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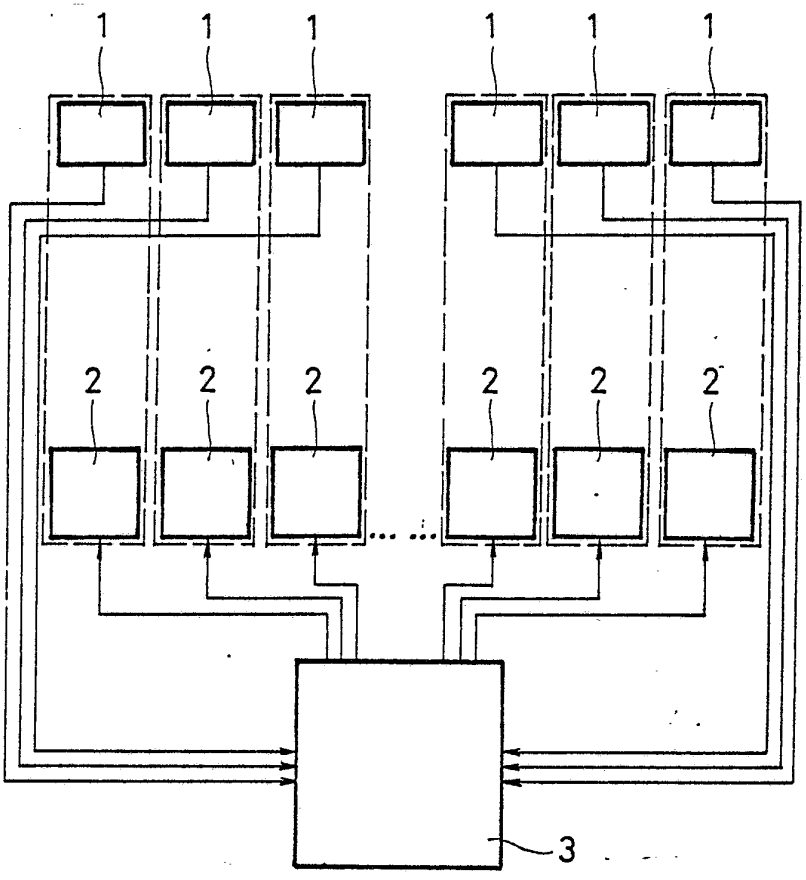
With amended claims.

(54) Title: PLANAR OR SPATIAL ELECTRONIC TOY

(57) Abstract

An electronic logical toy with a play field divided into field-elements which may take different states to be sensed visually or in another manner. Each of these field-elements is provided with means (1) sensing the fact of appointing and with means (2) displaying the momentary state. The toy comprises a central electronic unit (3) responding to output signals of the sensing means (1) of the just appointed field-element. Said control unit may change the state of one or more field-elements having been co-ordinated to the appointed one in compliance with a prescribed relationship and to form a predetermined target-configuration by means of a finite number of appointings. The novel feature of the invention is that the validity of the prescribed relationship is independent from the position of appointed field elements and the control unit (3) enables the choice of different prescribed relationships.



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Planar or spatial electronic toy

Technical Field

The invention relates to an electronic one-player logical toy or game with a planar (two-dimensional) or spatial (three-dimensional) play field, the field elements of which may change their visually or otherwise perceptible state or appearance.

Background Art

Toys are already known the field-elements of which can be selected and appointed by touching them or in any other suitable manner, for which purpose every individual field-element is provided with a sensor sensing the fact of appointing, as well as with means displaying the momentary state. In addition, the toy contains a central electronic control unit responding to the output signal of the sensor of the appointed field-element, this control unit being able to change the state of one or more other field-elements belonging to the appointed one according to a certain predefined relationship. Thus it is possible to form a predefined target-configuration by means of a finite number of appointments.

When playing, a large number of configurations may be produced by changing the states of the field-elements. The aim of the game is to produce a certain configuration or to restore a certain initial configuration after having mixed the states of the field-elements.

In the book "The complete guide to electronic

games" by Howard J. Blumenthal a game called "Merlin" is described in which planar (bidimensional) configurations can be produced. By touching (and thus appointing) whichever of the nine elements of the quadratic play field the state of several other elements is changed, according to a certain relationship. However, this relationship is not unambigously defined, because said relationship is reflected from the border or edge of the play field. Thus the game is not suitable to assure for the player an undisturbed logical experience.

Disclosure of Invention

The aim of the present invention is to produce an electronic logical game in which the logical and geometrical conceptions of the player come into full display, because according to the invention the relationship once prescribed between the appointed or selected field-element and the other elements belonging to it remains unchanged independently of the position of the appointed element, and, in addition, several such relationships can be used, that is to say at the beginning of the play the player may choose any of the relationships stored in the electronic control unit of the game.

Brief Description of Drawings

Figure 1 shows a simplified block scheme of the invention,

Figure 2 schematically shows the inner structure of the central control unit,

Figure 3 shows a simplified circuit layout of

the toy,

Figure 4 is a simplified block scheme of another embodiment,

Figure 5 illustrates a possible starting configuration of the playing field according to Fig. 3,

Figure 6 shows the change of condition of the configuration of Fig. 5 after the first step and

Figure 7 depicts the configuration after the second step.

Best Mode of Carrying out the Invention

According to Fig. 1 the display means 2 provided in each of the field-elements may be electromechanic, hot-wired (filament), vacuumfluorescent, liquid-crystalline means or those provided with a light emitting diode (LED), or it can consist of any other suitable device. All of the display means 2 are directly connected to a central control unit 3, the input of which is controlled by sensing means 1 also belonging to the field-elements. The sensing means 1 can be mechanical, magnetic, optical, inductive, capacitive or sensor switches. The main task of the sensing means is to sense the appointing of the field-element belonging to it. The appointment can be performed by hand or by some tool (e. g. magnetic rod). The signal of the sensing means 1 of the just appointed field-element arrives to the central control unit 3, and thus this unit actuates the appointed field-element itself and/or one or more other field-elements related to the appointed field-element according to a certain relationship, in order to let their display means 2 function.

Figure 2 shows the most important parts of the

central control unit 3. According to this figure this unit contains a relationship storage 4 having two-state storage elements, an adder 5, an address-producing logic 6 and a state storage 7 composed of as much elements as the number of field-elements. The former elements may take as much states as the display means are able to show.

The address producing logic 6 is in a two-way connection with the adder 5 and with the state storage 7, but the relationship storage 4 is in junction with adder 5 with a one-direction connection only. It should be noted that the adder 5 and the address producing logic 6 can mutually change their position. The lines 8 of the sensing means 1 (not shown in Fig. 2) are connected to the address producing logic, while the output lines 9 of the state storage are connected to the display means 2 also not shown in Fig. 2.

The functioning of the central control unit in the most general form is as follows: The configuration written (stored) in the relationships storage 4 (in the example according to Fig. 2 a cross built by logic ones) represents the relationship which determines which field-elements should change their state if any field-element is selected and appointed. The address producing logic 6 being connected to the sensing means, senses the position of the selected field element. The values (stored in storage unit 7) of those field-elements which can be covered by the elements of the said configuration if the reference point of the configuration (the centre of the cross in the example shown in Fig. 2) is positioned in imagination above the selected field-element and the values - stored by storage unit 4 - of the covering elements of the said configuration are sent to

the adder unit 5 where the respective value pairs will be added in modulo-m, where m is the number of states of each element of the state storage unit 7. The results of these additions will be stored in state storage unit 7.

Substantially in all of the forms or embodiments of the control unit 3 the inner structure is constructed according to Figure 2, independently from the fact that software, hardware or their combination was realized.

In any of the embodiments it is important that to every field-element belongs a storing element in the control unit, suitable to store two or more conditions or states. In addition, in case of a hardware solution the central control unit contains another storage means of n-bits for each of the field-elements, where n is the total number of field-elements. The n-bits storage means stores for each of the field-elements the information which determines which of the field-elements should change their state after appointment. In case of a software solution, however, all the control and storage functions can be solved by a suitably programmed memory, which substitutes the two above mentioned memories.

Let the possible states of the field-elements be denoted by the numbers 0, 1 ..., m. After appointing a field-element, the other field-elements which change their states will have their new state according to the following rule: if the old state of the field-element corresponded to a number different from m, the new state will be that corresponding to the old number increased by 1. If the old state corresponded to number m,

the new state of the field element will be the state corresponding to the number 0. If only two states are possible the said rule can be implemented by an exclusive-OR operation between the old and the new state.

In Figure 3 a circuit layout of the logical toy according to the invention, designed completely with hardware is to be seen. This solution is suitable but for two-state field-elements; for the sake of example in the Figure an arrangement on a quadratic play field 10 with a distribution of 5 x 5 is shown. With this arrangement just as much sensing means 11 (e. g. press-button-keys) as displaying means 12 (e. g. LED) belong to the twentyfive field-elements. All of the display means are connected to the output of a D-type flip-flop 13. In this circuit arrangement the latches 13 perform the task of two-state storing elements. At the same time, every sensing element is connected via the gate system 14 to a row-selecting input 17 of the memory 21 (e. g. RAM). To obtain a better view, only two elements each of the component group consisting of the said twentyfive pieces are completely shown, the others are indicated only symbolically.

The function of the circuit arrangement will be described on basis of Fig. 3. When the sensing means 11 being in the just appointed field-element foward a logical level 1 via the appointing lines 15 and the gate system 14 to the proper row-selecting input 17 of the memory 21, a word consisting of twenty-five bits and representing the relationship having been applied for the appointed field-element and previously written via data inputs 22 and addressing inputs 23 by

means of the circuit 25 selecting the game-function, appears in the read lines 18. Now the flip-flops 13 are toggled via the gate system 14 through state changing outputs 16 and therethrough the states of the display means 12 (LED) are changed.

Depending on the commands having been put in by means of pushbuttons 26, the circuit 25 selecting the game-function is well suitable for the prescription of different game-conditions, so e. g. one of the push-buttons 26 enables the choice of two kinds of relation-ships. According to the first relationship the field-elements being on contact along a common boundary line with the appointed one, and the appointed one itself are influenced; this means that when applying this re-lationship in an absolutely dark play field, a configurat-ion having the shape of a cross can be illuminated. In the other case the appointed field-element itself and those field-elements will be influenced which can be reached by the move of a chess-knight.

By means of two other pushbuttons 26 or other control means two kinds of starting configurations can be obtained for the play-field. By actuating one of the pushbuttons all the flip-flops are cleared via a reset line 24, so that nothing but dark quadratic field-elements appear. When pressing the other key, the out-puts of the random generator 20 toggles some of the flip-flops 13 via the filter 19 and the gate system 14, as a consequence some special configuration will be illuminated in the play-field. It should be noted that the filter 19 allows the realization only of such start-ing configurations out of those which can be produced by the aid of the random generator, from which the prescribed target-configuration can be developed.

Figure 4 is a simplified block scheme of the toy according to the invention designed with software. With this solution the central control unit is replaced by one single microcomputer 34 which scans by means of its line outputs 31 and column outputs 32 the sensing and display means on the play-field, and takes the information relating to the appointment, by the aid of its sensor inputs 33.

All of the control functions (changes of states, application of the relationship, generation of the starting configuration, etc.) are performed by the program stored in the internal memory of the microcomputer. Howeer, a circuit 37 selecting the game-function is to be used in this case too, fulfilling the task of the interface between the microcomputer 34 and the control means (keys) 38 which interface can be done in some cases by the microcomputer. Thus when one of the keys 38 is actuated, impulses are sent to the microcomputer through the data line 35 or the address line 36.

The use of the logical toy according to the invention will now be described by presenting configurations having been obtained by some steps that is to say by appointing of field-elements. Let us suppose e. g. that in the play field to be seen in Fig. 3 a starting configuration according to Fig. 5 was generated and that the field elements may take up two states. If now the third element of line 2 is appointed as a first step, the configuration according to Fig. 6 is obtained, and if the second element of line 3 is appointed as the next step, a configuration according to Fig. 7 appears.

The logical toy according to the invention can be realized as a three-dimensional design too, e. g. the elements of the play field can be arranged either on the surface of the spatial formation or in the inner volume thereof.

With a further developed embodiment the game-functions are completed by score indicators. This function can be most advantageously realized by using the play field as a dot-matrix display. So e. g. with the embodiment depicted in Fig. 4 it suffices to properly complete the actuating program in order to be able to display the data qualifying the intermediate or final scorings, e. g. the number of appointings performed, the elapsed time, or the combination thereof, either alphanumerically or graphically, in form of stationary or moving symbols.

Claims

1. Electronic logical toy with a planar or spatial play field divided into field-elements which may take different states to be sensed visually or in any other manner and each of these field-elements is provided with means (1) sensing the fact of appointing, as well as with means (2) displaying the momentary state, in addition the toy comprises a central electronic unit (3) responding to the output signal of the sensing means (1) of the just appointed field-element, said control unit being able to change the state of one or more field-elements having been co-ordinated to the appointed one in compliance with a prescribed relationship, as well as to form a predetermined target-configuration by means of a finite number of appointings, characterized in that the validity of the once prescribed relationship is independent from the position of the appointed field-element, and the control unit (3) enables the choice of different prescribed relationships.

2. Logical toy as claimed in claim 1, characterized in that the field-elements are able to take up more than two states in a manner to be defined by given relationships.

3. Logical toy as claimed in claim 1, characterized in that the field-elements may take two states and the new state of any field-element following the appointing of another field-element, as an output, is in an exclusive-OR connection with the previous state of the first mentioned field-element, as one of the inputs, as well as with the logical value of the relationship applied to the other field-element, as the

other input, said logical value being at the place of the first field-element.

4. Logical toy as claimed in claim 1, characterized in that the control unit (3) is suitable to produce several starting configurations with a random character, from which the prescribed target-configuration can be developed.

5. Logical toy as claimed in claim 4, characterized in that the central control unit contains two-state storing elements (13), a matching gate system (14), a filter (19) selecting the applicable starting configurations, a random signal generator (20), a memory (21) storing the relationships and a circuit (25) selecting the game-functions;

the outputs of the storing elements (13) are connected to the display means (12);

the clock pulse inputs of the storing elements (13) are connected via a gate system (14) either to the outputs of the filter (19) or to the read-out lines (18) of the memory (21);

the clearing inputs of the storing elements (13) are connected to the clearing outputs of the circuit (25) selecting the game-function;

the row-selecting inputs (17) of the memory (21) are connected to the sensing means (11) via the gate-system (14);

the writing and addressing inputs (22, 23) of the memory (21) are connected to the data and address outputs of the circuit (25) selecting the game-funtion;

the starting configuration output of the circuit (25) selecting the game-function is connected to the actuating input of the random generator (20);

control means (26) are connected to the

inputs of the circuit (25) selecting the game function, and

the outputs of the random generator (20) are connected to the inputs of the filter (19).

6. Logical toy as claimed in any of the claims 1 to 4, characterized in that the central control unit is formed by a microcomputer (34) and a play function selector (37).

7. Logical toy as claimed in any of the claims 1 to 6, characterized in that the playfield as a dot-matrix display is also suitable for an alphanumerical or graphical display of the number of the appointings performed, or the time elapsed, or an arbitrary combination thereof, or other date qualifying the intermediate of final scores of the game in a stationary or moving manner.

8. Logical toy as claimed in claims 1 to 7, characterized in that the central control unit (3) is suitable for setting several target-configurations.

AMENDED CLAIMS
(received by the International Bureau on 15 June 1983 (15.06.83))

1. (new) Electronic logical toy with a planar or spatial play field divided into field-elements which may take at least two different states to be sensed visually or in any other manner, c h a r a c - t e r i z e d in that each of these field-elements is provided with means (1) sensing the fact of appointing, as well as with means (2) displaying the momentary state, in addition the toy comprises a central electronic unit (3) responding to the output signal of the sensing means (1) of the just appointed field-element; said control unit being able to change the state of one or more field-elements having been co-ordinated to the appointed one in compliance with a prescribed relationship, as well as to form a pre-determined target-configuration by means of a finite number of appointings.

2. (new) Logical toy as claimed in claim 1, characterized in that the control unit (3) enables the choice of different prescribed relationships.

3. Logical toy as claimed in claim 1, characterized in that the field-elements may take two states and the new state of any field-element following the appointing of another field-element, as an output, is in an exclusive-OR connection with the previous state of the first mentioned field-element, as one of the inputs, as well as with the logical value of the relationship applied to the other field-element, as the

other input, said logical value being at the place of the first field-element.

4. Logical toy as claimed in claim 1, characterized in that the control unit (3) is suitable to produce several starting configurations with a random character, from which the prescribed target-configuration can be developed.

5. Logical toy as claimed in claim 4, characterized in that the central control unit contains two-state storing elements (13), a matching gate system (14), a filter (19) selecting the applicable starting configurations, a random signal generator (20), a memory (21) storing the relationships and a circuit (25) selecting the game-functions;

the outputs of the storing elements (13) are connected to the display means (12);

the clock pulse inputs of the storing elements (13) are connected via a gate system (14) either to the outputs of the filter (19) or to the read-out lines (18) of the memory (21);

the clearing inputs of the storing elements (13) are connected to the clearing outputs of the circuit (25) selecting the game-function;

the row-selecting inputs (17) of the memory (21) are connected to the sensing means (11) via the gate-system (14);

the writing and addressing inputs (22, 23) of the memory (21) are connected to the data and address outputs of the circuit (25) selecting the game-funtion;

the starting configuration output of the circuit (25) selecting the game-function is connected to the actuating input of the random generator (20);

control means (26) are connected to the

inputs of the circuit (25) selecting the game function, and

the outputs of the random generator (20) are connected to the inputs of the filter (19).

6. Logical toy as claimed in any of the claims 1 to 4, characterized in that the central control unit is formed by a microcomputer (34) and a play function selector (37).

7. Logical toy as claimed in any of the claims 1 to 6, characterized in that the playfield as a dot-matrix display is also suitable for an alphanumerical or graphical display of the number of the appointings performed, or the time elapsed, or an arbitrary combination thereof, or other date qualifying the intermediate of final scores of the game in a stationary or moving manner.

8. Logical toy as claimed in claims 1 to 7, characterized in that the central control unit (3) is suitable for setting several target-configurations.

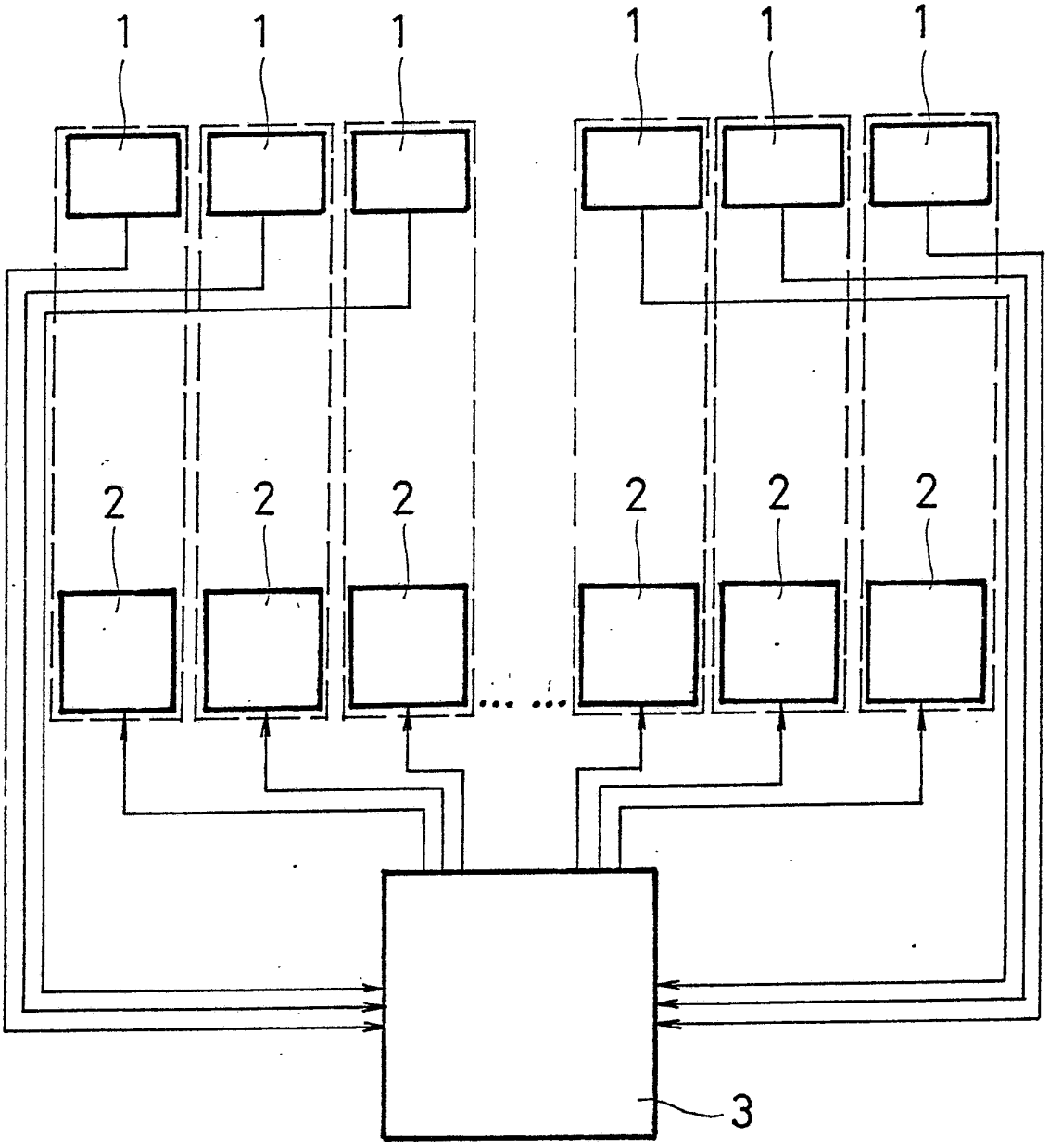

Fig.1

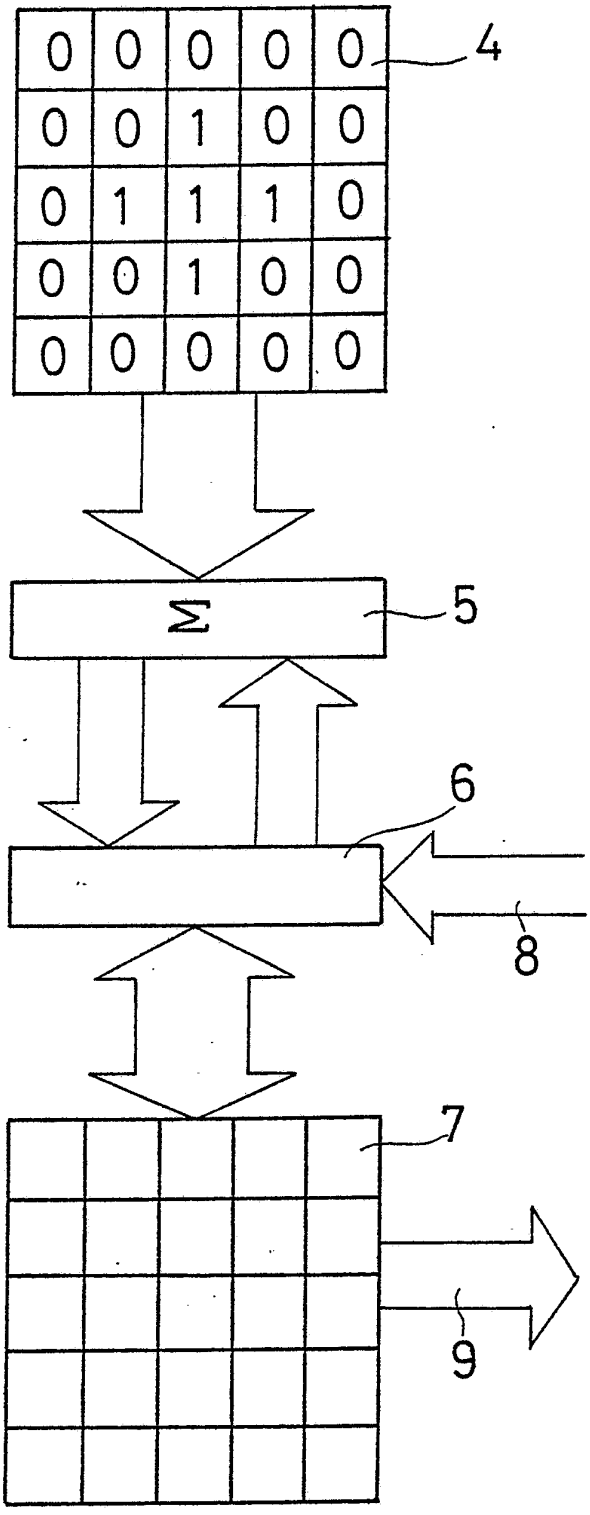

Fig.2

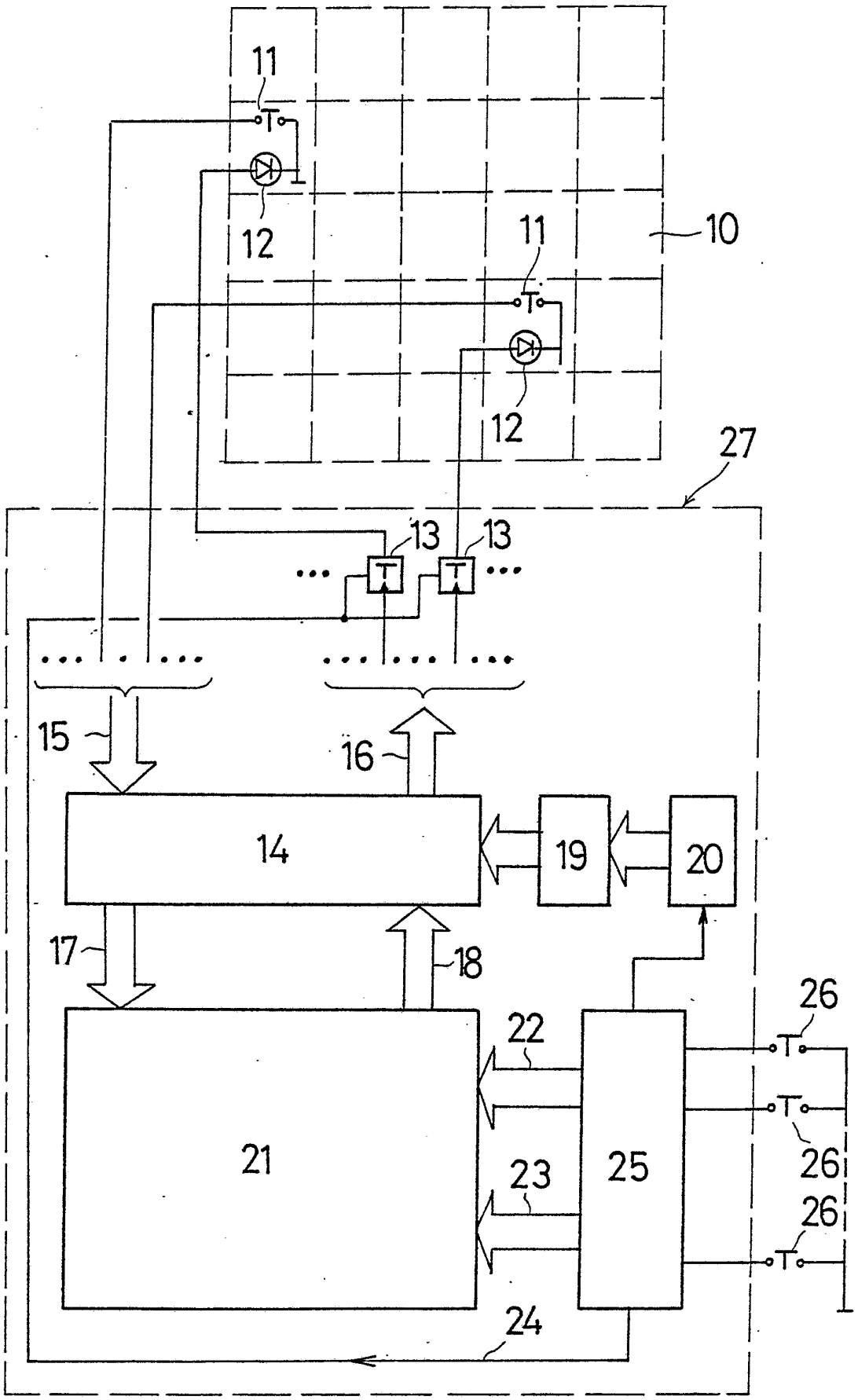

Fig. 3

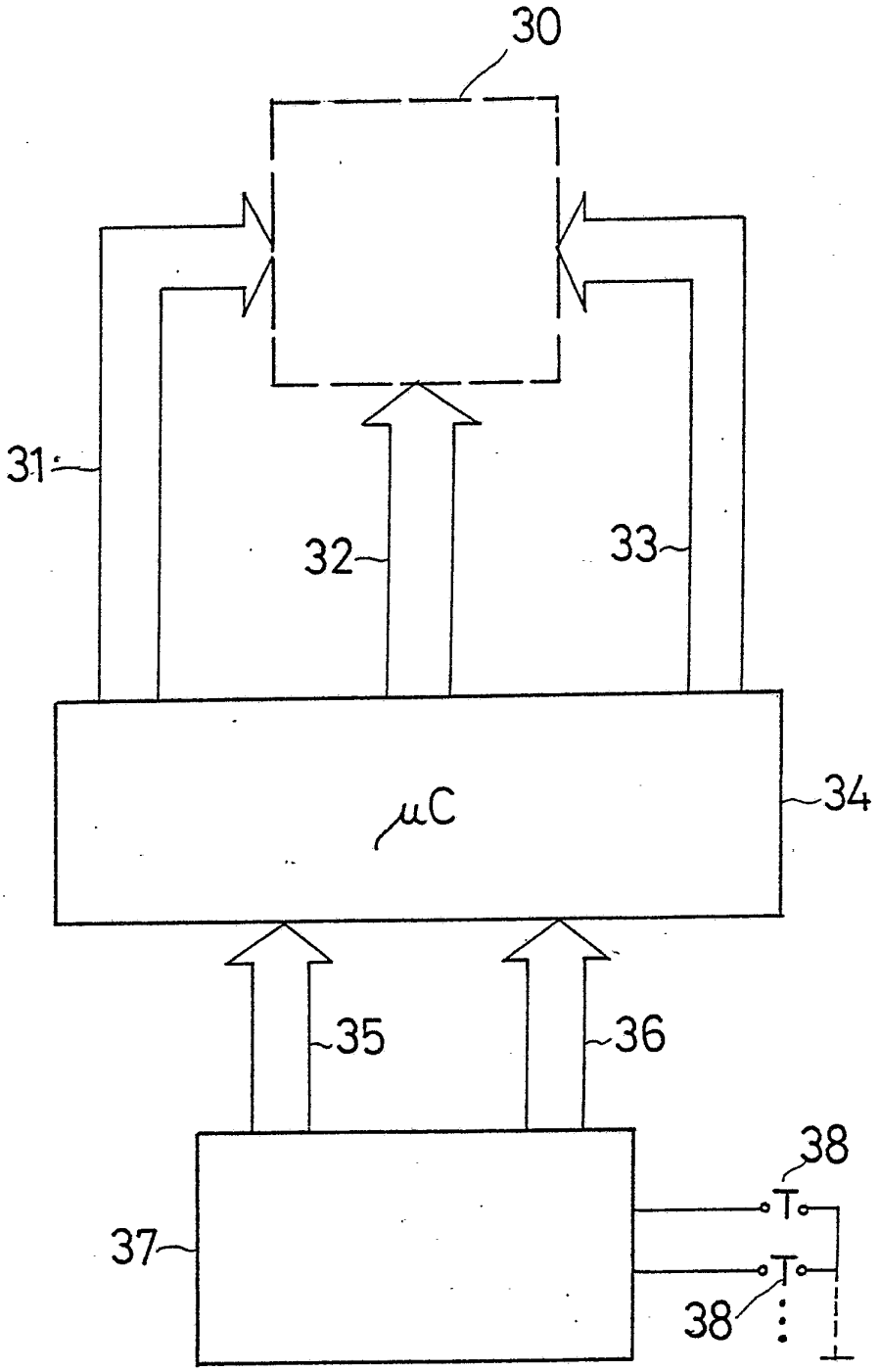

Fig. 4

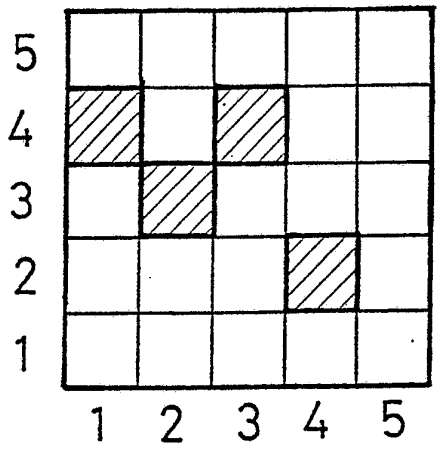

Fig 5

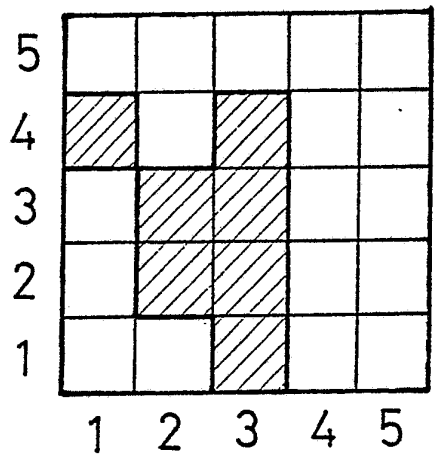

Fig. 6

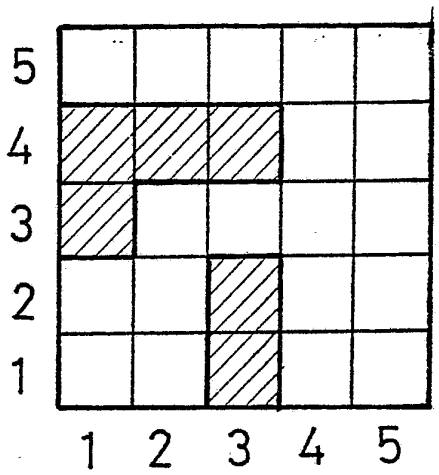

Fig.7

List of reference numbers

1	sensing means, sensor
2	display means
3	central control unit
4	relationship storage
5	adder
6	address-producing logic
7	state storage
8	sensor lines
9	output lines from the state storage
10	playing field
11	sensor
12	display means
13	flip-flop, two-state latch
14	gate system
15	appointing lines
16	state changing outputs
17	row selecting inputs
18	read-out lines
19	filter
20	random generator
21	memory
22	data inputs
23	addressing inputs
24	reset line
25	play function selector
26	control means, pushbuttons
27	central control unit
30	sensor and display means
31	row outputs
32	column outputs
33	sensor inputs
34	microcomputer
35	data lines
36	address lines
37	play function selector
38	control means

INTERNATIONAL SEARCH REPORT

International Application No PCT/HU83/00001

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

A63F 9/00

II. FIELDS SEARCHED

Minimum Documentation Searched [4]

Classification System	Classification Symbols
IPC[3]	A63F 9/00, A63F 9/22

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, 4240638 (Marvin Glass & Associates), 23 December 1980 (23.12.80)	1,5
A	US, A, 4093223 (William F.Wilke et al), 06 June 1978 (06.06.78)	1
A	US, A, 3887192 (Bally Manufacturing Corporation), 03 June 1975 (03.06.75)	5,8
A	US, A, 3982764 (Walter L. Dieball), 28 September 1976 (28.09.76)	7
A	US, A, 4114877 (Adolph E.Goldfard et al), 19 September 1978 (19.09.78)	1
A	US, A, 4206920 (Fred Weatherford et al), 10 June 1980 (10.06.80)	7,5

* Special categories of cited documents: [15]

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IV. CERTIFICATION

Date of the Actual Completion of the International Search [3]	Date of Mailing of this International Search Report [3]
15 March 1983 (15.03.83)	11 April 1983 (11.04.83)
International Searching Authority [1]	**Signature of Authorized Officer [20]**
ISA/SU	(L. Komarova)

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