May 28, 1963 M. R. SPEISER 3,091,466

COMPUTER-TYPE GOLF GAME

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Fig. 1

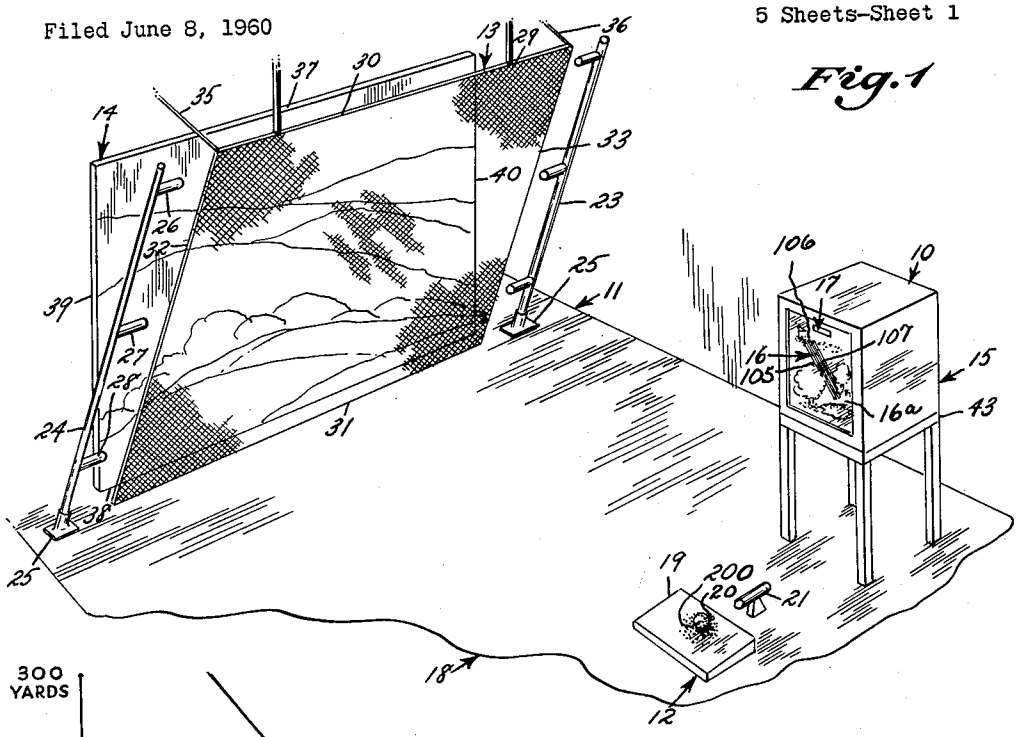


Fig. 2

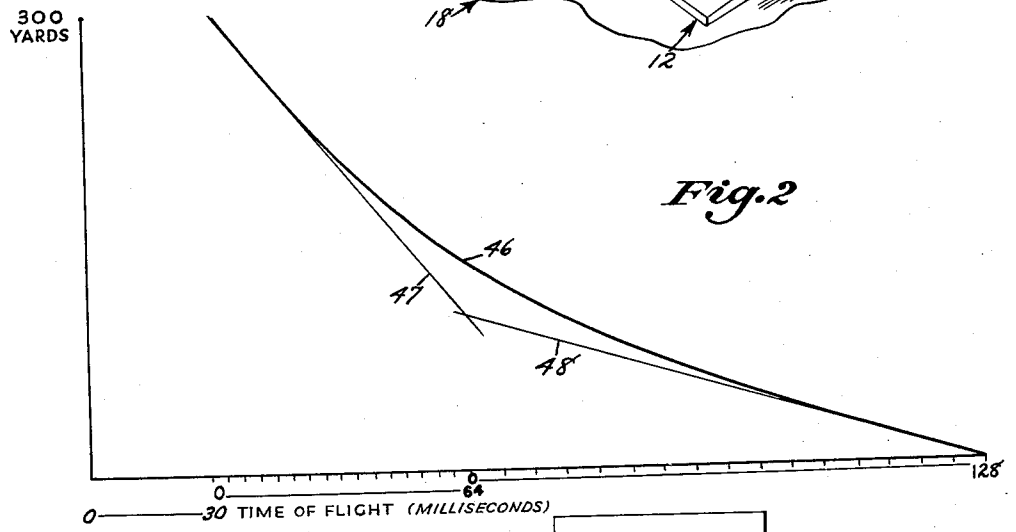
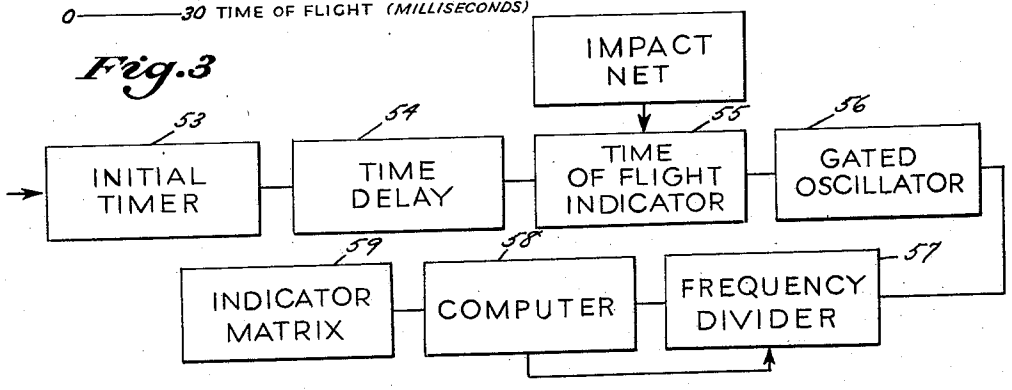


Fig. 3

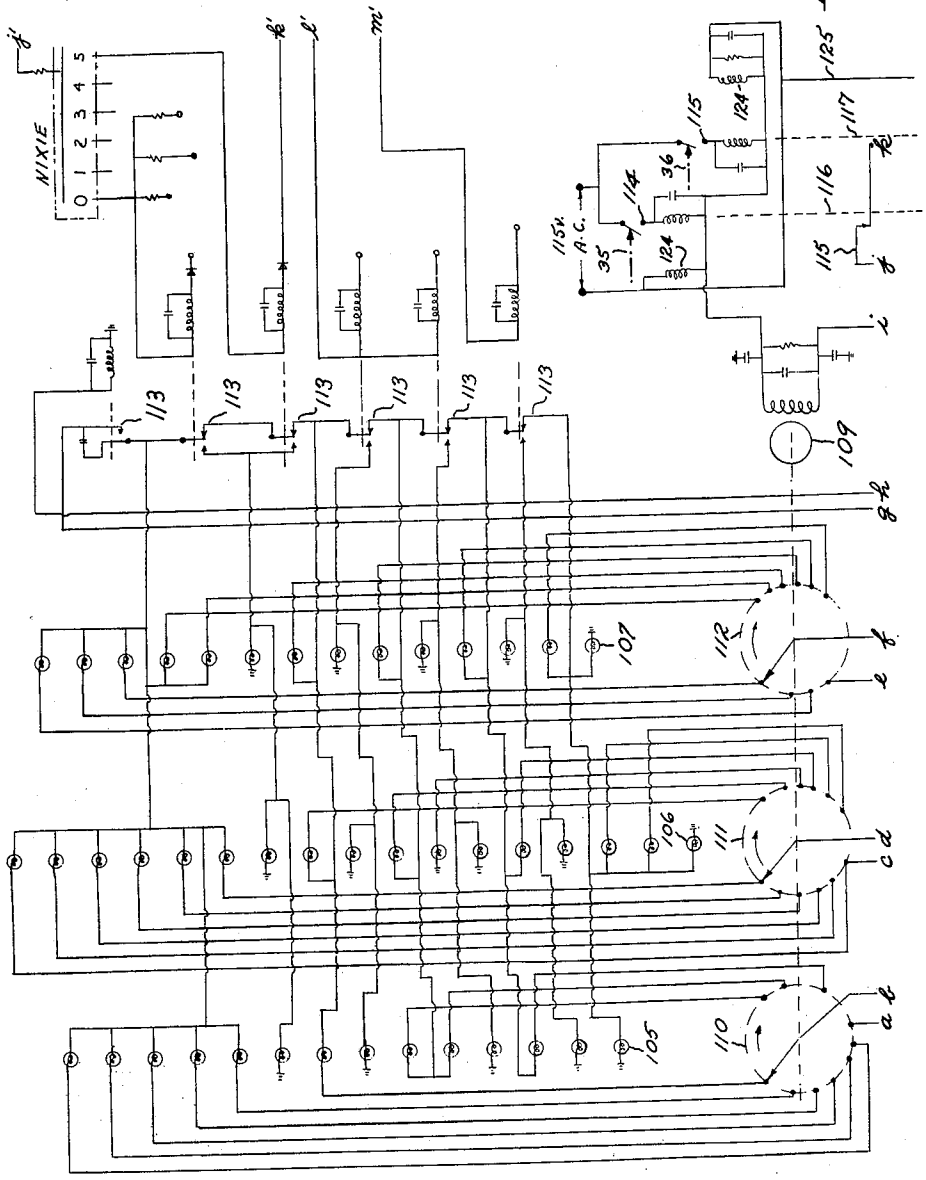


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COMPUTER-TYPE GOLF GAME

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Fig. 4a

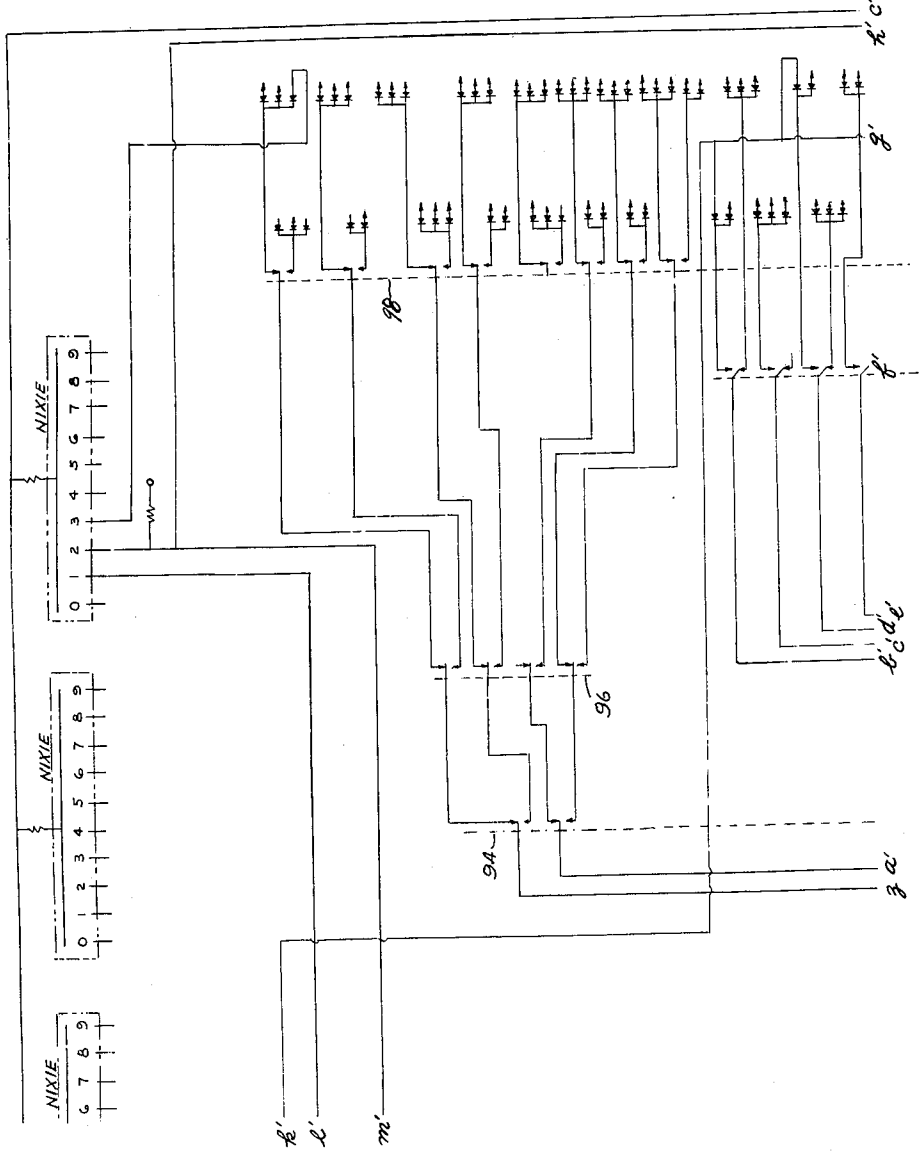


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COMPUTER-TYPE GOLF GAME

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Fig. 4b

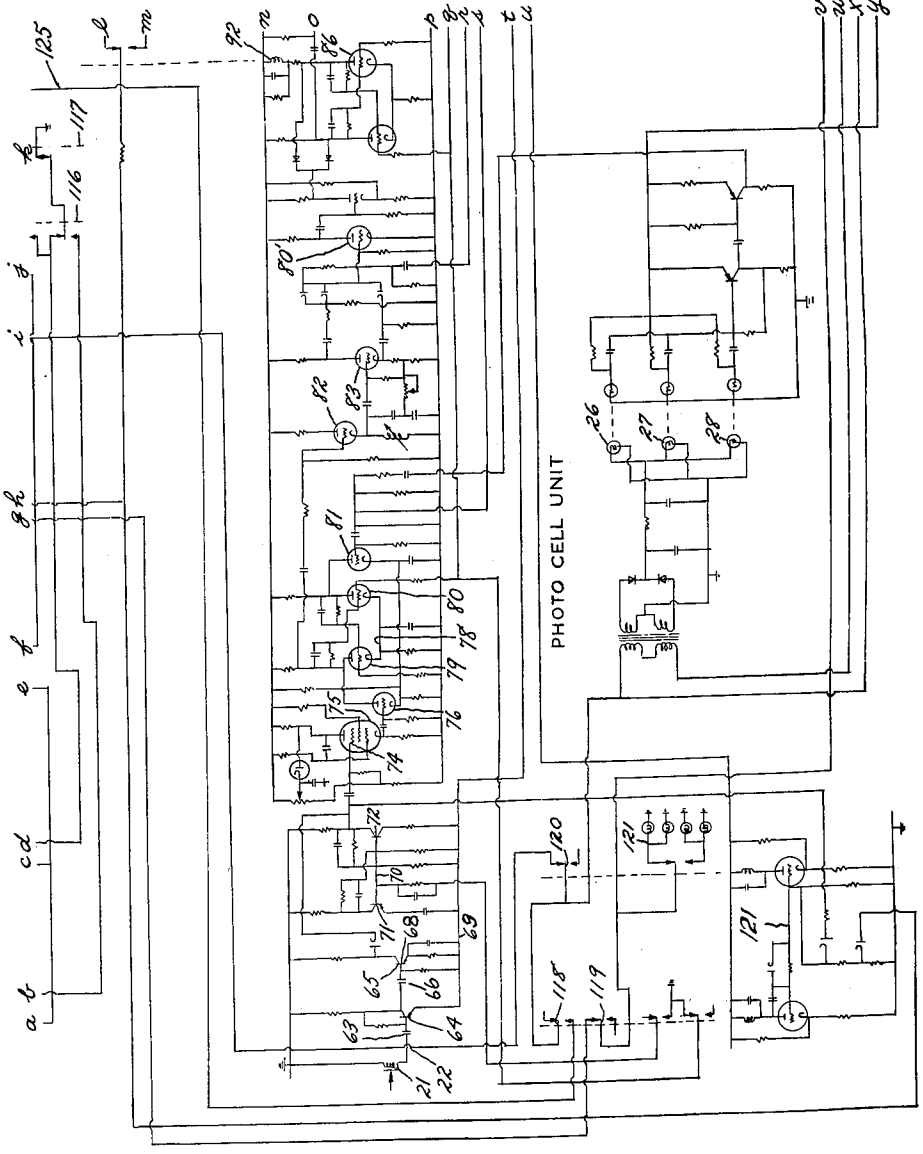


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COMPUTER-TYPE GOLF GAME

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Fig. 4c



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COMPUTER-TYPE GOLF GAME

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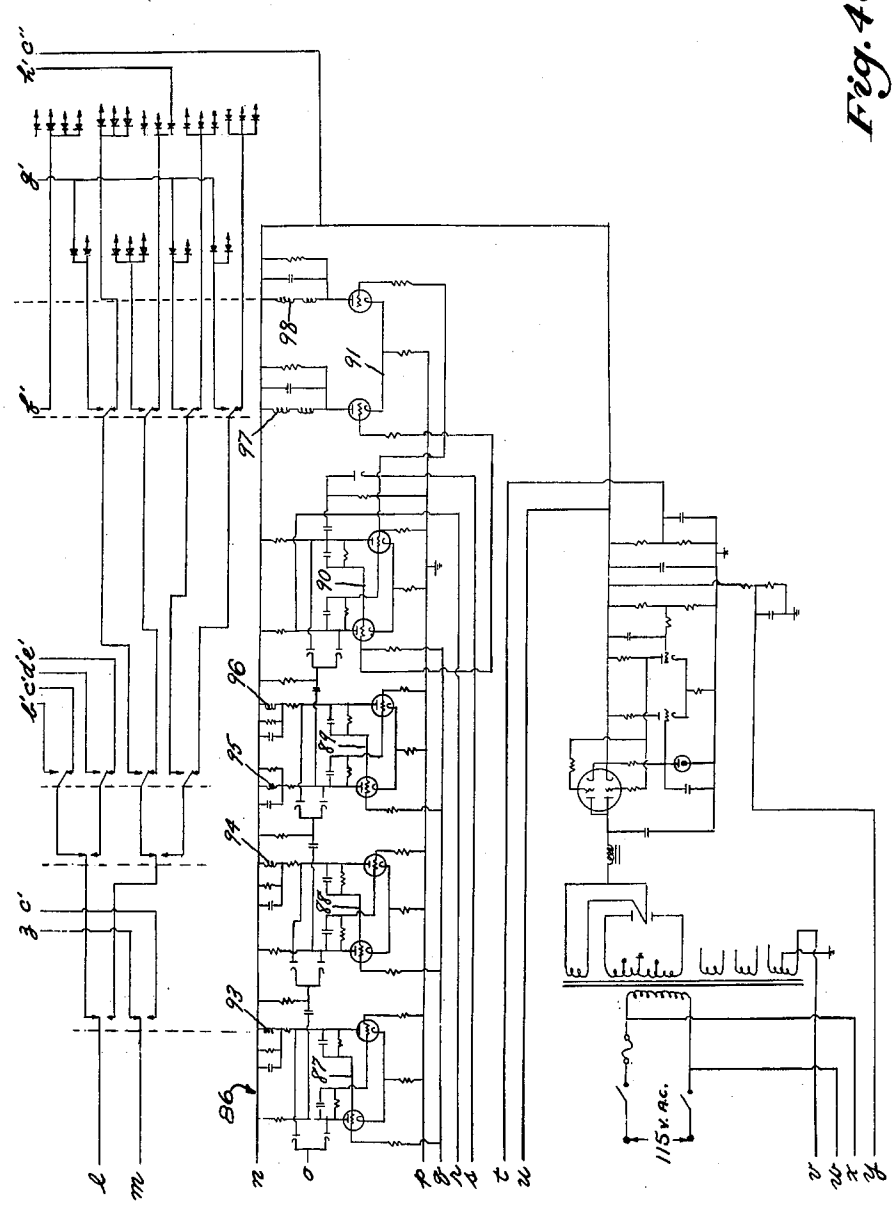


Fig. 4a

United States Patent Office 3,091,466 Patented May 28, 1963

3,091,466

COMPUTER-TYPE GOLF GAME

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4 Claims. (Cl. 273—184)

This invention relates generally to the field of amusement devices, and more particularly to an improved simulated golf driving range suitable for use in amusement parks, arcades and similar installations where considerations of space make the installation of an actual driving range impractical. Devices of this type are generally known in the art, and the invention in the specific construction employed which permits installation at a markedly reduced cost and accompanying simplified servicing of the device throughout its useful life.

In devices of the prior art, it is known to incorporate in the golf tee which supports the ball prior to contact by a golf club, a circuit-closing means which commences operation of a computing device, and which operates in conjunction with a second circuit-losing means disposed in an impact screen situated approximately 25 or 30 feet from the point of driving. Complicated analog computer devices have been employed to combine factors involving initial and final velocities of the driven ball, the degree of spin imparted to the ball, and the angle of initial flight to arrive at a probable estimate range and ultimate location of the ball at the completion of flight. Such devices are based on a mechanization of ballistic curves, and result in such a high degree of mechanical complexity, that initial cost as well as subsequent servicing are prohibitive. It has been found that to obtain an accuracy of approximately five percent, which is more than adequate for an amusement device, it is possible to base range solely upon initial velocity, disregarding the angle of impact, and the computation of this single factor may be performed with a complete elimination of the use of analog computers.

It is among the principal objects of the present invention to provide an improved device of the class described which may perform a reasonably accurate computation using a single binary computer, with a minimum of associated mechanical linkages.

Another object of the invention lies in the provision of a device of the class described in which the cost of fabrication may be of an order substantially less than existing prior art devices, with consequent wide sale, distribution and use.

Still another object of the invention lies in the provision of a device of the class described in which the player is advised in terms of actual footage the approximate range of an individual drive, and within a very short period of time after the drive has been completed.

A further object of the invention lies in the provision of a golf game of the class described in which the player is presented with a display upon a screen showing the representation of his drive as a plurality of serially flashing lights along a pre-selected path, the length of the path being determined by the above-mentioned binary computer as an associated function.

A feature of the invention lies in the total absence of variable potentiometers and other voltage-storing devices requiring a substantial amount of time to reach a null or to reset, thereby providing for extremely rapid operation.

These objects and features, as well as other incidental ends and advantages, will more fully appear in the progress of the following disclosure, and be pointed out in the appended claims.

In the drawings, to which reference will be made in the specification, similar reference characters have been employed to designate cooresponding parts throughout the several views.

FIGURE 1 is a view in perspective of an embodiment of the invention.

FIGURE 2 is a graph showing a time cycle used during a single cycle of operation of the device.

FIGURE 3 is a block diagram of the electronic circuit used in connection with the embodiment.

FIGURE 4 is an electrical schematic diagram showing in greater detail the elements shown in FIGURE 3.

In accordance with the invention, the device, generally indicated by reference character **10**, comprises broadly: a driving range **11**, having thereon a driving location **12**, an impact screen element **13**, a back drop **14**, a computer element **15**, first indicator means **16** and second indicator means **17**.

The driving range **11** may be installed in any suitable location offering approximately an area of ten feet by thirty feet, the bulk of the floor area, generally indicated by reference character **18** of which may be covered by simulated grass or the like. The driving location **12** may be provided with a small raised platform **19** simulating a golf tee area, the tee **20** having associated therewith in close proximity a dynamic microphone **21** adapted to generate a signal upon occurrence of a sound of contact between a club head and a golf ball.

The impact screen element **13** is preferably inclined at an angle with respect to the vertical, as best seen in FIGURE 1, and includes a pair of supporting stanchions **23** and **24**, the lower portions **25** of which are anchored to the floor **18**. A plurality of photocell units **26**, **27** and **28** are disposed within the stanchions **23** and **24**, and located in such position that the path of light beams emanating from one of the stanchions to the other is blocked by a meshed screen **29**. Impact of a golf ball upon the screen will distort the screen from its normally planar condition to permit at least one of the photocell units to generate a signal, which will indicate the completion of flight of the golf ball. The screen **29** is preferably rectangular in configuration, including an upper edge **30**, a lower edge **31**, as well as side edges **32** and **33**. Adjacent the upper left- and right-hand corners are small cords **35** and **36** connected to switches (not shown) which indicate the presence of a drive leftward or rightward of the fairway, which information is utilized, as will become more clearly apparent at a point later in the disclosure, in the actuation of the second indicating means **17**.

The back drop **14** may be of any suitable construction, or may be painted upon a wall of the room in which the device is disposed, the same being bounded by an upper edge **37**, a lower edge **38** as well as side edges **39** and **40**.

The computer element **15** is preferably supported upon a table element **43** adjacent the player, so that he may readily observe the results of each drive. Before entering into a detailed consideration of the computer element, a short discussion of the theory involved is believed in order.

Theoretically, a golf ball, like any projectile, will execute a trajectory in accordance with well-known ballistic equations. After contact with the head of a golf club, the ball commences flight at an initial angle with respect to the horizontal, and with an initial velocity. The ball will encounter normal air resistance, will be affected by prevailing winds, and will accelerate in a downward direction in response to the force of gravity. It has been empirically determined that over the relatively short path of flight normally traversed by a golf ball (under 300 yards) that almost all golf balls which will travel more than 30 or 40 feet will leave the tee at an angular path of travel which varies not more than a few degrees, with

respect to the horizontal. In most cases, therefore, practically all of the considerations employed to determine ultimate displacement may be disregarded with the exception of the initial velocity. Further, it is not necessary to measure the total lapse of time from the moment the ball is struck until it reaches the impact screen, since all balls having sufficient velocity to reach the screen will require a certain minimum period of time to reach the same, and if more than a predetermined additional period of time is required before the ball ceases flight, it will not possess sufficient initial velocity to reach the screen. Thus, FIGURE 2 in the drawing discloses a simple trajectory curve in which displacement of the ball is plotted against elapsed time. The curve **46** may be closely approximated by drawing first and second straight lines **47** and **48** tangent to two parts of the curve. It will be observed that the initial period of approximately thirty milliseconds is required by even the fastest traveling ball.

The relatively rapid rate of displacement is continued for approximately another 64 milliseconds, at which point a greater lapse of time of flight results in markedly less difference in displacement. After an additional 128 milliseconds, the elapsed time of flight is such that balls having a still greater time of flght will not reach the impact screen. Thus, if it is possible to eliminate the initial minimum period during which the fastest traveling ball will reach the impact screen, and to divide the remaining period of time into two portions in which time is measured in the first portion over relatively short increments, and in the second portion over relatively long increments, it is possible to employ a relatively simple binary circuit to measure substantially all of the possible variations in flight, from the standpoint of elapsed time.

Referring to FIGURE 3 in the drawing, there is seen a block diagram including a first or initial timer unit incorporating the microphone **21**, a first amplifier **53**, a time delay unit **54** which places a thirty millisecond delay upon the operation of the timer. A time-of-flight measuring unit **55** operates a gated oscillator **56**, which is controlled as to frequency by a frequency divider **57**. The controlled signal emanating from the oscillator **56** is fed to a binary unit **58** of the computer element **15** which feeds its information to a matrix **59** operating the first and second indicating means **16** and **17**. The computer unit **58** contains means controlling the frequency divider **57**.

Referring to FIGURE 2, it will be noted that the first thirty milliseconds of flight may be disregarded from the standpoint of measuring the time of flight. The next period is divided into increments of four milliseconds each to cover approximately the entire range of the line **47**, there being sixteen such increments. The next period corresponding to the line **48** is divided into sixteen increments of eight milliseconds each. During operation, the contact of a ball by a golf club generates a signal in the microphone **21**. This signal is gated so that only the first oscillation of the damped vibration is employed. This oscillation passes through the first amplifier **53** and the time delay unit causing a delay of thirty milliseconds. At the completion of this period, the time-of-flight unit **55** commences operation, and the gated oscillator **56** commences oscillation at 250 cycles per second. Upon contact of the impact screen element **13** by the ball, the photocell units **26–28**, or at least one of them, will cause a signal to be impressed upon the gated oscillator **56** terminating subsequent oscillation. When the point of intersection of the lines **47** and **48** is reached, the computer unit **58** operates the frequency divider **57** so that alternate pulses only are measured to permit increments of eight milliseconds (as opposed to four milliseconds) for the remaining third period. The information of the computer unit operates a binary circuit to be subsequently described, and the output thereof is then transmitted to the indicator means **16** and **17**.

With the foregoing discussion in view, reference is now made to FIGURE 4 in the drawing where the circuit shown in FIGURE 3 is illustrated in greater schematic detail. The microphone **21** generates a signal which is fed through a capacitor **63** to the base of a first transistor **64** (see FIGURE 4*c*). This signal is impressed upon the base **65** of a second transistor **68** through a capacitor **66**, the second transistor acting as an amplifier. The signal subsequently passes through the conductor **69** to a bi-stable multivibrator circuit **70** including a third transistor **71** and a fourth transistor **72**. The output of the circuit **70** is impressed upon the grid **74** of a pentode tube **75** forming part of a Miller-sweep circuit. The output of this tube operates a trigger tube **76** controlling a bistable multivibrator circuit **78** comprising two triodes **79** and **80**. The gated oscillator tube **81** is controlled by the frequency divided tube **82** upon the occurrence of sufficient bias impressed upon the latter emanating from the computer unit **58**. Since the primary oscillation includes pulses from both the plate and cathode of the oscillator, the voltage divider merely arrests oscillations on the plate, causing the net oscillation to be one half that of the undivided frequency. Reference character **83** designates an amplifying triode, the output of which is fed to a driver triode **80′** which feeds this output to the computer unit.

Referring to FIGURES 4*a*, 4*b*, 4*c* and 4*d*, the binary circuit, generally indicated by reference character **86**, includes a first multivibrator circuit **87**, a second multivibrator circuit **88**, a third multivibator circuit **89**, a fourth multivibrator circuit **90** and a fifth multivibrator circuit **91**. Each of the multivibrator circuits **87–91** operates one or more solenoid type relays **92**, **93**, **94**, **95**, **96**, **97** and **98**, as is well known in the art. The five multivibrators **87–91** provide thirty-two increments, the first sixteen of which correspond to the 4 millisecond increments seen in FIGURE 2, and the remaining sixteen of which correspond to the 8 millisecond increments which subsequently follow. The output of the binary computer circuit **86** is fed directly to three electronic numeral indicator or nixie tube circuits shown in FIGURE 4 which illuminate momentarily to show the projected range of an individual drive. Referring to FIGURE 4*a*, a plurality of tracing lights **105**, **106** and **107** may indicate left, center or right-hand path of flight respectively. A single motor **109** drives rotary type switches **110**, **111** and **112**, current passing through relay switches **113** operated by the binary computer circuit **86**, indicating length of path corresponding to distance. Directional switches **114** and **115**, controlled from the impact net element by members **35** and **36**, determine a selection of left or right-hand paths, the same controlling relays **116** and **117**. Normally, the center lights **106** will be operated. In the event that the ball strikes leftward or rightward on the impact net element, the corresponding switch will be tripped to result in flashing of the rows of lights **105** or **107**, which will appear through the translucent panel **16***a* forming the first indicator means **16**. As the switches **113** are operated by the binary computer circuit, the number of lights flashing to indicate the path will be roughly proportional to the projected distance, so that the player has not only an indication of the number of yards of the projected drive, but an approximate visual indication of the projected path of flight as well. At the same time the nixie tubes will show the projected distance of ball travel forming the second indicator means **17**.

The device is readied for a subsequent drive by operation of a standard electronic capacitor type timer **121**, the circuit of which merely places the necessary bias voltages upon the above-described components to return them to their initial state. The larger the capacitor **122**, the longer the lights **105**, **106** or **107** are illuminated after the flight of the ball **200** is terminated. Relay contacts **118** control the unlatching relay coils **124** via conductor

125; contacts 119 control running lights; and contacts 120 control the motor 109.

I wish it to be understood that I do not consider the invention limited to the precise details of structure shown and set forth in this specification, for obvious modification will occur to those skilled in the art to which the invention pertains.

I claim:

1. In a golf game including means for producing a pulsing electrical signal upon commencement of flight of a ball from a starting position, and arresting said signal upon contact of said ball with a screen disposed within the path of flight of said ball, improved means for closely estimating the length of projected trajectory of said ball in the absence of said screen, by assuming said projected trajectory to be along two straight intersecting lines, said means comprising: a computer system having first delay means for commencing operation of said computer a first fixed period of time after commencement of said flight of said ball, during which period said ball is assumed to be traveling along one of said straight lines, second means for computing the elapsed time of flight in relatively small increments for a second fixed period of time commencing after operation of said delay means, and during which period said ball is assumed to remain traveling on said above-mentioned straight line, and third means commencing operation after said second fixed period of time has elapsed for computing elapsed time in relatively greater increments, during which period said ball is assumed ot be traveling along the other of said straight lines; and means for translating computed periods of time into visible indicia.

2. In a golf game including means for producing a pulsing electrical signal upon commencement of flight of a ball from a starting position, and arresting said signal upon contact of said ball with a screen disposed within the path of flight of said ball, improved means for closely estimating the length of projected trajectory of said ball in the absence of said screen, by assuming said projected trajectory to be along two straight intersecting lines, said means comprising: a computer system having first delay means for commencing operation of said computer a first fixed period of time after commencement of said flight of said ball, during which period said ball is assumed to be traveling along one of said straight lines, second means for computing the elapsed time of flight in relatively small increments for a second fixed period of time commencing after operation of said delay means, and during which period said ball is assumed to remain traveling on said above-mentioned straight line, and third means commencing operation after said second fixed period of time has elapsed for computing elapsed time in relatively greater increments, during which period said ball is assumed to be traveling along the other of said straight lines; and electronic numeral indicator means

for translating computed periods of time into visible indicia.

3. In a golf game including means for producing a pulsing electrical signal upon commencement of flight of a ball from a starting position, and arresting said signal upon contact of said ball with a screen disposed within the path of flight of said ball, improved means for closely estimating the length of projected trajectory of said ball in the absence of said screen, by assuming said projected trajectory to be along two straight intersecting lines, said means comprising a computer system having first delay means for commencing operation of said computer a first fixed period of time after commencement of said flight of said ball, during which period said ball is assumed to be traveling along one of said straight lines, second means for computing the elapsed time of flight in relatively small increments for a second fixed period of time commencing after operation of said delay means, and during which period said ball is assumed to remain traveling on said above-mentioned straight line, and third means commencing operation after said second fixed period of time has elapsed for computing elapsed time in relatively greater increments, during which period said ball is assumed to be traveling along the other of said straight lines; and a series of indicator lights, and means illuminating said lights in repetitive serial fashion in proportion to computed periods of time.

4. In a golf game including means for producing a pulsing electrical signal upon commencement of flight of a ball from a starting position, and arresting said signal upon contact of said ball with a screen disposed within the path of flight of said ball, improved means for closely estimating the length of projected trajectory of said ball in the absence of said screen, by assuming said projected trajectory to be along two straight intersecting lines, said means comprising: a computer system having first means for computing the elapsed time of flight in relatively small increments for a first fixed period of time commencing after flight of said ball has commenced, during which period said ball is assumed to be traveling along one of said above-mentioned straight lines, second means commencing operation after said first fixed period of time has elapsed for computing elapsed time of flight in relatively greater increments, during which period said ball is assumed to be traveling along the other of said straight lines, and means for translating computed periods of time into visible indicia.

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