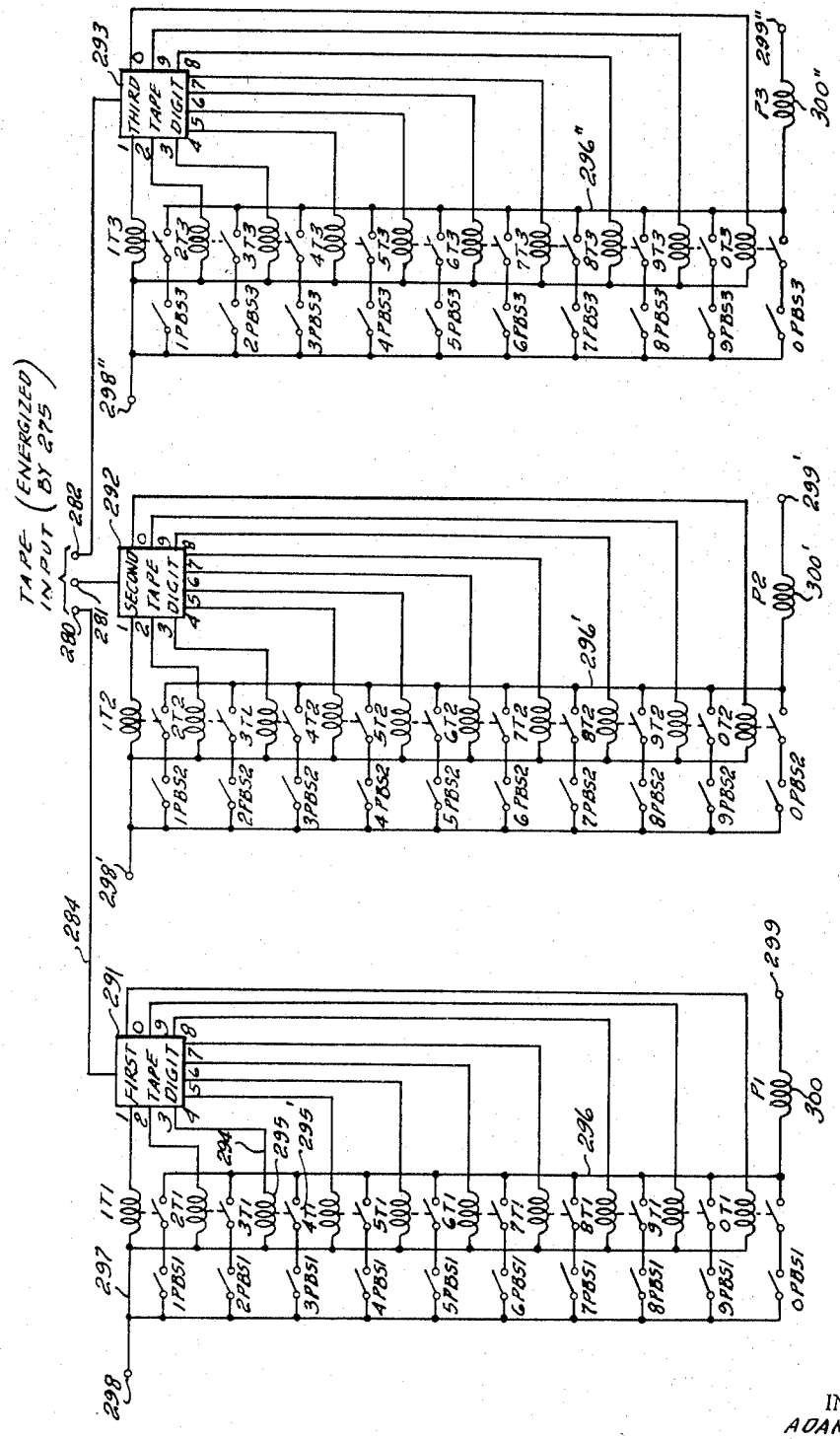


FIG. 4

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3,438,628

ELECTRICAL GAME APPARATUS

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Int. Cl. A63f 9/00; A63b 71/00
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ABSTRACT OF THE DISCLOSURE

This invention is related to game apparatus wherein a player selects in sequence a series of numbers or characters from which an electrical comparison is made with a like number of unknown characters from a previously programmed record comprising randomly distributed groupings of numbers or letters. The player wins when there is identity between all or a selected number of the numbers or letters or under some conditions where there is identity between the numbers and letters selected and the preselected numbers or letters, even though the order may not be identical.

This invention relates to a game apparatus and particularly to one of a type where a player selects a sequence of numbers or characters from which an electrical comparison may be made with a like number of unknown numbers or characters selected from a sequence of randomly distributed groupings formed into a previously programmed record.

In most instances, the previously programmed record is in the form of a magnetic tape or punched or photographic strip upon which a series of numbers or characters has previously been recorded in generally random or haphazard fashion. The recording may or may not have been prepared with reference to a numerical sequence. In operation of the game device herein to be described, the player is called upon to make a selection of several numbers or characters. The selection is used to control the operation of electrical circuitry thereby finally to indicate the success or failure of the player to make a selection which happens to correspond in either or both number and order to the unknown sequence of randomly selected numbers from the previously programmed record.

The player is permitted to select a plurality of numbers, say three, in any desired order, say between **1** and **9**, or **10**, for illustration. These numbers are then registered in a suitable selector unit. An extensive series of numbers has previously been registered (as above stated) in random fashion on a recording medium. The game device is activated immediately following the last of the number selections made by the player. Usually, the selection of the several numbers or character by the player registers these numbers in appropriate electrical circuitry into which memory may or need not be built. Following the selection, a like number of the previously recorded series of numbers or characters is fed into the machine so that the previously recorded indicia can activate appropriate electrical circuitry through which a comparison is initiated with those instantaneously selected by the player. In many instances, one or more of the selected numbers or characters will correspond to certain of those previously recorded. Where agreement or coincidence exists between the numbers, the player may be awarded an appropriate prize. For instance, a prime of one character may be given if the selection of three numbers happens to coincide by number and order with the set previously recorded. In another instance, if one number selected happens to coincide and appear in the same order as one of those previously selected and the other two numbers selected coincided but do not appear in

the same order on the previously recorded record, a different and lesser value prize may be awarded. Where a selection fails to correspond to any of the previously registered and randomly recorded numbers, the player loses, since there has been no match to the previous record.

The present invention thus comprises a suitable means for choosing a sequence of selected numbers or characters from a group. This selection is compared with a previously registered record of the same quantity of numbers recorded in random fashion, which recording may have its numbers in sequence or out-of-sequence or varying in identity in any chosen or unknown fashion. Prize awards may be made in accordance with any chosen pattern.

In the prior art, various proposals have already been made for various forms of game devices which make number, letter or character choices. In some instances, teaching machines are available which make electrical comparisons to determine whether or not multiple choice answers correspond to the correct answer that may be in coded form. Particularly in teaching machines, the coded answer usually is not randomly recorded but the selection can be made between different forms of record selections. In many instances, various forms of code wheels containing an array of electrical contacts have been used for making random selections. In other instances, previously printed records on cards have been matched against instantaneously made selections without having considered the particular sequential relationships that are desired.

An aim and object of the present invention is to provide electrical circuitry which makes possible a comparison between instantaneously selected numbers and those previously selected in order to determine the possible degree of coincidence, if any, between two selections.

According to a preferred form of the invention, various types of push buttons or selectors are used normally for making the manual choices. The circuits set up by such selective choices are conditioned so as to act as holding circuits or as suitable AND circuits or OR circuits. The various circuits, then, are energized by the outputs of each of the manual selections and the previously recorded selections so that, by combining the signals from all of the circuitry, representations can promptly be made as to how many, if any, of the player's selections, and in what order, register with the random selections of the record.

The invention has been shown in one of its schematic and preferred forms by the accompanying drawings, wherein:

FIG. 1 is a logic diagram schematically illustrating the fashion by which three selections of numbers within the selected range may be manually made by a player and by which three previously selected and randomly chosen but previously recorded numbers may be compared with those instantaneously chosen;

FIG. 2 is a schematic circuit diagram of a selecting arrangement whereby a player may make a choice of a limited group of characters, say three, for instance, of a larger group, say ten, for instance which can be compared with previously recorded random choices of a like number of characters in a like size larger group;

FIG. 3 is a schematic circuit diagram to illustrate one form of circuit to register the player's choice of characters for making the comparison; and

FIG. 4 is a circuit diagram for registering the previous randomly selected and recorded characters or numbers with which the player's choices are to be compared.

If reference is now made to the drawings, and first to FIG. 1, for a further understanding of the invention, it may be assumed, for illustrative purposes, that a player (not shown) may select three numbers from a group. The explanation will be given at this point merely as an illustrative example but without limitation and it will be

appreciated that while three characters are here shown, this is merely to illustrate examples and in practice the number will be larger, as will be discussed by FIGS. 2, 3 and 4. Also, it may be assumed that previously there has been recorded in any suitable form, as upon magnetic tape or upon cards or on a photographic film from which suitable translation may be made, any randomly selected sequence of numbers also chosen from the same size group. In some instances, for the previously recorded numerical sequence, the information may be produced on three separate records all of which will be reproduced at the same or as approximately the same time. Alternatively, the information for the assumed sequence of three selections may be recorded on the record in random fashion as a sequence of numbers sequentially positioned on the record strip. Still further, the sequence of the assumed three numbers may be provided by three numbers adjacently positioned with the next randomly chosen set of three numbers longitudinally spaced along the record strip. The precise form of recording is not significant of any specific part of this invention except as it relates to the operation and except as reproduction of signaling impulses from the previously recorded random sequence is necessary to the operation.

For purposes of explanation, FIG. 1 uses a simplified logic diagram to explain both the principle and the operation of the invention. There is a player's station, generally designated **15**, whereat three number-selection points **16**, **17** and **18** are arranged. The identifying positions at which the previously recorded randomly selected information from the tape-record strip or the like is picked up, may be assumed for illustration as a plurality of three separate stations, identified at **20**. There may be first, second and third pick-up points **21**, **22** and **23**. Where the randomly recorded grouping of the assumed three numbers in the group **1** through **3** are adjacently positioned the record may be formed upon a magnetic tape with the stations **21**, **22** and **23** constituted as three separate and adjacent transducer heads each arranged to trace one of the record tracks on the strip. If the numbers are successively arranged on the tape, a single transducer from one to another of three separate input series (later to be explained) provided.

At the player's station **15**, the selection of numbers may be made of any one of the assumed numbers at the first station **16**. This is done (illustratively) by depressing a suitable energizing button (not shown) to make one of the selections. Similarly, the second number then may be selected at station **17** by the activation or depression of a second identifying button in the group. A similar choice may be made at the third station **18**.

For purposes of illustrating the principles of the invention, the accompanying figure is set up as a logic diagram showing one conductor only for conveying any of the assumed signals to the utilization points. It should be borne in mind, however, that within the station separate pick-ups for making the selection of any one of the numbers would normally be used. Likewise, for interlocking the system as a whole, multiple connections normally would be used. To simplify the illustration, these have not been shown. Likewise, the logic pattern will obviously be expanded in known fashion to accommodate many more selections where desired. The explanation to follow will make evident nevertheless the nature of the connections in the normal operation for an illustrative number of selections and random numbers.

As the invention will be described, it may be assumed that there are three numbers or characters of any suitable kind arranged in three similar series. The player at station **15** selects from each series one of the numbers. Prior to the time the player makes a selection, random selections of three series has been made and recorded, as above stated. Following a selection by the player of the elected number of choices the last selection may be assumed to initiate the operation of a transducer translating the previously recorded message from the record strip into an electrical signal suitable for comparison with that provided by the player's selection.

If reference is now made particularly to the player selection positions at **16**, **17** and **18**, it may be assumed that the separate selection buttons are there provided. The players selects one of the buttons at position **16**. This is followed by a similar choice at **17**, followed by a similar choice at position **18**. With each selection of the number at the player's station **15**, a selection of one previously recorded number or character from a set of three is concurrently made at each of the record stations **21**, **22** and **23**.

At the position **20**, a selection of one of the push buttons at the first selection point **16**, for instance, in addition to performing other functions, will serve to condition certain combining circuits which, for convenience of illustration, are here shown as the normal AND circuits. A substantially similar operation will be performed automatically from the first of the previously recorded data location **21** at station **20** after all player's selections are made.

Considering specifically station **16** for the moment, the depression of any of the assumed three control buttons in the group serves to produce a conditioning pulse via a connection **26** to a combining or AND circuit **30**. At the same time, by the circuitry established, a similar signaling impulse is provided by conductor **27** and through the conductor **28** to energize a similar combining or AND circuit **31**. The same selection also will energize still another similar combining or AND circuit **32** by way of the conductor **27** directly.

As this energization of the AND circuits occurs, the translated signals from the randomly chosen record at station **21** when available also produce a signal supplied on conductor **33**. This signal is then supplied to the AND gate **30** by way of conductor **35**, and concurrently to the AND gates **37** and **38** by conductors **39** and **40** which connect with conductor **35**. Here, it may be noted that the output from the first transducer station **21** energizes the AND gate **30** in the same order as that due to its energization from the selecting station **16**.

In the next position where the selection of the second assumed numeral or character is made by the player at station **17**, the pulse output representing this selection is supplied to AND gate **43** by way of conductor **44**. Simultaneously, the same signal is applied by a conductor **45** to AND gate **48**, as well as by conductors **45** and **49** to the AND gate **38**. Here, it may be recalled that for the first position of the recorded data one portion of the output from the transducer at record station **21** provide an input signal to AND gate **38**. Later, as at the selection at the second station **17** was made, pre-recorded and random outputs from the second transducer point **22** are made available on conductor **53** and thence by way of conductor **54** to the AND gate **43** or by way of conductors **55** and **56** to the AND gates **31** and **58**, respectively. For the latter condition, inputs to the AND gate **43** are in the same space or order derived position of the selector point **17** and recorded pick-up **22**.

In the third position, where selection is made by the player at station **18**, the developed signals are supplied by way of conductor **60** to the AND gate **61** and, then also, by way of conductors **62** and **63** to the AND gate **37** and by conductor **62** to the AND gate **58**. The random signal, as previously recorded, then can later be picked up by the transducer at station **23**. In this order position the random signal pulse is supplied by conductors **65** and **66** to the AND gate **61**. The same signal pulse is also supplied by conductors **67** and **68** to AND gates **48** and **32**, respectively.

From the foregoing, it is apparent that if the selection by the player of three of the chosen numbers or characters available at stations **16**, **17** and **18** happen to coincide in order of choice with the randomly reproduced signals representing three numbers or characters available from pre-recordings at stations **21**, **22** and **23**, that the

AND gates 30, 43 and 61 become energized or activated simultaneously by two signals representing the same choice of number or character. In this assumed instance, gate 30 provides an output on its output conductor 71 because the signal supplied to it from station 16 coincides with the signal supplied from station 21 of the randomly selected group. Similarly, AND gate 43 develops an output signal on its output conductor 72 if the input from station 17 happens to coincide with that available at pick-up point 22. AND gate 61 provides an output signal on conductors 73 when the input to it derived from selecting point 18 coincides with that available at the third station 33 for the randomly selected outputs. A condition of the aforesaid type would signify that the player selected three number or characters in sequence which happen to coincide precisely with those signals instantaneously available on the pre-recorded and randomly selected input position 20.

Indication of this coincidence is derived from the output of the AND circuit 75 which receives as its input the combined output of each of the gates 30, 43 and 61. Output signals then become available on the output conductor 76 at all times when there is a coincidence in the input to the AND gate 75 from all of the AND gates 30, 43 and 61. For such conditions, it may be assumed, illustratively, that direct indication of such coincidence and the selection by the player of three numbers or characters coinciding precisely in order with the random selection may be directly observed by an indicator, such as a lamp 77 (or the equivalent) in the output circuit 76 which leads to a source (not shown) of sufficient voltage to activate the indicator.

Before referring to other possibilities of selection, it may be noted, illustratively, that gate 37 is arranged to provide an output signal on its output conductor 81 at times when there is a coincidence in input signal on conductors 63 and 39. This establishes a third number or character selected by the player at station 18 would coincide with the first number or character of the series of three previously recorded and available at the pick-up station 21. For a third possibility, the same number or character which the player first selects, which is available on conductor 27 may happen to coincide with the third randomly selected number or character available at pick-up point 23 and supplied to the AND gate 32 by way of conductor 68. With respect to the second selected number or character provided by the player, it may similarly be observed that an output indicative of the selection is made available at AND gate 38 which has already received an input indicative of the first randomly chosen number or character available at station 21. Following through in accordance with the outline of conditions (as above-identified) of selection for the assumed showing here made AND gate 48 provides an output signal when the input derived from the third pick-up position 23 for the random selection corresponds to the second selection made by the player at position 17.

The third selection by the player is made available, as already explained, as one of the inputs to AND gates 37 and 58. The other input to AND gates 37 and 58 is derived from the first randomly picked-up character indication at station 21 and the second picked-up character indication from station 22, respectively.

It is thus established that when the player makes a selection from the first number or character the selection conditions AND gates 30, 31 and 32 for the illustration diagrammed. The selection of the second number or character by the player conditions AND gates 43, 38 and 48. The third number or character selected by the player conditions AND gates 61, 37 and 58. The first programmed or randomly chosen digit produces a signal which is supplied to the AND gates 30, 37 and 32. The second programmed digit or character produces a signal from point 22 which is simultaneously applied to the AND gates 43, 31 and 58. In the last position, the third programmed digit derived at station 23 is simultaneously available as an input signal to AND gates 61, 48 and 32 respectively.

When the selected digits made by the player happen to coincide precisely and to have been made in the precise order of the programmed selection as randomly available, this identity manifests itself (as above noted) in an energization of all of the AND gates 30, 43 and 61 which, in turn, supply the necessary input signals to activate the AND gate 75 and produce an indication at 77 of the correctness of player selection.

When the conditions as last stated do not apply or apply only in part, as where one selected number or character happens to coincide with one number or character which has been previously recorded but the condition is not true for the other two selected numbers or characters, there is always a possibility that the numbers or characters selected may be the same as those randomly reproduced but appear in a different order from those previously programmed and made randomly available at the station 20.

The AND circuits 37, 38, 31, 58, 48 and 32, respectively, determine when the condition last stated occurs, if it does. If, for instance, the previously programmed digit or character available at transducer point 22 in the second position should happen to correspond to the selected number or character made by the player at the first position 16, it can be seen from the diagram that AND circuit 31 receives its two inputs from conductors 28 and 55. These two inputs thus represent a corresponding condition, with the result that the AND circuit 31 is activated to produce an output signal on conductor 83. A signal on conductor 83 provides one of the indicated three inputs required for the AND gate 85 to operate.

If now the identity of signals at gate 38 is such that the second number selected by the player at station 17 happens to coincide with the first number randomly available from the programmed information so that gate 38 is energized, a second input signal for the AND gate 85 becomes available on conductor 86. For the third condition to energize AND gate 85, it may be noted that an output from AND gate 61 is required. This represents identity in selection of the third number or character by the player and a simultaneous occurrence of the same number or character from the programmed information at station 23. The signal output available on conductor 73 from gate 61 is also supplied via conductor 87 as the third input for the AND gate 85. At this time also an output signal from the AND gate 85 is available on conductor 88 to be supplied to the OR gate 89, as will later be explained.

For completing the consideration, AND gate 90 is connected to receive different input signals, one of which is from conductor 81 representing, as above noted, a condition when the third selection by the player happens to coincide with the first selection programmed. The second input to the AND gate 90 by way of conductor 91 represents a condition when the second selection made by the player happens to coincide with the second programmed selection to provide the output from AND gate 43 on conductor 72, as already explained. The third input to the AND gate 90 is by way of conductor 92. It represents a condition where the player, for the assumed conditions, has made a selection of the first number which corresponds to the programmed selection of the third number thereby activating the AND gate 32. When the AND gate 90 concurrently receives input signals from all of the AND gates 43, 37 and 32, it develops an output signal available on on conductor 93. This output is supplied as one of the signal inputs to the OR gate 89.

In a generally similar manner, AND gate 95 receives an input from the AND gate 30 by way of conductors 71 and 96, as well as from AND gates 58 and 48 respectively, via conductors 97 and 98. Under the conditions, this would signify that the selection by the player and the programmed selection corresponded in the first position but, in the second position, the player's third selection corresponded to the programmed second selection and the

player's second selection corresponded to the programmed third selection. The selection, as far as the number or characters are concerned, made by the player thus happens to be correct, although the order is incorrect.

Nevertheless, AND gate **95** under such circumstances develops an output signal available on conductor **99** as the third input to the OR gate **89**. The significance here is that if there is an input signal available on any of input conductors an output signal is available from the OR gate **89**. Such output signal appears on conductor **101** to indicate that at least one number selected by the player appeared in the correct sequence. For such conditions, a favorable indication may be provided by the source **103** similar to that developed by indicating source **77**. With these conditions, the output available on conductor **101** is also supplied by conductor **104** to a second OR gate **105**, which is connected also to receive an input corresponding to that available on conductor **76** to be supplied through conductor **106**. The OR gate **105** produces a signal output on conductor **107** which, through appropriate regulation, can be made to indicate that no numbers appear in sequence.

Throughout this description, for reasons of simplification, the various components have been illustrated in the form of logic components only. In respect to the selection stations **16**, **17** and **18** at location **15**, each may consist of a plurality of buttons adapted to close one or another circuit thereby to provide for connecting one or another of a plurality of inputs into the AND circuits. The components shown at **21**, **22** and **23** at station **20** for the prerecorded randomly distributed signals are preferably in the form of a magnetic tape on which recordings have been made in random fashion. The tape record is translated by an appropriate transducer to provide in the output circuits impulses of one or another character, depending upon the selection.

The signals developed from each of the selection stations and the pick-up stations are then supplied in the fashion above explained to the AND circuits **30**, **43**, **61**, **37**, **38**, **31**, **58**, **48** and **32**, respectively, and in the manner already explained. Following the selection of the last of the three numbers or characters to be made at selection station **18**, and following a time adequate to feed signals into the various AND circuits, the inputs of the AND circuits are cut off. Where there is a signal identity, the operation occurs as already explained.

Each of the AND circuits is of the normal and ordinary type wherein an input from two separate sources simultaneously active is required to initiate an operation and to develop an output signal. At times when the AND circuit receives signal inputs simultaneously from each of the two or more selected sources an output is made available. Circuits of the AND or OR types are too well known to require further illustration or description. They may be found described in various forms in many technical brochures, technical magazines and publications, as well as in numerous patents.

The AND circuit **75** which is activated by the concurrent receipt of signal input information from each of the AND circuits **30**, **43**, and **61** is a circuit of the same general type as circuit **30**. It is, however, on some occasions, referred to as a "NAND" circuit in that more than two separate inputs must be concurrently supplied to develop or change output signals. This type of circuit is also well known and need not be described in any further detail. The AND circuits **90**, **85** and **95** are of a type similar to that explained for circuit **75**. The circuits designated as OR circuits and herein identified as **105** and **89** are sometimes termed "OR-GATES" or "EXCLUSIVE-OR CIRCUITS" meaning that if either input signal is present, the circuit is operative since the signal input feeds through two separate components into the output circuit. This type of circuit also is too well known to require detailed illustration.

Making reference now to FIG. 2 of the drawings for a consideration of a modification, a selector station **115** is shown. This station may consist of a console or a similar array where a series of selector control or push buttons, herein illustratively numbered **1**, **2**, **3**, **4**, **5**, **6**, **7**, **8**, **9**, **0**, are shown. These selectors permit the player (in the illustrated example) to depress any one of ten push buttons to select his choice of possible numbers, letters or characters. Each selector control or push button is of the multiple-contact variety. Each is suitably ganged to a plurality of contacts, as indicated by the dotted lines. Considering the first push button **1**, it has upper contacts **116** and **117** and (in many instances) therewith an additional series of associated lower contacts which are adapted to be closed with the depression of the button. In the undepressed position of the various selector control or push buttons the indicated circuits are closed. These circuits are usually opened with depression of the selector buttons and then, in many instances, a connection to other contacts is made to close other circuitry.

Illustratively, the selector control or push button marked "**1**" in the position shown aids in completing one circuit, but through terminals **116** and **117** if depressed establishes a circuit in another path by closing against a pair of lower contacts **116'** and **117'**. The push buttons as a whole are connected in the ganged relationship with additional series of contacts, such as **118**, **119**, **120** and **121** ganged through the schematically shown connector rod or the equivalent represented by the dotted line connection **122**. All other push buttons are similarly connected. In the inactive position of the switch button **1**, the contact **118** in row II is closed against contact points **123** and **124**. If the push button **1** is depressed, however, the contactor **118** will be released from the terminal points **123** and **124** to come to rest upon lower terminal points **123'** and **124'**. Likewise, if the control or push button **1** is depressed, the connector **122** will cause the contactors **119**, **120** and **121** to be broken away from the terminal connections to which they are shown connected. In the case of contactors **119** and **121**, the circuits are opened, but, in connection with the contactor **120**, the depression of the contactor serves to close a circuit through terminal points **125** and **126**, or other similar points, all as will be explained.

Similar arrangements are made for the connections to all of the control or push buttons **2** through **0** and will not be further discussed by a numerical representation at this point but reference will be made in the description to follow the circuit set up when activating these elements. The operation is similar to that of contact **1**.

For activation of the apparatus as a whole, there is an activating relay **130** which is closed in any desired manner, illustratively by the switch **131**, so that current flow from any suitable source **132** may energize relay and this initial operation of the system. Three separate contacts **134**, **135** and **135'** are associated with the relay **130**. Activation or energization of relay winding **130** closes each by the schematically shown contactors by the ganged connection **136**. With closure and energization of relay **130**, voltage from a source (not shown) connected between terminals **140** and **141** is applied through the now-closed connection **134**, the conductor **142**, relay winding **143** and the various closed push buttons of the series **1** through **0** whose contactors close against terminal points, like those already explained at **116** and **117**. At this point, current flowing through the winding of relay **143** has opened the connection of the contactor **147** shown beneath the relay (in this description, a line through the contactor such as shown at **147** indicates that in the de-energized state of the associated relay, the contact is closed). Other contacts, such as **134** and **135**, in the form shown, indicate an open contactor unless the relay is energized.

At this point, the player of the game located at the

console 115 may make a first selection of a number, letter or character in the series 1 through 0, as shown. This is done by depressing any one of the controls or push buttons having a numbering corresponding to that which the player wishes to select. Assume, for instance, that the player wishes to make the first selection (assuming the selectable characters as numbers) as the number 1. This is done by depressing the control or push button 1. This depression breaks the contact between terminals 116 and 117 thereby immediately to de-energize the winding of relay 143. The contactor 147 then promptly closes. As the button 1 is depressed to make contact at the terminal points 116′ and 117′, a circuit is closed between the terminal 141 through the contactors 116′ and 117′ and the depressed push button, as well as conductor 149 through contact 147 and the winding of relay 150 and thence, back to terminal point 140 by way of the closed contact 134 which has been closed by activation of the relay 130.

Energization of the relay winding of the relay 150 then closes contact points 151 and 152. With this condition obtaining, the same voltage present at terminal 141 is available also at the terminal 141′ and, with the closure of contact 151, the relay 150 is provided with a holding current flowing between the terminal 141′, the contactor 135 of relay 130, contactor 151 of relay 150 and the winding of relay 150 through the contact 134 of relay 130 back to the terminal 140. Thus, with the initiation of the selection, relay 150 is energized and remains energized by its own holding current.

Each time one of the control or push buttons 1 through 0 is depressed, a circuit is closed between terminal point 141 and terminal point 140 through the conductor 178 and all upper contacts to the left (looking at FIG. 2) of the control or push button are depressed. Then, the circuit completes itself through the lower contacts of the depressed control or push button through one of the relay windings 181 to 190 and thence via conductors 175 and 142 as well as closed contact 134 to the terminal point 140. Illustratively, if control or push button number 3 had been depressed, it is apparent that upper contacts of control or push buttons 1 and 2 would remain closed but the contact of push button 3 would be moved to its lower contact points. In this instance, the connection between the terminals 140 and 141 would be through the upper contacts of control or push buttons 1 and 2 and thence through the lower contact of push button 3 and relay winding 183. Under the circumstances, none of the other relay windings can be energized because relay windings 181 and 182 are disconnected from the source by reason of the conductors above terminals 123′, 124′ (or similar terminals for push button 2) being closed but no circuit established to either winding 181 or 182. Likewise, no circuits can be formed through any of relay windings 184 through 190 because, if it is assumed that control or push button 3 is depressed, that button depression breaks the circuit established, as in FIG. 2, between the various push button contacts through which any of windings 184 to 190 would have to be energized. This acts as a safety check to insure that if more than a single control or push button is depressed at any one time in the example shown, only the lower number chosen will be effective to actuate the system. The operation and control of relay windings 181 through 190 will be further explained particularly in connection with FIG. 3 and need not be considered in more detail at this point.

With the selection assumed to have been made by the player, the control or push button, which the player selected, is released. Once more, an initial current path is established between the terminals 140 and 141 through the push buttons or controls.

It will be recalled, however, that with the depression of the selector control or push button 1, all of the elements 119, 120 and 121 have been opened but, at this point, such contactors are of no moment because circuits through which they function have not yet been set up, as will later be apparent. Following the selection of the first number, character or letter by the player and the release of the first chosen control or push button selected, the player may immediately make a second selection. This may be done because, after making the first selection which, as above pointed out, closed the contact points 116′ and 117′ (for the illustrated example) and initiated operation of the relay 150, the contact 152 became closed. Also, the first closing activated one of the relays 181 through 190, as already discussed, thereby to set up (as shown by FIG. 3) an operation of the display or indicator means. As soon as the control or push button originally selected is released, a circuit is established between the terminal 140 through relay 160 (contact 152 having been held by winding 150) and the set of control or push buttons in the second row down here marked generally by the letter designation II. Current flowing through the relay 160 then serves to energize and close all of contacts 161, 162 and 163 therewith associated. With the relay 150 being held activated by current flow therethrough between terminals 141′ and 140, it is apparent likewise that the relay 160, as soon as initially activated, will be hled energized by current flow between the terminal 141′ through the contactor 161, the contactor 152, the relay winding 160 and back through conductor 164 to terminal 140.

Immediately following energization of relay 160 and the closure of contact 162, with the control or push buttons being in their indicated state in row III, current then may flow through the closed contactors such as 119 in row III between terminal point 165 and 166 via the contactors, conductor 167, contact 162 and the relay winding 168. This operational condition of the relay 168 then serves to open contact 169 during the period of activation of relay 168 to preclude operation of relay 170 which otherwise would be energized by current from a source now shown connected between terminals 172 and 173 and flow through the closed contactors of the control or push buttons such as 120 in row IV.

The second selection of a control or push button made by depressing any one of the elements 1 through 0 again closes the contact to one of the lower terminals of row II and thus establishes a connection between terminal point 140 through the closed connector 134, the conductor 142, conductor 175 and one of the relays 181 through 190 associated respectively with the lower connections from the controller push buttons 1 through 0 in row II. For illustration purposes, if it be assumed that the control or push button 1 is depressed a second time after having been released, then the current path will be through the relay 181 and conductor 176 back to the source connected at terminal 141 through the terminal points 124′ and 123′ and conductor 178. A similar condition would obtain if any of the other control or push buttons had been depressed but the current path would have been through one of the relays 182 through 190.

For this condition, activation of one of the relays 181 through 190 conditions the second of the indicating circuits to be described with FIG. 3 where the operation and registration of the selection is determined by the state of activation of relay 160 and its operated contact 161′.

At this point, if the third selection is to be made, the control or push button 1 through 0 previously depressed is released. In the released state (with winding 160 already energized and on "hold") current can flow through the relay winding 168. The current path is between the terminal 165, through the now-closed contacts (such as 119) in row III, conductor 167 and contact 162 (closed by relay 160 activation) through to terminal 166. This closure opens the contact 169 serially connected with contactor 163 which had closed by activation of relay 160. The connections 169 and 163 are serially connected with the winding or relay 170. The relay 170 is of the slow-release type so that after activation it has a short "hold" period.

The connection of the relay is made then between terminals 172 and 173 through contacts such as 120 of row IV.

With the operation of one of the control or push buttons for making a third selection, one of the contacts in the line IV corresponding to that shown at 120 is broken. A new contact is established to the lower contact points such as those in line with the terminal points 125 and 126. The depression or operation of the control or push button also opens one of the contacts in row III thereby to de-energize the winding of relay 168 which, in turn, permits a closure of the contact 169. Under the circumstances, with the contact 163 remaining closed by virtue of the holding effect on relay winding 160, the activation of the third control or push button establishes a circuit closure between one of the contacts on the lower group of row IV corresponding to that in which contacts 125 and 126 are located. At such time, current can flow from the terminal 172 through the conductor 195 and the now closed contacts 163, 169 through the relay winding 170 of the slow-release relay to the terminal 173. Energization of the slow-release relay winding 170 then serves to close contacts 198 and 199 which are operated thereby. Closure of contact 198 holds relay 170 energized after the control or push button has been released. This energization is maintained because of the slow-release character of the relay winding 170 maintaining the closure of contact 198 and because the activating relay 130 maintains the contact 135' closed through activation by way of the control 136. In this condition, current may flow between the terminals 172 and 173 through the contacts 135' and 198 to maintain the relay 170 activated. Activation of relay 170 and its closing of contact 199 in row V then permits current to flow between terminal point 201 and terminal point 202 through the lowermost row of contacts shown in FIG. 2 with the flow being through the contact 199 and the relay winding 205. At the same time, and as explained in connection with the first and second selections, one of the relay windings 181 through 190 has been energized by the depression of one of the control or push buttons 1 through 0 closing the row II contact against the lower contacts.

With the foregoing points in mind, it will be observed that relay winding 150 continues to remain energized by virtue of the holding circuit established about it. The same condition is true for relay winding 160. The relay winding 170 is held activated following release of the third selected control or push button by reason of relays 160 and 170 being actuated. The contacts 162 and 199, respectively, are closed so that with return of the control or push buttons in rows III and V to the shown state, relay windings 168 and 205 are also maintained activated.

Now, making reference to FIG. 3 of the drawings, contact 150' is closed by the continued energization of relay winding 150. Contact 161' is closed by the continued energization of relay 160, and contact 198' is closed by the continued energization of relay 170. Similarly, it will be observed that in the central vertical column of FIG. 3 and in the right-hand vertical column of FIG. 3, contactors 209 are controlled by operation of relay windings 168 and 210 controlled by energization of relay winding 205 (FIG. 2). Considering now the conditions obtaining by the selection of the first control or push button of the series 1 through 0, it may be assumed, illustratively, that the first made selection was to depress control or push button 1. Under these circumstances, contact 181' may be assumed to have been closed. No other similar relay winding in the column can be energized, for reasons already explained. Thus, all similar contacts in the column are open for the selection condition made. This closure of contact 181' provides a current path between terminal points 191 and 192 through the now-closed contact 150', conductor 215, closed contacts 217 of a lock-out relay 250 serially connected with the contacts 181' of relay 181 and relay winding 221 forming a part of what will here be termed a "push button stick relay" and thence through conductor 231 to the terminal point 192. Energization of the push button stick relay 221 closes its contact 221' and establishes a circuit closure from terminal 191 through the now-closed contact 150', the conductor 215, the contact 221' and conductor 232 to what may be considered a light source bearing the numerical indicia "1" contained within the first digit observation display 235 and thence through conductor 240 to terminal 192. Operation of push button stick relay 221 closes a contact 241 therewith associated and establishes a "hold" connection through the relay winding 221 from terminal point 191 to terminal point 192. The push button stick relay 221 also serves to open the connection heretofore made through the connecting points 217 of the lock-out relay 250 (see lower part of FIG. 3) so that the circuit established previously through the contacts 217 of the lock-out relay and the contacts 181' closed by the relay winding of the push buttons. This condition is shown in schematic form immediately below column 1 of FIG. 3 where the lock-out relay 250 is shown serially connected between the terminal points 190 and 192 with a series of contactors for each of the push button stick relays in the column including relays 221 and 222 through 230 which were initially closed thereby normally to energize the lock-out relay and to maintain connection 217, for instance, closed.

Energization of the push button stick relay 221, for instance, will open the contact 221'' and thus interrupt the current flow through the lock-out relay and break the cricuit through relay connection at 217 previously made through contact 181' to the push button stick relay 221. However, at this time, the holding circuit is established through the connection 211 and the relay 221 will remain energized to hold contact 221' closed and also hold the indicator light or the equivalent in the display 235 activated. Had some other selection button in the series 1 through 0 at the console 115 of FIG. 2 been selected, it is apparent that similar conditions would have obtained but through a different path. The activation and energization of the connection produced, such as the connections of conductor 232 to the display 235, will continue as long as relay 150 remains activated to hold connection 150' closed.

The second selection is made similarly except that it will be noted in establishing a connection between terminal points 191' and 192' the contactor 161' controlled by relay winding 160 initially controls the current flow. If, for instance, again it be assumed that the second selection happened also to be pushed button 1 of FIG. 2, (and it also be asumed that none of the push button stick relays of the central column of FIG. 2 is energized) lock-out relay 250' will function in the same fashion as already explained for lock-out relay 250 and connection 217' will be in the same state as connection 217 of the left-hand column. It will be noted, however, that connected between the connection 217' and the connection 181', there is included in the showing in the middle column the contacts 209 operating similarly to the contacts 169 of the relay 168. Under these circumstances, if the selection had closed contacts at 181' then, the selection with the closure of contact 161' would have provided a circuit between terminals 191' and 192' which would have included closed contact 161', conductor 253, closed contact 217', closed contact 209 (closed by relay 168 at this point), contact 181' and thence through push button stick relay 221' and conductor 231' to the connection 192'. Activation of push button stick relay 221' closes contact 260 which then provides a current path from the terminal 191' through contact 161', contact 260, conductor 232' to the display medium 235' and thence, to terminal 192'. This provides activation of a display element located at the junction of the display panel 235' and the conductor 232' similar to that already explained. At the same time, following energization of the push button stick relay 221', the second contactor 260' is closed to provide

a holding current. Lock-out relay **250'** is operated to open the connection between the terminals **191'** and **192'** via the path indicated at the bottom of the figure. For any other selection the circuit path obviously would have been made in a similar fashion.

The same general explanation holds for the third selection as depicted in the column at the right of FIG. 3. Under these conditions, current flow can only be initiated after slow-release relay winding **170** (see FIG. 2) is activated to close the connection **198'** and, then, the current path is through one of the push button selector relays for the third column, as already explained. The holding and lock-out function similarly and the activation of the relay winding **205** serves to open the connection between the lock-out relay and the push button selector, as already explained. The display of the third digit thus comes about at one of the points on the display unit 235'' corresponding to the selection made.

The connection for the last digit control varies slightly from that shown for the left-hand and central column of FIG. 3. In that, between the third display unit **235''** and the terminal point **192''**, a further relay winding **275** is included. The relay winding **275** is adapted to actuate three contactors to close respectively a circuit from a source (not shown) to one of the terminals **280**, **281** and **282** as shown by FIG. 4.

In the showing of FIGS. 2, 3 and 4, for reasons of simplicity and for ready identification, the activated relay windings have been shown by letters and, in many instances, also by numerical indications. The letter indications have been included for reasons of simplicity and to identify the different connections or windings between the different sheets of drawings more readily. For the different push buttons, the letters "PB" have been used in FIG. 2 preceded by the push button number selected. In FIG. 3, the push button stick relays have been identified by the letters "PBS" with a numerical indication preceding the letters to indicate the selection button that would have been activated and a numerical indication following the letters to indicate the column in which the relay is included. Similarly, for the lock-out relays, the letters "LO" are preceded by the number of the column in which the relay appears.

With the finalization of any manual selection, as explained particularly in connection with FIGS. 2 and 3, the pre-recorded and randomly selected data are available to the display units such as **291**, **292** and **293**. In this showing of FIG. 4, the relay coils in the vertical columns are designed by the letter T with the suffix number being the column indication and the prefix number being the selected number in the series between **1** and **0**. Assuming now that for the first input available at terminal **280**, the coded information retrieved from the tape happens to be an indication of the number **3**. The coded indications are supplied (under control of relay **275** of FIG. 3) to the terminal **280** and carried via the conductor **284** to the first display unit **291**. The display unit may be any well known type of resolver by which, for instance, analog or digital information can be resolved to one single output. Illustratively surrounding the display unit **291** are designations of the numerals **1** through **0** indicating that any output there available would be one corresponding to the selected number. Assuming now, illustratively, that the first retrieved information from the tape input corresponding to the randomly selected data, and unknown to the player who made selections at console **115**, happens to be an indication of the number **3**, this signal is fed by conductor **284** to the display unit **291** and thence via conductor **294** to the relay winding **295** (here designated **3T1** to indicate number **3** for column **1**) and thence via conductors **296** and **297** to the terminal point **298**. Current flow through the winding **295** then closes the contact points **295'**. For this condition, a circuit is then established between terminal points **298** and **299** through the contact point **295'** if the push button stick relay **3** of column **1** (see FIG. 3) has been energized. This is shown as the relay connection indicated in FIG. 3 as "3PBS1." If however, this condition did not obtain, then it will be appreciated that an open circuit condition exists and current cannot flow through the closed contacts of the relay winding **295**.

Assuming, however, that the manual selection made for the first column, that is, the first numerical selection made by the player at console **115** happened to be the number **3**, a condition exists where push button stick relay **3PBS1** of FIG. 4 will have been closed in accordance with the operating program described by FIG. 3. For these conditions, a current path could then be established between terminals **298** and **299** through the contacts **3PBS1** and **295'**, as well as relay winding **300** to terminal **299**. Relay **300** may be regarded as a tape indicator relay serving to indicate whether or not coincidence exists in the actual number selection of the first character (then registered in column **1**) as compared to the random selection provided by the tape input. The tape indicator relay **300** will only be energized for conditions when this identity is obtained.

Following the same principles, the tape indicator circuitry of the central column of FIG. 4 and the right-hand column of FIG. 4 may similarly be considered. Wherever identity exists, one of the relay windings **300**, **300'** or **300''** will be energized.

If all of relay windings **300**, **300'** and **300''** are simultaneously energized this is indicative of a precise match in selection between those made by the player at the console **115** and those previously randomly selected on the input tape whose signals are fed in at the terminal points **280**, **281** and **282**. Under these circumstances, by establishing a serial connection between two points of potential (not shown) and three connections established by energization of the relay windings **300**, **300'** and **300''** and which serial connection will include an indicator such as a bell, a light or some other form of arrangement, a special notice may be immediately flashed that the player won a maximum prize. A similar condition could be provided by supplying a voltage through each relay into an AND circuit responding only to the summation of all three outputs with the output then energizing an indicator.

By following similar patterns there, of course, may be set up indication of some identity between some of the random and selected numbers to provide an indication of a lesser degree of success the player may have had in matching whatever has been previously and randomly recorded. Also it is possible to set up connections whereby even inverted numbers may be capable of being recognized. For such a condition, for instance, circuits may be established through a number of parallel paths between two points of potential. Each of these parallel paths will include serially therewith a form of indicator to indicate the degree of success. Illustratively, circuit paths might be set up whereby between terminal points, such as **298** and **299**, there would be included each of the connections from **1PBS1** through **0PBS1** and in series with each of the "PBS" connections would be, in the case of PBS1, for instance, a parallel combination of either the circuit closure contacts for the relay winding **1T2** or **1T3** in parallel. Then, the relay connections **2PBS1** may be connected serially with a parallel combination of the connections **2T2** and **2T3**. Likewise, the connection **3PBS1** might be connected serially with a parallel combination of connections **3T2** and **3T3**, as contrasted with the connection through the contact of **3T1** (shown at **295'**) as depicted in the left-hand column of FIG. 3. For these conditions, the operation would carry through the complete series of each of the PBS conductors for all columns and include the connections of all other columns following the pattern hereinabove outlined. Operation then of any one of the possible parallel paths would control the activation of another relay coil which then might

be serially connected with one or two of the contacts closed by the coils 300, 300', 300'' to provide the desired result. Similar connections may be made for the center and right-hand columns of FIG. 4.

In a further consideration, if it be assumed that connections through the contacts of column 1 and various contacts of column 2 as above explained, the activated relay might be a relay identified as B1. Likewise, if the PBS contacts of column 2 and similar character connections, the connection might be through a relay winding B2. The same would hold for the arrangement of column 3. Then, by providing a series of additional parallel paths where connections could be established between two terminal points and a group of three elements in series and four such series groups in parallel, further indication of the degree of success could be had. Illustratively, one such series combination might be the contacts of winding P1 and the contact points of windings herein assumed B2 and B3 or in parallel with the aforesaid series group, there might be the contacts of all of windings B1, B2 and B3, all in series. Or, as a further alternative and in a parallel combination, the contacts of windings B1, B2 and P3 or, as a fourth alternative, the contacts of windings B1 and B3 with that of P2. These then may measure the degree of success and establish that at least some indication of success in identifying possible selections may be had without precise identity.

After the selections made by the player have been displayed and there has been a registration or display of the selections which appeared from the randomly chosen record, the conditions resulting will be maintained unless the apparatus is disconnected from the state in which it was initially energized through the closure of contact 131 to activate relay 130. A new game may be initiated following opening and reclosing of the switch contact 131 with the circuitry being in condition to restart the game immediately. Alternatively, since it usually requires only a limited amount of time for the player to make the required number of selections at the console 115, the switch contact can be operated under the control of a time delay to open automatically after a selected time interval has passed. Then, with the commencement of the game, the switch contact 131 can be reclosed. The switch contact 131 may be closed in any desired fashion such as by direct closure by the player or by any other various well known and recognized means for establishing an electrical connection and performing any desired type of operation of which there are too many available to require illustration at this point.

Various and other modifications, of course, may be made within the spirit and scope of what is here disclosed.

Having described the invention, what is claimed is:

1. In a game apparatus, the combination comprising n manually operable selection means each representing a different character of which one is to be selected at a time and a total of m selected in sequence, a plurality of registry means electrically connected to said selection means, whereat each of the selected character choices is registered in the selected order, means for limiting the registry at each registry means at any instant to one character, means to supply a random chosen sequence of m characters from the group n, means for registering one of said randomly chosen characters at each of said registry means and means, following registry of said manually selected and randomly chosen characters, to indicate identity or disparity between said characters.

2. In a game apparatus, the combination comprising, n manually operable selection means, each representing a different character, of which one is to be selected at any one time, m registry means whereat each of the selected characters is individually electrically registered, electrical means to register selections at the registry means, means for permitting successive manual selection of individual characters until a total of m have been made, means to register each selection in sequence at a different one of said registry means, means for limiting the registry at each registry means at any instant to one of the possible selections, means to supply previously recorded information of a separate sequence of m characters from the group n, means to register one of the randomly selected characters at each of the m registry means following the registry thereat of the manually selected characters to thereby register either identity or disparity between the manual and random selections.

3. In a game apparatus, the combination comprising, n manually operable selection means, each representing a different character of the group of n, electrical means to restrict operation of the selection means at any one instant to one of the possible selections, m registry means each for registering individually each of the n possible selectable character choices, each of n and m being integers, means for permitting successive manual selection of individual possible character choices until a total of m are made, means for registering the sequential selections of m characters at the registry means in sequence, means for limiting the registry at each registry means at any instant to one of the possible selections, means for supplying a separate sequence of m randomly chosen characters, means for registering in the order of selection one of the randomly selected characters at each of the registry means following the registry thereat of the manually selected characters to thereby register either identity or disparity there-between.

4. The game apparatus as claimed in claim 3 wherein the selection means comprises a series of push-buttons.

5. The game apparatus as claimed in claim 4 comprising, in addition, a plurality of electrical activating circuits for each of the m choices, means for controlling each of the m chosen circuits by the related character selection, and means for sequentially transferring the selection between the m circuits in the order in which the selections are made.

6. The game apparatus of claim 4 wherein n is 10 and m is 3.

7. In a game apparatus, the combination comprising, a plurality of n selection means each representing a different character of which one is adapted to be selected at any one time by a player, m electrical registry means at each of which one of the selected character choices is individually registered, each of n and m being integers; means for registering the instantly selected selection at the registry means, means for permitting successive selections of individual characters until a total of m have been made, means for registering each of the separate character selections in sequence at a different registry means until m selections have been made, means to supply an additional and separate sequence of m characters randomly selected from the group n, means to register each of the randomly selected characters in sequence at a different one of said registry means, and means to indicate either identity or disparity between said manually and randomly selected characters.

8. The game apparatus of claim 7 and comprising means to limit the effective selection of characters at any instant to one.

9. A plurality of stations whereat players may select individually and in sequence m characters from a selected group of n characters, one selection being made at each station, means to convert each character selected into an electrical signal, means from which to derive a second series of m unknown signals randomly from a plurality of previously recorded characters consisting of characters from the group n, a first plurality of means to register the signals selected by the players and the unknown signals and to develop from each means an output signal at times of coincidence in both character and order of said selected and derived characters, summation means connected to receive as its input the output from each of said comparison means and to produce an output signal at

times of concurrent input from all of said comparison means, and indicating means responsive to the output from said summation means for indicating said coincidence.

10. In a game apparatus, means having a plurality of characters chosen from the group *n* recorded thereon arranged in random sequence, means for making one selection of *m* characters from the recorded sequence, *m* selecting points whereat a player may make a sequential selection of *m* characters from the group *n*, one selection being made at each station, means to develop identifying electrical signaling indications coincidentally with the selection of each sequential selection, and for each of the *m* randomly chosen characters a plurality of adding circuits in units of *m*, all the adding circuits in each unit connected to receive the signal from a different one of said *m* selecting points and each adding circuit in each unit connected to receive the signal from a different one of said randomly produced *n* signals, a summation circuit connected to receive as input the output of said adding circuits representing coincidence in order and character of the characters selected at said selecting stations and chosen at said random means, and an output circuit connected to said summation circuit to indicate said coincidence.

11. In a game apparatus, record means having recorded information thereon arranged in random a sequence of characters from the group *n*, means for making one selection of *m* characters from said sequence, each character producing an electrical signal upon being selected, *m* selecting points whereat a player may make a sequential selection of characters from the group *n*, one selection being made at each selecting point, means to develop an electrical identifying signaling pulse coincidentally with the selection of each instantaneously selected character, m^2 adding circuits in *m* units all the adding circuits in each unit connected to receive the signal from a different one of said *m* selecting points and each adding circuit in each unit connected to receive the signal from a different one of said randomly produced *m* signals, a summation circuit connected to receive as input the output of said adding circuits representing coincidence in order and character of the characters selected at said *m* selecting stations and at said record means, and an output circuit connected to said summation circuit to indicate said coincidence.

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