United States Patent [19]

Dice

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[54] **SIMULATED DICE GAME AND CONTROL CIRCUIT THEREFOR**

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[52] **U.S. Cl.** ..... **273/138 A,** 331/111

[51] **Int. Cl.** **A63b 71/06**

[58] **Field of Search** ..... 273/138 A; 331/111

[56] **References Cited**

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[57] **ABSTRACT**

A simulated dice game including a playing board on which is presented a display including lamps arranged in a pattern corresponding to the spot patterns on two dice. A manually operated switch button is provided to activate and deactivate pulse generating devices for each lamp arrangement, and the generated pulses are fed to counter circuits that are switched through a predetermined recurring sequence of operating states which selectively energize the lamps through output circuitry to show combinations of one to six lamps on each die. The pulse generating device produces triggering pulses at a relatively low frequency and at a constant repetition rate during activation thereof by the switch button and produces such pulses at a descending repetition rate upon deactivation thereof by the switch button whereby the lamps flash visibly during activation and continue to flash at a descending repetition rate upon deactivation until a final operating state is displayed upon cessation of pulse generation.

2 Claims, 2 Drawing Figures

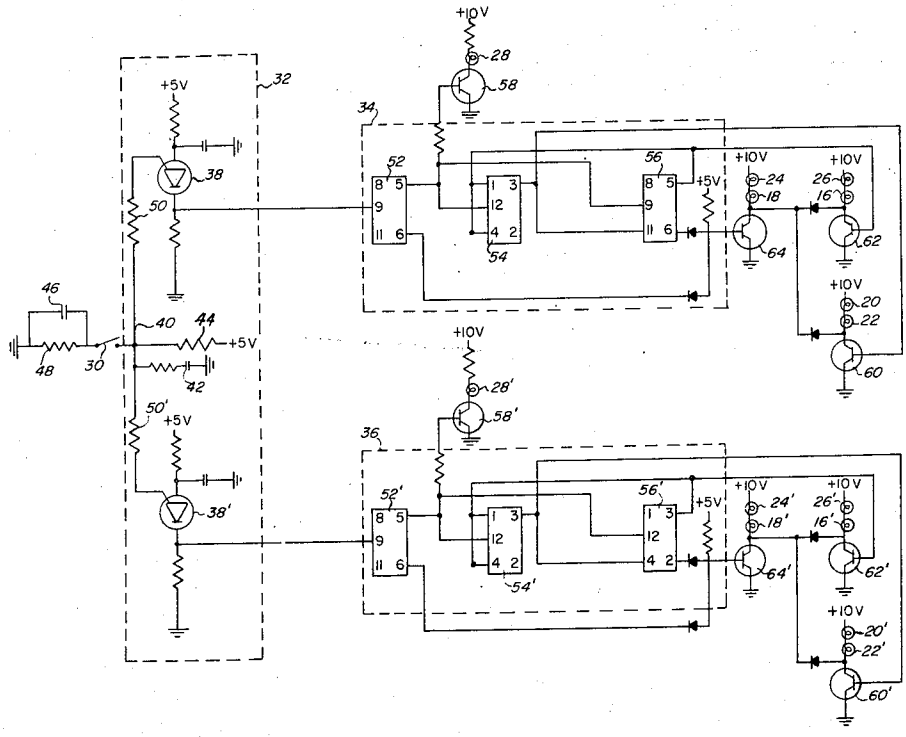


Fig. 1

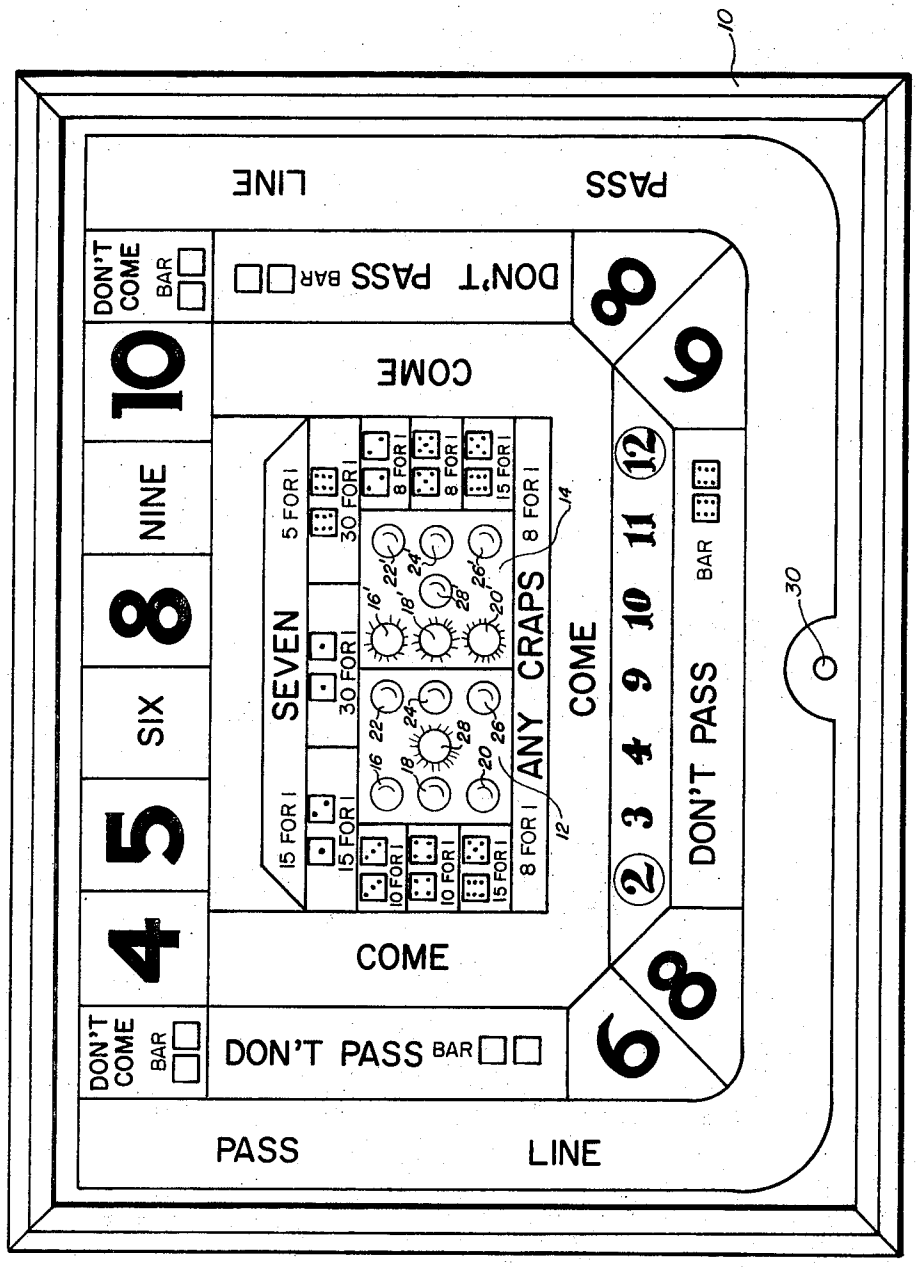
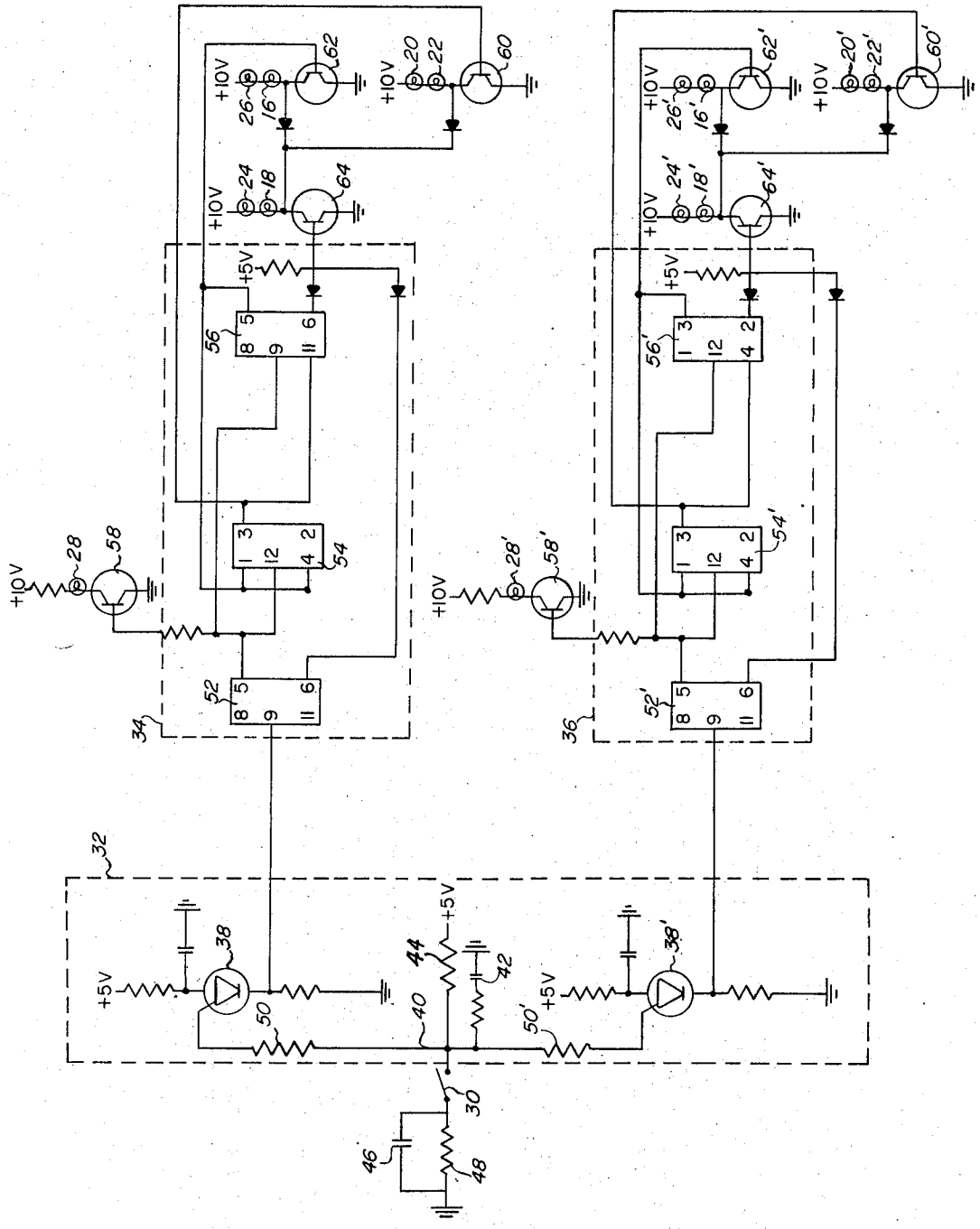

10
PASS
LINE
DON'T PASS BAR
COME
DON'T COME BAR
8
9
10
NINE
8
SIX
5
4
DON'T COME BAR
6
8
12
11
10
9
4
3
2
BAR
DON'T PASS
30
5 FOR 1
30 FOR 1
8 FOR 1
15 FOR 1
SEVEN
ANY CRAPS
14
12
16
18
20
22
24
26
28
15 FOR 1
10 FOR 1
8 FOR 1
COME
DON'T PASS BAR
PASS
LINE

Fig. 2


+10V
+5V
62
60
64
62'
60'
64'
56
56'
54
54'
52
52'
58
58'
28
28'
34
36
32
38
38'
44
42
40
50
50'
30
46
48
26
16
24
18
20
22

SIMULATED DICE GAME AND CONTROL CIRCUIT THEREFOR

BACKGROUND OF THE INVENTION

It is now commonplace to find applications utilizing an array of lamps or other indicators that are controlled by pulse generating circuitry and dividing outputs which operate to switch the indicators randomly through a predetermined sequence of states until a final indicating state remains. Amusement devices are common examples of such applications, particularly games of chance such as games designed to simulate the rolling or throwing of conventional dice cubes by lamp arrangements depicting combinations presented by the spots on the faces of dice.

It is, of course, important in games such as this that the control circuits be designed to eliminate any reasonable possibility that an operator or player can control the final state of the indicators to obtain a desired result, and it is likewise significant in the enjoyment of such games that a player have a sense of participation in the operation of the game as well as a sense of anticipation about the final state of the indicators. Prior proposals have heretofore failed to meet all of these requirements.

One of the more pertinent of these prior proposals is disclosed in an article entitled "Spots Before Your Eyes" appearing in the September 1967 issue of *Popular Electronics* magazine at pages 29–34. The device described in this article includes two dice-simulating lamp configurations controlled by respective counter circuits having a reset feature and characterized by a relatively low frequency (i.e., 500 HZ) oscillator to drive the counter circuits. It is to be noted that from a psychological standpoint, it is very advantageous to have a low frequency response from lamps because it allows the player or operator of the device to see the lamps flashing as the counter circuit switches. However, in the device described in the aforementioned article, this advantage is outweighed by the fact that it is perhaps possible because of the low frequency operation for the final outcome to be predetermined by a player or operator who has had some experience in manipulating the control switch.

In an effort to eliminate the possibility of controlling the dice odds in this manner, it has also been proposed in U.S. Pat. No. 3,592,473, issued July 13, 1971, to provide separate oscillators for each simulated die and more importantly to increase substantially the frequency at which these oscillators operate. The patent indicates that this operating frequency should be at least 100,000 cycles per second, but the patentee prefers to use regenerating oscillators having a substantially higher frequency (e.g., 1MHZ). While this prior art disclosure apparently does eliminate the possibility of a practiced operator being able to influence successfully the outcome of the dice display, the high frequency oscillators eliminate the aforementioned desirable effect obtained by the relatively slow flashing of the lamps which gives the operator a greater sense of participation and anticipation.

In accordance with the present invention, a unique pulse generating circuit is utilized which provides lamps with a relatively slow flashing frequency, yet which successfully eliminates any possibility of obtaining a predetermined final state and this pulse generating circuit is incorporated in a dice-simulating game which does not have the drawbacks described above in connection with known prior art dice games.

SUMMARY OF THE INVENTION

The present invention includes an arrangement of lamps or other indicators which are controlled through a drive circuit that is manually activated and deactivated and that is operable to switch the lamps through a predetermined recurring sequence of operating states and to retain the lamps in one such operating state after the drive circuit is deactivated. The lamps are switched through these operating states at a low frequency having a constant repetition rate during activation of the drive circuit; and they continue to be switched through such operating states at a decreasing repetition rate after deactivation of the drive circuit until a final operating state is presented by the lamps.

The present invention has particular application to amusement devices such as a simulated dice game, but it is to be understood that the present invention is not limited to this particular application and can be useful in other amusement devices and similar devices employing indicators which are switched through a plurality of operating states.

In the disclosed embodiment of the present invention, a pulse generating circuit is provided for selectively producing pulses at a constant repetition rate in one condition thereof and for producing pulses at a descending repetition rate in a second condition thereof. This circuit includes a programmable unijunction transistor having a ground connection to the cathode thereof,, a supply voltage supplied to the anode thereof, and a bias voltage imposed on the gate thereof. The gate biasing circuit includes a voltage source, a resistor-capacitor (R-C) timing circuit, and a manually operated switch which is selectively operable between a first position at which the transistor gate is biased into conduction, and a second position at which the R-C circuit is connected to the transistor gate. In the first position of the switch, the voltage at the transistor gate is substantially zero and the transistor therefore generates pulses at a constant rate, while in the second position of the switch, the gate voltage is progressively increased by allowing the capacitor to charge through resistor until it equals or exceeds the anode voltage whereby the transistor generates pulses at a descending repetition rate until the transistor becomes disabled and ceases generating pulses.

This pulse generating circuit is used in the present invention in a simulated dice game which includes an output display having two lamp arrangements each of which is patterned after the spot arrangements on the faces of a conventional die. A divide-by-six counter circuit for each lamp arrangement is connected to the aforesaid pulse generating circuit and is operable to be switched through a predetermined recurring sequence of operating states by pulses received from the pulse generating circuit, and the output display is connected to the counter circuit means and is operable to provide an indication of the operating state of the counter circuit.

Thus when the manual switch is at its first or "on" position, the lamps will flash continuously as the pulses are generated at a constant repetition rate, and upon turning the switch to its second or "off" position, the lamps will flash at a descending repetition rate until the

transistor in the pulse generating circuit becomes disabled whereupon the lamps will be left lighted to indicate the last operating state of the counter circuit.

It will be noted that a low frequency pulse generating circuit can be employed to provide visibly flashing lights, yet the final operating state of the counter circuit cannot be correctly anticipated because it continues to switch for a time even after the operating switch is moved to its "off" position.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** illustrates a game board for a simulated dice game according to the present invention, including two simulated dice faces having lamps representing the spots thereon; and

FIG. **2** is a logic diagram of the simulated dice game of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Looking now in greater detail at the accompanying drawings, FIG. **1** illustrates a gameboard **10** which includes a plurality of representations similar to those found in conventional dice games whereby players can place chips or similar tokens at designated locations to obtain varying odds in attempting to predict correctly the number of "spots" which will appear on the playing dice. At the center of the gameboard **10,** two simulated dice faces **12** and **14** are presented, each such dice face **12** and **14** including a display of seven lamps **16–28** and **16′ – 28′** respectively, arranged in a pattern corresponding to the spot arrangements on the surfaces of a die. Also included on the gameboard **10** is a push-button switch **30** which operates an electronic circuit disposed beneath the gameboard **10,** and this circuit controls the energizing and deenergizing of the lamps in a manner to be described in greater detail presently.

The logic diagram for the lamp control circuit is shown in FIG. **2** together with the aforementioned lamps and switch **30.** This circuit includes a pulse generating unit **32** for supplying separate pulses to divide-by-six counter circuits **34** and **36** which are thereby cycled through six states in a fixed sequence each of these six states being then displayed in different combinations of lighted lamps as will become apparent below.

The pulse generating unit **32** includes two low frequency oscillators **38, 38′** which, preferably, are programmable unijunction transistors manufactured by General Electric Company as D13T. The two oscillators **38, 38′** are identical and generate pulses at substantially the same frequency (i.e., 16 HZ), although there will obviously be some minor variation therein because of normal tolerances, and such variation precludes the two dice faces always having identical lamp displays and identical progressions of lamp switching. Since these oscillators **38, 38′** are identical, it is only necessary to explain the operation of one. As will be apparent to those skilled in the art, the oscillator **38** has a source voltage (i.e. 5 volts) applied to the anode thereof, and the voltage at the gate thereof can then be varied so that the oscillator will generate pulses when the anode voltage is greater than the gate voltage. The oscillator will cease generating pulses when gate voltage exceeds the anode voltage.

In conventional pulse generating circuits, the voltage at the gate of the oscillator of the type described above is substantially instantaneously increased to and from a value substantially equal to the anode voltage whereby the oscillator likewise changes instantaneously between a state of generating pulses at a maximum frequency rate and a state of non-generating of pulses. However, in accordance with the present invention, a unique control circuit is provided for the oscillators **38, 38′** which results in their having the capability of starting to generate pulses at a constant repetition rate substantially instantaneously with the closing of switch **30,** and then continuing to generate pulses at a descending repetition rate for a brief period after switch **30** is opened. This control circuit includes a common line **40** connecting the gates of oscillators **38, 38′,** and this common line **40** is connected to a capacitor **42** (i.e. 6.8 uF) and a resistor **44** (i.e. 100,000 ohms) which is connected to a voltage supply (i.e. 5 volts). Also connected to the common line **40** is the switch **30,** and a capacitor **46** (i.e. 1uF) and a resistor **48** (i.e. 100,000 ohms).

With this circuit arrangement, when the switch **30** is initially closed, the resistance **48** will be placed across capacitor **42** and the supply voltage at the gate of each oscillator **38, 38′** will be quickly reduced so that these oscillators will commence pulsing substantially instantaneously at its constant maximum frequency repetition rate. Then when the switch **30** is opened, the bias voltage at the gates of the oscillators **38, 38′** will increase relatively slowly due to the charging of capacitor **42** through resistor **44,** and this relative slow progressive increase in the bias voltage at the gates will result in the oscillators **38, 38′** generating pulses at a descending repetition rate until the bias voltage reaches a point just below the anode-supply voltage at which time pulsing ceases.

The time period during which the oscillators **38, 38′** continue to generate pulses after switch **30** is opened depends upon the rate of voltage increase at the oscillator gates. Using the formula $T=RC$, when T is time, R is resistance and C is capacitance, it will be noted that when resistor **44** is 100,000 ohms and capacitor **42** is 6.8 uF, $T = 0.68$ second. Thus, after switch **30** is opened, the lamps will continue to flash at a descending repetition rate for 0.68 second whereby the lamps flash in a manner that is visibly discernible and, yet, the final state of the lamps cannot be determined by the operator.

It will also be noted that the common line **40** includes two isolation resistors **50, 50′** which eliminate voltage feedback between the gates of oscillators **38, 38′** when the switch **30** is closed and thereby prevent synchronized pulse generation by the oscillators **38, 38′.** These isolation resistors **50, 50′** are relatively small (i.e. 47,000 ohms) and they have substantially no effect on the circuit when the switch **30** is open and the oscillators therefore become substantially synchronized when switch **30** is opened.

Thus, with a pulse generating circuit as described above, the closing of switch **30** will result in the oscillators **38, 38′** substantially instantaneously generating pulses at a constant maximum repetition rate, when switch **30** is opened, the oscillators will generate pulses at a descending repetition rate for a period of time after which pulse generation will cease altogether.

The pulses generated by oscillators **38, 38′** will be fed to counter circuits **34, 36,** respectively, and since these counter circuits **34, 36** are identical, it is only necessary to explain the operation of one. The counter circuit **34**

has a divide-by-six output and includes three conventional flip flops **52, 54** and **56** which as is well understood in the art, are switched by a pulse from one stable condition ("1" state) during which an output signal is produced at one output to a second stable condition ("0" state) at which an output signal is produced at the other output thereof.

By way of illustration, it will be assumed that flip flop **52** is at a "1" state with an output signal produced at terminal **5** thereof, flip flop **54** is at a "0" state with an output signal produced at terminal **2** thereof, and flip flop **56** is at a "0" state with an output signal produced at terminal **6** thereof. In this condition an output signal from terminal **5** of flip flop **52** is an input for drive **58** associated with lamp **28** whereby the source voltage will be transmitted through the driver **58** to light lamp **28.** However, since there is no output signal from terminal **3** of flip flop **54,** the driver **60** for lamps **20** and **22** will receive no voltage and, accordingly, lamps **20** and **22** will be unlighted. Likewise, since there is no output signal from terminal **5** of flip flop **56,** driver **62** will not permit lamps **16** and **26** to be lit. Moreover, since the driver **64** for lamps **18** and **24** is controlled by a decoding circuit as shown in FIG. **2,** lamps **18** and **24** will only be lighted when flip flops **52** and **56** are both at a "0" state, and they will, therefore, not be lighted in the assumed condition because flip flop **52** is in the "1" state. Thus, in the assumed condition of states of "1", "0", and "0" for flip flops **52, 54** and **56,** respectively, only lamp **28** will be lighted.

When the next pulse is received from the oscillator **38,** flip flop **52** will change from its "1" state to its "0" state, and the decrease in voltage at terminal **5** of flip flop **52** will change the state of flip flop **56** from "0" state to "1" state. However, this decrease in voltage at terminal **5** of flip flop **52** will not change the state of flip flop **54** because its terminal **1** is grounded. Accordingly, after receiving the first pulse, the state of flip flops **52, 54** and **56** will be changed from "1", "0", and "0" respectively to "0", "0", and "1" respectively. In this latter condition, lamp **28** will not be lighted because terminal **5** of flip flop **52** does not generate a signal, lamps **20** and **22** will not be lighted because there is no output signal generated at terminal **3** of flip flop **54,** and lamps **18** and **24** will not be lighted because flip flop **56** is in a "1" state. However, lamps **16** ans **26** will be lighted because of the output signal to driver **62** from terminal **5** of flip flop **56** (in its "1" state). Accordingly, two lamps, **16** and **18,** will be lighted on dice face **12** in the second condition of flip flops **52, 54** and **56.**

The two states of the three flip flops described above are set out in Table A below, together with the subsequently recurring states that occur when additional pulses are received from the pulse generating unit. It is to be noted, of course, that since the counter circuits **34** and **36** are divide-by-six counter circuits, the flip flops will proceed from the sixth state set out in Table A to the first state upon receiving a further pulse.

TABLE A

State of: Flip-flop 52	Flip-flop 54	Flip-flop 56	Lighted Lamps
1	0	0	28
0	0	1	16,26
1	0	1	28,16,26
0	1	1	16,26,20,22
1	1	1	28,16,26,20,22
0	0	0	16,26,20,22,18,24

Thus it will be seen that as each pulse is generated by the oscillators **38, 38'** and fed to the counter circuits **34, 36** the lamps on each of the dice faces **12, 14** will be progressively lighted in six combinations corresponding to the six spot arrangements which would occur in throwing a conventional die.

When the push-button switch **30** is pressed momentarily, the oscillators **38, 38'** will cause the lamps on each die face to progress through the six recurring sequences and because of the low frequency (16 HZ) of the pulse generation; this recurring progression will be plainly visible to the players as a discernible flashing progression which adds to the anticipation and excitement of playing the game. However, even though the flashing progression is visible, a player still cannot acutally "step" the sequence of progression by releasing the push-button switch **30** at a particular instant because, as has been previously described, the oscillators **38, 38'** continue to generate pulses at a descending repetition rate after switch **30** is released and the lamps will therefore, continue to flash for a period of time until a final state is reached. This descending repetition rate serves the dual function of adding to the anticipation and enjoyment of the game, and more importantly, it prevents a player from being able to cause a certain final state for the lamps by releasing the switch **30** at a certain instant. Finally, it will be noted that if the oscillators **38, 38'** began generating pulses at a low repetition rate when switch **30** was closed, it may be possible for a player to instantaneously press and release the switch **30** and thereby "step" the lamp sequence by advancing it one progression. However, because capacitor **46** and resistor **48,** the oscillators **38, 38'** begin to generate pulses at a maximum repetition rate as soon as switch **30** is closed.

The present invention has been described in detail above for purposes of illustration only and is not intended to be limited by this description or otherwise to exclude any variation or equivalent arrangement that would be apparent from, or reasonably suggested by, the foregoing disclosure to the skill of the art.

I claim:

1. An amusement device for producing one of a plurality of possible output indications selected by chance, including, in combination, manual switch means operable between activating and deactivating positions; pulse generating means connected to said switch means for activation and deactivation thereby, said pulse generating means producing triggering pulses at a constant repetition rate during activation thereof by said switch means and for producing triggering pulses at a descending repetition rate following deactivation thereof by said switch means and said pulse generating means including a programmable unijunction transistor having a ground connection to the cathode thereof, means for supplying the anode of said transistor with a supply voltage, means for imposing a bias voltage in the gate of said transistor, and selectively operable means including said switch means for imposing bias voltage on the gate of said transistor for establishing a voltage differential at which the anode voltage exceeds the gate voltage sufficiently to cause the transistor to commence generating pulses at a constant rate, and for decreasing said voltage differential at a predetermined rate until said voltage differential is substantially zero whereupon said transistor will cease generating pulses,

said predetermined rate of decreasing said voltage differential being sufficiently slow to result in said transistor generating pulses at a descending repetition rate beginning at said constant repetition rate and progressing through a plurality of different repetition rates until no pulses are generated; counter circuit means connected to said pulse generating means and operable to be switched through a predetermined recurring sequence of operating states by pulses received from said pulse generating means and operable to remain in an operating state in the absence of said pulses; and output means connected to said counter circuit means and operable to provide an indication of the operating state of said counter circuit means.

2. An amusement device as defined in claim **1** and further characterized in that said selectively operable means includes said switch means and a gate biasing circuit which includes a voltage source and a resistor-capacitor timing circuit, said switch means being selectively operable between a first position at which said transistor gate is effectively grounded whereby the voltage at said gate is reduced and a second position at which said resistor-capacitor timing circuit is in circuit with said gate whereby said voltage at said gate is progressively increased as said capacitor charges until the voltage at said gate is sufficient to disable said transistor.

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