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Baron et al.

[11] **3,814,438**

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[54] **GOLF GAME APPARATUS**

[76] Inventors: **Philip N. Baron,** 5333 N. Kenamore Ave., Chicago, Ill. 60640; **Bernie Schulman,** 4250 N. Marine Dr., Chicago, Ill. 60613

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[52] **U.S. Cl.**.... **273/176 FA,** 273/185 R, 273/181 H

[51] **Int. Cl.**..... **A63b 69/36,** A63b 67/02

[58] **Field of Search** 273/181, 185, 176, 184

[56] **References Cited**

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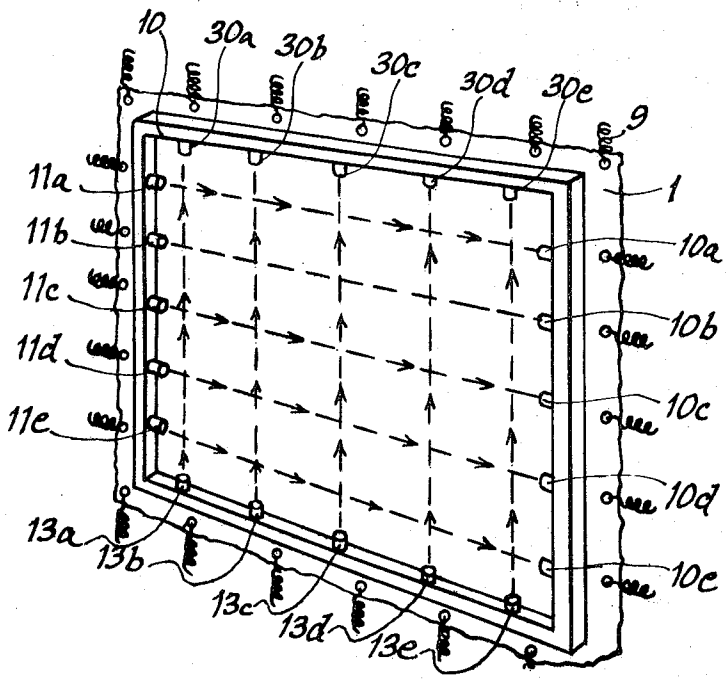
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Primary Examiner—George J. Marlo
Attorney, Agent, or Firm—Marshall S. Segal

[57] **ABSTRACT**

Apparatus for improving one's golf game, in which the ball is hit from a contact location to a flexible sheet member. The sheet member has a selected flexibility to permit the ball contacted portion thereof to flex and thereby break one of a plurality of light beams directed to photosensitive elements on the side of the sheet member opposite the ball contact location. A readout device is provided for indicating to the player the area of the sheet member where the ball was received and the distance that the ball would have traveled. The registration system is inhibited or prevented from indicating any registration other than that produced by the first hit, in order to eliminate any conflicting registrations arising from secondary flexings of the sheet member wehn the ball strikes the sheet member.

2 Claims, 7 Drawing Figures



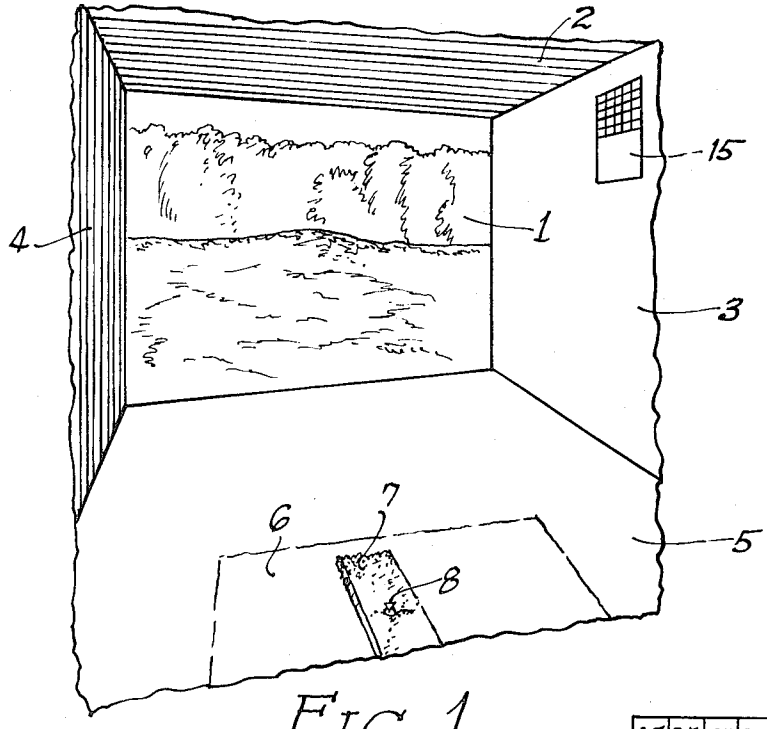


FIG. 1

A5	B5	C5	D5	E5
A4	B4	C4	D4	E4
A3	B3	C3	D3	E3
A2	B2	C2	D2	E2
A1	B1	C1	D1	E1

15 →

100 10 40 70
200 20 50 80
300 30 60 90
YARDS

FIG. 2

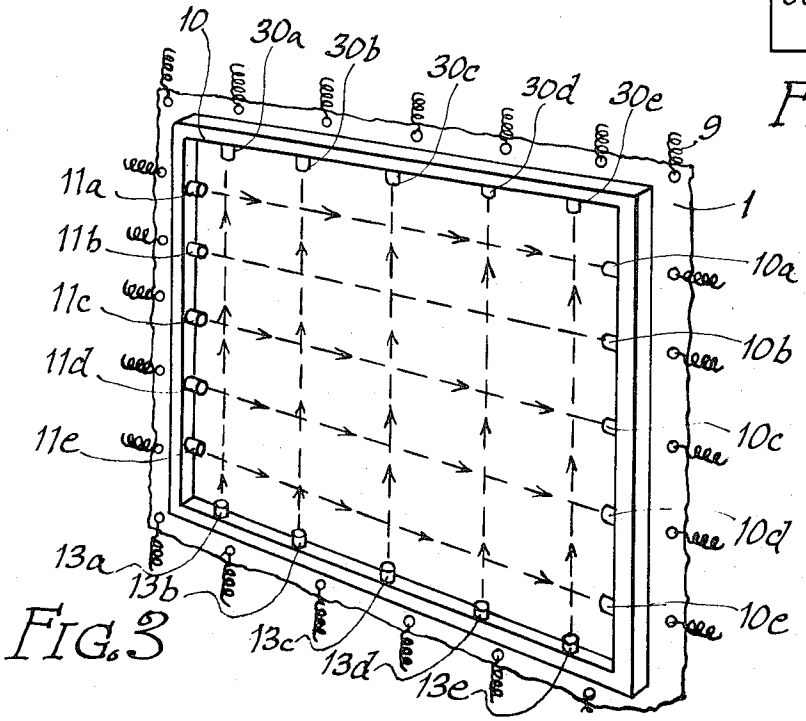


FIG. 3

FIG. 4a

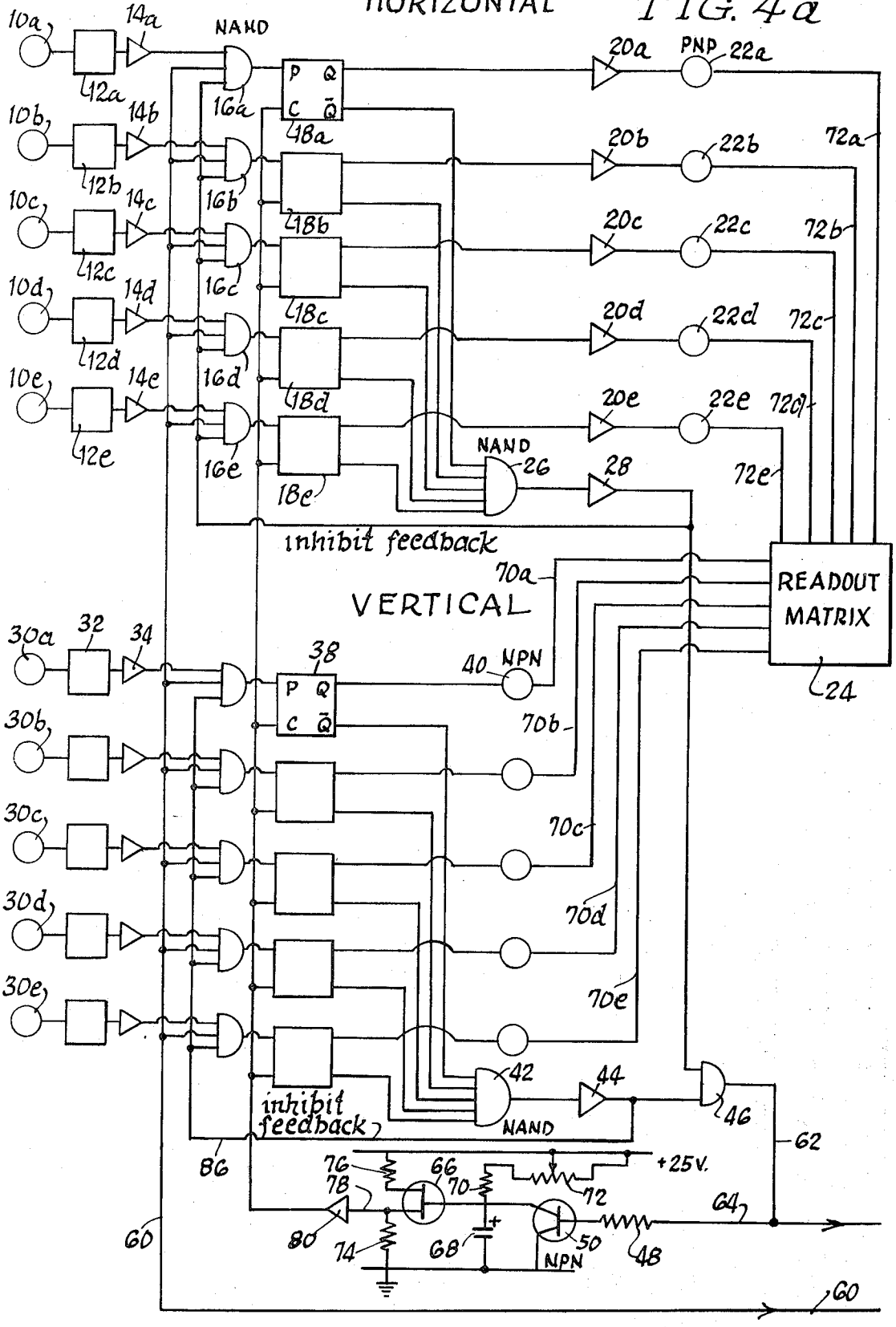
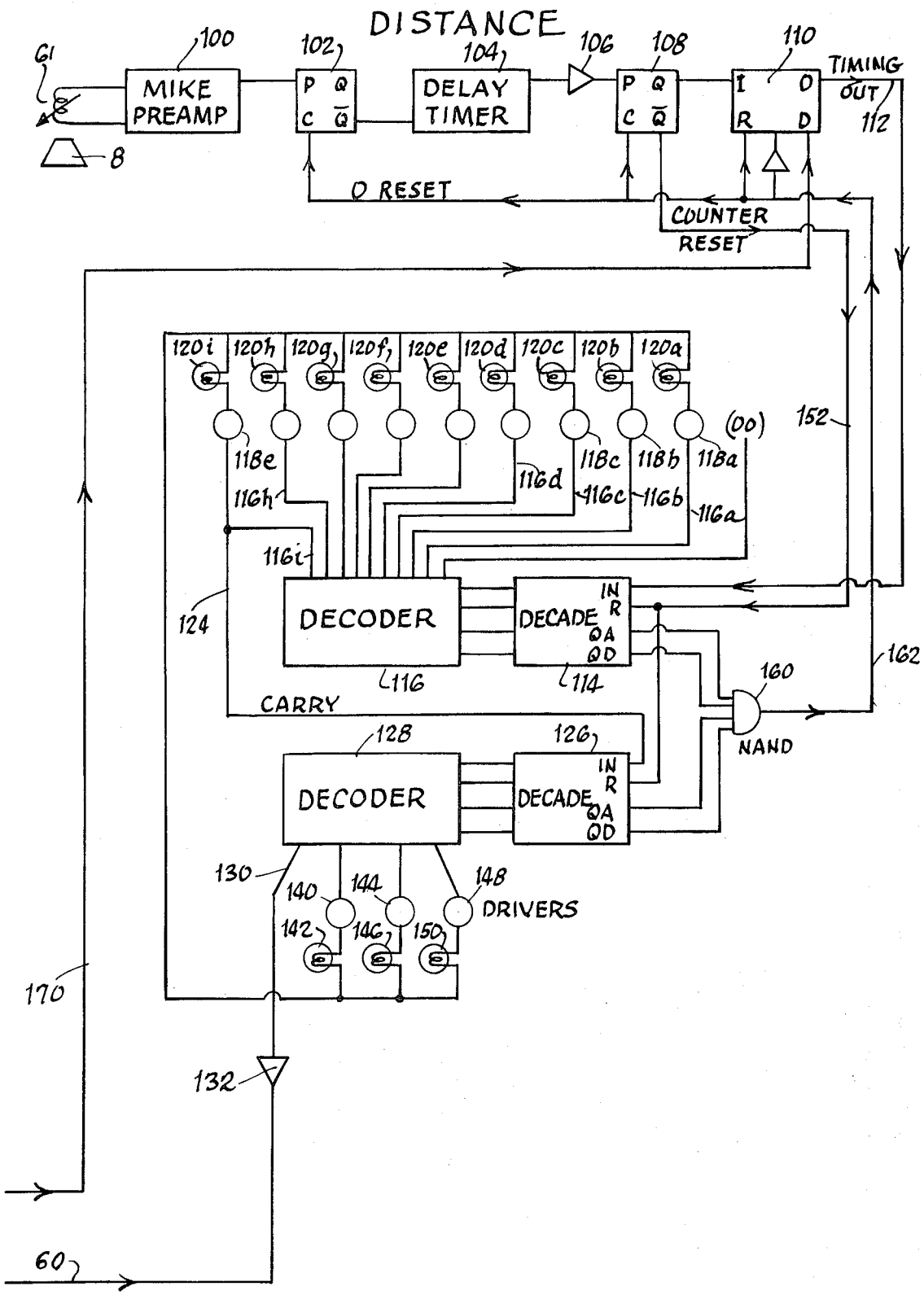

HORIZONTAL
VERTICAL
NAND
PNP
NPN
READOUT MATRIX
inhibit feedback
inhibit feedback
+25V.
10a
10b
10c
10d
10e
12a
12b
12c
12d
12e
14a
14b
14c
14d
14e
16a
16b
16c
16d
16e
18a
18b
18c
18d
18e
20a
20b
20c
20d
20e
22a
22b
22c
22d
22e
24
26
28
30a
30b
30c
30d
30e
32
34
38
40
42
44
46
48
50
60
62
64
66
68
70
70a
70b
70c
70d
70e
72
72a
72b
72c
72d
72e
74
76
78
80
86

FIG. 4b


DISTANCE
MIKE PREAMP
DELAY TIMER
TIMING OUT
0 RESET
COUNTER RESET
DECODER
DECADE
CARRY
NAND
DRIVERS

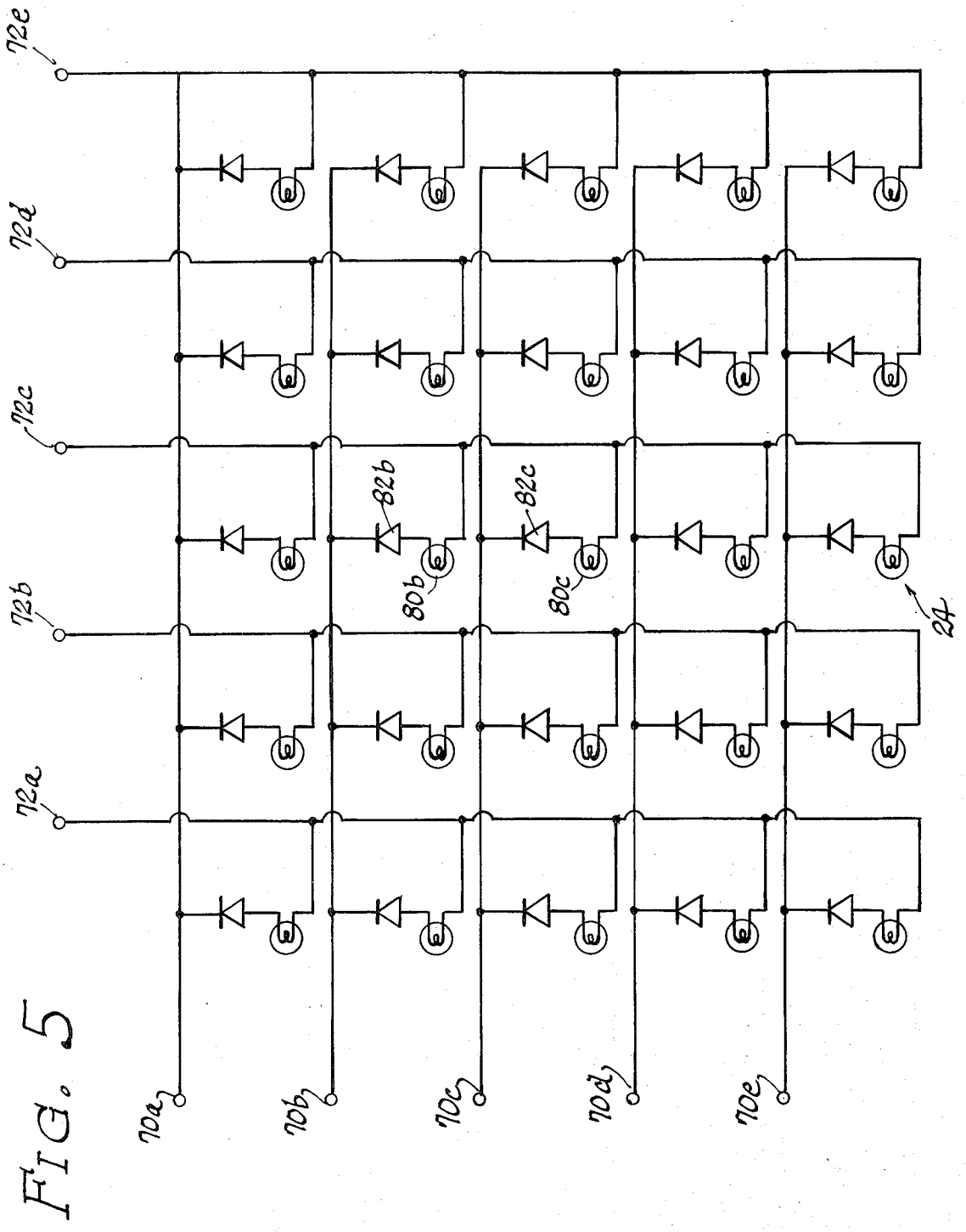


FIG. 5

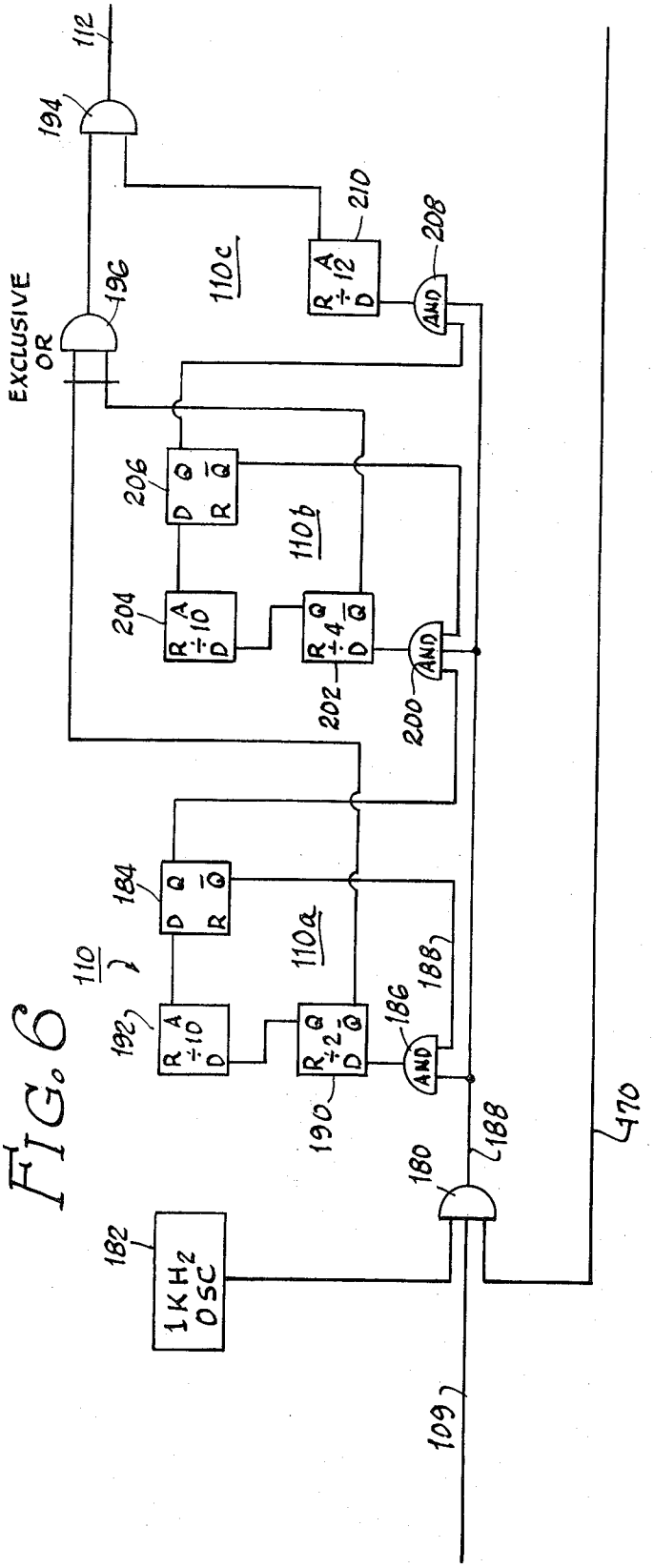

112
194
196
EXCLUSIVE OR
110c
210
208
AND
206
110b
204
200
202
184
110a
188
186
192
190
180
182
1KHz OSC
109
470

FIG. 6

GOLF GAME APPARATUS

BACKGROUND OF THE INVENTION

This invention relates to indoor apparatus which shows a golfer either the area where his ball would have traveled, the distance of flight of his ball, or both.

Indoor golf systems for improving one's golf game and utilizing a computing circuit are known in the prior art. Although certain prior art systems may be useful to determine the distance of flight of a driven golf ball, no indication is given as to where the ball hits the target. Such indication is desirable so that a golfer can know whether his ball travels too low, too high, too far to the left, too far to the right, etc.

Additionally, prior art apparatus have had difficulties in obtaining a correct reading when the ball contacts the target. It is, therefore an object of the present invention to provide a novel and improved means for determining when the ball has hit the target and for indicating to the player the area of the target where the ball was received.

BRIEF DESCRIPTION OF THE INVENTION

In accordance with the present invention, there is provided an apparatus for improving one's golf game. It can be seen that the apparatus of the present invention might be adopted for use in improving one's baseball batting ability. The apparatus comprises a ball contact location with a flexible sheet member or target spaced a predetermined distance from the ball contact location. A plurality of photosensitive elements and a plurality of light beam providing means are located on the side of the flexible sheet opposite the side on which the ball contact location is located.

The plurality of photosensitive elements and the light beam providing means are positioned on opposing positions adjacent the sheet member, whereby a plurality of light beams traverse the area of the flexible member adapted for ball contact and are received by strategically located photosensitive elements. The flexible sheet member has a selected flexibility to permit a ball contacted portion thereof to flex, thereby breaking a light beam and varying the light received by one of the photosensitive elements. A control circuit is coupled to readout means for indicating a condition to the player. Means are provided for coupling the photosensitive elements to the control circuit for operating the control circuit in response to the reception of light condition of the photosensitive elements.

In one form of the invention, the photosensitive elements are spaced to form a matrix of ball reception areas on the flexible sheet member. The readout means is coupled through the control circuit for indicating to the player the area of the sheet member where the ball was received.

In one embodiment of the invention, the ball contact location has a transducer located thereat. The transducer is responsive to the ball contact by the player. The control circuit includes a timing circuit, means for setting the timing circuit to a first condition in response to reception of a signal by the transducer when the player contacts the ball, and means for setting the timing circuit to a second condition in response to reception of a signal from the photosensitive means when the ball contacts the flexible member to break the light beam. In this manner the timing circuit is operable to time the flight of the ball from the transducer to the flexible member. Means are also provided for translating the elapsed ball travel time to distance indicia.

A more detailed explanation of the invention is provided in the following description and claims, and is illustrated in the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a fragmentary, perspective view of a self-improvement apparatus constructed in accordance with the principle of the present invention;

FIG. **2** is a front view of readout to indicate to the player the area of the target where the ball was received and the projected distance of flight of the ball;

FIG. **3** is a fragmentary, perspective view of the rear of the target of FIG. **1**, showing the photosensitive elements in position therewith;

FIG. **4***a* is the left-hand side of a block diagram of a control circuit constructed in accordance with the principles of the present invention;

FIG. **4***b* is the right-hand side of a block diagram of a control circuit constructed in accordance with the principles of the present invention, with FIGS. **4***a* and **4***b* being connectible to form a complete block diagram;

FIG. **5** is a schematic circuit diagram of the readout matrix circuit of FIG. **4***a*; and

FIG. **6** is a schematic circuit diagram of the log pulse generator of FIG. **4***b*.

DETAILED DESCRIPTION OF THE ILLUSTRATIVE EMBODIMENT

Referring to FIG. **1**, there is shown an indoor golf apparatus comprising a target **1** bounded by ceiling **2**, sidewalls **3** and **4**, and floor **5**. Located on floor **5** is a mat **6** having thereon simulated grass **7** upon which a tee **8** is position.

Target **1** is formed of a flexible sheet member suspended by springs **9**. The flexible sheet member is preferably formed of a canvas material and has a selected flexibility to permit a ball contacted portion thereof to flex. Positioned behind sheet member **1** is a rectilinear frame **10** carrying a number of spaced horizontal light beams providing means **11***a*, **11***b*, **11***c*, **11***d*, and **11***e*. These light beam directing means direct beams of light to respective horizontally spaced photocells **10***a*, **10***b*, **10***c*, **10***d* and **10***e*. Frame **10** also carries a number of vertically spaced light beam providing means **13***a*, **13***b*, **13***c*, **13***d* and **13***e* which provide light beams to respective vertically spaced photocells **30***a*, **30***b*, **30***c*, **30***d* and **30***e*.

The light beams emitted by means **11** horizontally traverse the rear side of target **1** to be received by the respective photocells. Likewise, the vertical beams provided by means **13** vertically traverse the rear of target **1** to be received by photocells **30**.

When a portion of target **1** is hit by the ball, that portion will flex and break one of the beams traversing the rear thereof. The breakage of such beam will be transmitted to a control circuit which is coupled to each of the photocells and the control circuit will operate a readout device **15** which will indicate to the player the area of the target that has been hit by the ball and the projected flight distance of the ball. For example, if the ball is hit and received at the upper left portion of the target, the light beams to photocells **10***a* and **30***e* will be broken due to the flexing of the net thereat. Refer-

ring to FIG. 2, the control circuit will compute the position of the ball and the designation "A5" of readout 15 will be energized to show the player that the ball has hit the upper left-hand portion of the target. The lower portion of readout 15 will show to the reader the projected flight distance of the ball, which will be computed by the control circuit that is discussed in detail below.

Referring to FIGS. 4*a* and 4*b*, a number of equally spaced horizontal indication sensors are provided. The indication sensors comprise spaced photocells 10*a*, 10*b*, 10*c*, 10*d* and 10*e*. For brevity, the multiplicity of identical elements which are represented in the drawings with the reference numerals and small letters will sometimes be referred to by the reference numeral alone. Photocell 10 is connected through Schmidt trigger 12 to inverter 14 which is connected to one of the inputs of NAND gate 16. The output of NAND gate 16 is connected to the preset junction of FLIP FLOP 18. The Q output of FLIP FLOP 18 is connected to the input of an inverter 20, the output of which is connected to a positive driver 22 which comprises a PNP transistor having a base input, and the collector of the transistor is connected to readout matrix 24 which will be described in more detail below.

The vertical indentation sensors are similar to the horizontal sensors and comprise a number of equally spaced photocells 30 each of which is connected through a Schmidt trigger 32 to inverter 34, the output of which is connected to one of the inputs of NAND gate 36. The output of NAND gate 36 is connected to the preset junction of FLIP FLOP 38, the Q junction of which is connected to the base of NPN transistor 40, forming a negative driver. The collector of transistor 40 is connected to readout matrix 24.

The sub Q junctions of FLIP FLOP 18 are each connected to an input of NAND gate 26, the output of which is connected to inverter 28. The output of inverter 28 is connected to an input of AND gate 46.

In the vertical system, the sub Q junction of FLIP FLOP 38 is connected to an input of NAND gate 42, the output of which is connected to an inverter 44. Inverter 44 is connected to the other input of AND gate 46.

The output of inverter 28 also feeds back to an input of each of NAND gates 16 and the output of inverter 44 feeds back to an input of each of NAND gates 36. A signal is provided from the distance system (which is discussed below) via line 60 to the other input of NAND gates 16 and 36.

The output of AND gate 46 is connected via line 62 and 64 to a timing circuit which includes a resistor 48 connected to the base of NPN transistor 50. The emitter of transistor 50 is connected to ground and the collector is connected to the emitter of unijunction transistor 66. A timing capacitor 68 is connected between the emitter of unijunction transistor 66 and ground and a series resistor 70 and potentiameter 72 are connected between the emitter of unijunction transistor 66 and a positive voltage source. The resistor 74 is connected between base one of unijunction transistor 66 and ground and a resistor 76 is connected between base two of unijunction transistor 66 and the positive voltage source. An output from unijunction transistor 66 is connected via line 78 through inverter 80 to the clear input junctions of FLIP FLOPS 18 and 38.

OPERATION OF THE REGISTRATION SYSTEM

The horizontal photocells 10 are equally spaced across the ball receiving target 1 in a horizontal direction and the vertical photocells 30 are equally spaced across the target 1 in a vertical direction. Assume now that the golf ball hits the center of the target. The indentation of the target will block the light to photocells 10*c* and 30*c*. When the light to photocell 10*c* is blocked, a 1-level signal is fed to Schmidt trigger 12*c* which emits a 0-level signal to the input of inverter 14*c*. A 1-level pulse is fed from the output of inverter 14*c* to an input of NAND gate 16*c*. If the distance system is ready to count, as will be described in detail below, line 60 is feeding a 1-level pulse to another input of NAND gate 16*c*. In its normal state, a 1-level pulse is being fed to the other inputs of gate 16*c*. Hence when two of the inputs of NAND gate 16*c* are at a 1-level and a 1-level pulse is fed to the other input of NAND gate 16*c* from inverter 14*c*, a 0-level pulse will be produced by NAND gate 16*c* to preset junction of FLIP FLOP 18c. At rest, FLIP FLOP 18*c* has a 1-level at its sub Q junction and a 0-level signal at its Q junction. When a 0-level pulse is applied to the present junction of FLIP FLOP 18*c*, FLIP FLOP reverses states thereby producing a 1-level signal at the Q junction and a 0-level signal at the Q junction.

The 1-level at the Q junction is inverted by inverter 26 and applied as a 0-level turn-on signal to the base of PNP transistor 22*c*. When transistor 22*c* is conductive, a signal is fed to a diode readout matrix 24.

Like the horizontal system, when the target is indented by a golf ball striking it at the center thereof, the light to photocell 30*c* will be blocked thereby producing a 1-level input signal to Schmidt trigger 32*c* which produces a 0-level signal to the input of inverter 34*c*, which 0-level signal is inverted and applied as a 1-level pulse to an input of NAND gate 36c. The other inputs of NAND gate 36*c* normally have a 1-level pulse applied to them and, when NAND gate 36*c* receives a 1-level pulse from inverter 34*c*, a 0-level pulse will be applied to the said junction of FLIP FLOP 38c. The sub Q junction of FLIP FLOP 38*c* is normally at a 1-level and the Q junction of FLIP FLOP 38*c* is normally at a 0-level. When the 0-level pulse is applied to the preset junction of FLIP FLOP 38*c*, the states will reverse and a 1-level turn-on pulse will be applied to the base of NPN transistor 40*c*. Thus NPN transistor 40*c* will be conductive and current will be fed via line 70 to diode readout matrix 24 at the same time that current is being fed via line 72 from the horizontal system to readout matrix 24. A signal lamp will indicate that the central portion of the target has been hit.

A schematic diagram of the readout matrix is shown in FIG. 5. Referring to FIG. 5, it can be seen that matrix 24 comprises inputs corresponding to the outputs of the positive drivers. The inputs are designated reference numerals 72*a*, 72*b*, 72*c*, 72*d* and 72*e*. The other terminals of the matrix correspond to lines 70*a*, 70*b*, 70*c*, 70*d* and 70*e* from negative drivers 40. When PNP transistor 22*c* and NPN transistor 40*c* are conductive, current will flow via lines 72*c* through lamp 80*c*, diode 82*c*, and line 70*c* to thereby energize lamp 80*c* thereby indicating that the ball has hit the center of the canvas. It will be apparent to those skilled in the art that other photocells will react to the ball hitting other portions of the target to energize other lamps in the matrix 24 in

the same manner that lamp **80***c* is energized when the light to photocells **10***c* and **30***c* is blocked due to the ball hitting the center of the target. To eliminate any conflicting registrations arising from secondary flexings of the canvas when the ball strikes the canvas, the registration system is inhibited or prevented from indicating any registration other than that produced by the first hit. To this end, although NAND gate **26** normally has all 1-level pulses at its inputs, as soon as a 0-level pulse is received at any of the inputs of NAND gate **26,** a 1-level pulse will be emitted at its output, will be inverted, and a 0-level pulse will be fed via line **84** to an input of NAND gates **16.** In this manner the 1-level signal must remain at the outputs of NAND gate **16** thereby preventing any of the FLIP FLOPS other than the one which has changed states, from changing state.

Likewise, the inputs to NAND gate **42** are normally at 1-level and the 0-level signal from one of the sub Q junctions of one of the FLIP FLOPS **38** will cause NAND gate **42** to produce a 1-level signal at its output, which signal is inverted to produce a 0-level signal via line **86** to an input to each of NAND gates **36.** As before mentioned, this will prevent all of the FLIP FLOPS **38** except for the one which has already changed state, from changing states.

A system is provided for determining the length of time in which the registration and distance indication to the operator will be energized. At the same time that **0**-level signals are being fed from inverters **28** and **44** via the respective feedback line to an input of gates **16** and **36,** the 0-level pulses are also being fed to the inputs of AND gate **46.** This results in an 0-level output of AND gate **46** which turns off NPN transistor **50.** When NPN transistor **50** is not conductive, timing capacitor **68** will charge. Potentiameter **72** is set so that after a pre-determined period of time, say 15 seconds, unijunction transistor **66** will be rendered conductive and emit a 1-level pulse which is inverted through inverter **80** to reset the system by placing a 0-level pulse at the clear junctions of all of the FLIP FLOPS **18** and **38.**

As stated below, the inputs to NAND gates **26** and **42** are normally at one level, thereby producing 0-level outputs which are inverted by inverters **28** and **44,** thereby producing a 1-level input at each of the inputs to AND gates **46.** This produces a 1-level output from AND gate **46** thereby rendering NPN transistor conductive to prevent capacitor **68** from charging until the ball is hit to activate the horizontal and the vertical photocells, thereby causing one of the horizontal and one of the vertical FLIP FLOPS to change states and provide a 0 input to each of NAND gates **26** and **42,** thereby turning off NPN transistor **50.**

DISTANCE RECORDATION SYSTEM

When the ball is hit and exits the tee, a transducer L1 is activated by the club passing it, thereby providing a pulse to Schmidt trigger **100.** The trigger **100** provides a negative square wave to the preset junction of FLIP FLOP **102,** the sub Q junction of which is connected to a delay timer **104** which is conducted through an inverter **106** to the preset junction of a FLIP FLOP **108.** The Q junction of FLIP FLOP **108** is connected to input I of log timer **110** which produces output pulses of varying length via output line **112** to the input of a decade counter **114.** Counter **114** is a unit decade counter and is connected to a unit decoder **116,** the outputs of which are connected through driver transistors **118** to indicating lamps **120.** Nine lamps **120** are provided, each of which correspond to 10-yard distances of the golf ball travel. For example, lamp **120**a corrsponds to 10 yards travel, lamp **120***b* corresponds to 20 yards travel, lamp **120***c* corresponds to 30 yards travel, etc., while lamp **120***i* corresponds to 90 yards travel.

The last output **116***i* of decoder **116** (which is connected to driver **118***i* and lamp **120***i*) is also connected to carry line **124** to the input of tens decade counter **126,** the outputs of which are connected to a tens decoder **128.** Tens decoder **128** has four outputs, the first of which is connected to line **130** which feeds a signal to inverter **132,** the output of which is connected to an input of NAND gate **16** and **36** via line **60.** When the system is at rest, the decoder **128** provides a 1-level pulse which is inverted by inverter **132** to provide a 0-level pulse to the inputs of NAND gates **16** and **36.** In other words, registration can only occur if the distance function is operating. The second output of decoder **128** is connected through a driver **140** to an indicating lamp **142** for indicating a 300-yard distance. The third output of decoder **128** is connected through a driver **144** to an indicating lamp **146** for indicating a 200-yard distance. The fourth output of decoder **128** is connected through driver **148** to an indicating lamp **150** for indicating a 100-yard drive.

At rest, the decade counters are held at the 0-level so that no lamps are illuminated. Holding the decade counters at the 0-level is achieved by a 1-level signal from the sub Q junction of FLIP FLOP **108** which is fed via line **152** to the reset junctions of decade counters **114** and **126.**

The first pulse to the unit decade counter **114** is translated by the decoder **116** to change the signal from the 00 junction of decoder **116** to the **116***i* junction of decoder **116** permitting **120***i* (90 yard) to be energized. Simultaneously, a pulse fed by carry line **124** will be translated by decoder **128** to transfer the signals from the 000 level, (line **130**) to driver **140** which energizes lamp **142** (300 yards). Changing the signals from the 00 level of the unit counter and the 000 level of the tens counter to energize lamps **120***i* and **142** can only occur when FLIP FLOP **108** changes its state to provide 0-level pulse at the sub Q junction thereof. Pulses from log generator **110** via line **112** cause the decade counters **114** and **126** to rate in the conventional manner to change the energization of the lamps **120** and **142, 146, 150,** via decoders **116** and **128,** respectively. As the pulses from pulse generator **110** proceed, first lamp **120**i and lamp **142** will be energized.

During the time interval that the ball is hit by the operator and the instant the ball hits the target, the pulses being produced by generator **110** will cause lamps **120** to be energized from left to right in sequence, and after lamp **120***a* has been energized, the next pulse lamp **142** will be de-energized and lamp **146** will be energized. Lamp **120***i* will then be energized and again the lamps will be energized in sequence going from left to right (with respect to FIG. **4***b*) and after lamp **120***a* is energized, lamp **146** will be de-energized and lamp **150** will be energized. It can therefore be seen that as the time passes between the time that the ball is hit by the operator and it his the target, the lamps will indicate a smaller distance of the ball travel because of the length of time that the ball takes to reach the canvas.

During the counting function, the output from the QA and QD junctions of decade counter **114** and the output from the QA and QD junctions of decade counter **126** are such that NAND gate **160** will have randon inputs thereto (not all at one level) so that a 1-level signal will be produced at the output of NAND gate **160** during counting. When counting is completed so that the decoder has achieved an energization of lamp **150** and a 00 output with respect to the units driving system, all of the inputs to NAND gate **160** will be at one level, thereby producing a 0-level signal from NAND gate **160** which is fed via line **162** to reset log pulse generator **110** and to clear FLIP FLOPS **102** and **108.** Therefore, the illustrative embodiment permits indication of distance that a ball travels from 390 to 100 yards.

The reset pattern of the distance metering section always functions in this described manner. In the event of a score, when line **170** changes to 0-level to arrest the operation of the log function generator, the counting stops and the appropriate score lamps remain lighted. When the unijunction timer **66** (FIG. 4*a*) completes its reset cycle, as described, line **170** returns to 1-level. With line **170** at 1-level, the log function generator continues its timing cycle until NAND gate **160** provides the 0-level reset signal, by the conditions described.

Once the ball is hit, and the club passes transducer L1 to register, delay timer **104** provides a 60 millisecond delay before it begins firing. The delay timer may be of any conventional type, such as the capacitor-unijunction transistor type timer illustrated in connection with the registration system. After the 60 milliseconds has passed, lamps **142** and **120***i* will be energized to indicate 390 yards. The log pulse generator **110** is providing pulses of unequal length. In this manner, for example, after 20 milliseconds the 300-yard lamp **142** will be energized, after 40 additional milliseconds the 200-yard lamp **146** will be energized, and after 120 additional milliseconds, the 100-yard lamp **150** will be energized. In other words, the lamps are energized in accordance with the exponential relationship of the time of travel and distance traveled.

As explained above in connection with the registration system, the output of AND gate **46** is normally at a 0-level. When the registration system is operating, this indicates that a distance indication is being achieved (i.e., the distance system is counting). When there is a score during the counting, line **170,** which normally is at 1-level, changes to 0-level to prevent an output signal from log pulse generator **110.** In other words, the counters of the distance system commence counting 60 milliseconds after the club swings adjacent to transducer L1 and when the ball hits the target, the log pulse generator **110** is prevented from having an output by putting a 0-level pulse on line **170.** The operation of the log pulse generator is shown most clearly in FIG. **6.** Referring to FIG. **6,** it is seen that line **109** from FLIP FLOP **108** is connected to one of the inputs of AND gate **180.** A 1 kilohertz oscillator **182** is connected to another input of AND gate **180** and line **170** is connected to the third input to AND gate **130.** Normally, line **109** is at 0-level so there is 0-level output at AND gate **180.** After the 60 millisecond delay has occurred, FLIP FLOP **108** will change its state to provide a 1-level pulse at the center input of AND gate **180** to permit AND gate **180** to follow the levels of oscillator **182.** Oscillator **182** turns AND gate **180** on 1,000 times per second.

A FLIP FLOP **184** is provided, normally having a 1-level output at its sub Q junction, which is fed to the input of AND gate **186.** Therefore, AND gate **186** follows the fluctuations from AND gate **180** on line **188.** The output of AND gate **186** is connected to the input of a divide-by-two FLIP FLOP **190,** the Q junction of which is connected to the input of a divide-by-10 FLIP FLOP **192.** The output of the divide-by-10 FLIP FLOP **192** is connected to the input of FLIP FLOP **184** so that AND gate **186** will be turned off when 20 counts have been recorded. The purpose of AND gate **186** and FLIP FLOPS **184, 190** and **192** is to provide 10 2-millisecond pulses to the previously described counter circuitry. The pulses are fed via dual input gate **194** to line **112** which feeds the input of decade counter **114.**

After the 10 pulses have been recorded, FLIP FLOP **184** changes its state to present a contact 0-level at the output of AND gate **186** and to present a 1-level pulse to the input of AND gate **200.** AND gate **200** is now responsive to the pulses via line **188** and will activate divide-by-four FLIP FLOP **202** which is connected to divide-by-10 FLIP FLOP **204** which is connected to FLIP FLOP **206.** The purpose of the section including AND gate **200** and FLIP FLOPS **202, 204** and **206** is to provide 10 4-millisecond pulses for a timed duration of 40 milliseconds to exclusive OR gate **196** and positive NOR gate **194** to line **112.** After 10 4-millisecond pulses have been recorded, FLIP FLOP **26** will change its state to provide a 0-level pulse to the input AND gate **200** thereby providing a 0-level pulse to the input AND gate **200** thereby providing a constant 0-level pulse at the output of AND gate **200** and Q junction of FLIP FLOP **206** which will provide a 1-level pulse to the input of AND gate **208.** The other input of AND gate **208** which is connected to line **188,** will cause AND gate **208** now to follow the pulse on line **188** to activate a divide-by-12 FLIP FLOP **210.** FLIP FLOP **210** is utilized to provide 10 12-millisecond pulses over a 120 millisecond time period via positive NOR **194** which provides a signal via line **112** to decade counter **114.**

As explained above, when 180 milliseconds have expired, the decade counters **114** and **126** have arrived at 1-levels so that the input to NAND gate **160** are at 1-level thereby providing a 0-level pulse via line **162** to clear FLIP FLOP **102,** FLIP FLOP **108,** and to reset log pulse generator **110.** Summarizing with respect to the log pulse generator **110,** it is seen that after 60 milliseconds have expired from the time the club is swung, a first stage **110***a* will provide 10 2-millisecond pulses over a 20 millisecond time period. After that 20 millisecond time period has expired (for a total of 80 milliseconds) stage **110***b* will provide 10 4-millisecond pulses for a 40 millisecond time period. After the 40 millisecond time period has expired (for a total of 120 milliseconds) stage **110***c* will prove 10 12-millisecond pulses for a time period of 120 miliseconds. After a 120 millisecond time period has expired (for a total of 240 milliseconds) the counter circuitry resets and is placed in condition for determining the distance for the next ball that is hit.

Although an illustrative embodiment of the invention has been shown and described, it is to be understood that various modifications and substitutions may be

made by those skilled in the art without departing from the novel spirit and scope of the present invention.

What is claimed is:

1. In a apparatus for improving one's golf game or the like, wherein a screen is spaced a predetermined distance from a ball contact location; the improvement comprising, in combination: said screen being formed of a flexible sheet member; a plurality of horizontally and vertically disposed photosensitive elements; a plurality of horizontally and vertically disposed light-beam providing means; said photosensitive elements and said light-beam providing means being located on the side of said flexible sheet opposite the side on which said ball contact location is located, said photosensitive elements and said light-beam providing means being located on opposing positions adjacent said flexible sheet member whereby a plurality of light beams traverse the area of said flexible sheet member adapted for ball contact and are received by strategically located photosensitive elements to form a matrix of ball reception areas on said flexible sheet member; sand flexible sheet member having a selected flexibility to permit a ball contacted portion thereof to flex thereby breaking a light beam and varying the light received by one of said photosensitive elements; a control circuit coupled to readout means for indicating to the player the area of said sheet member where the ball was received; said control circuit including means for permitting transmission of a signal in response to the light beam breakage received by a first horizontal-vertical photosensitive elements combination and for inhibiting transmission of additional signals thereafter in response to the light beam breakage received by other horizontal-vertical photosensitive elements combinations; and means for resetting said transmission-inhibiting means.

2. Apparatus as described in claim **1**, said ball contact location having a transducer located thereat, said transducer being responsive to the ball contact by the player, said control circuit including a timing circuit, means for setting said timing circuit to a first condition in response to reception of a signal by said transducer when the player contacts the ball, means for setting said timing circuit to a second condition in response to reception of a signal from said photosensitive means when the ball contacts the flexible member to break a light beam, said timing circuit thereby being operable to time the flight of the ball from the transducer to the flexible member; and means for translating the elapsed ball travel time to distance indicia.

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