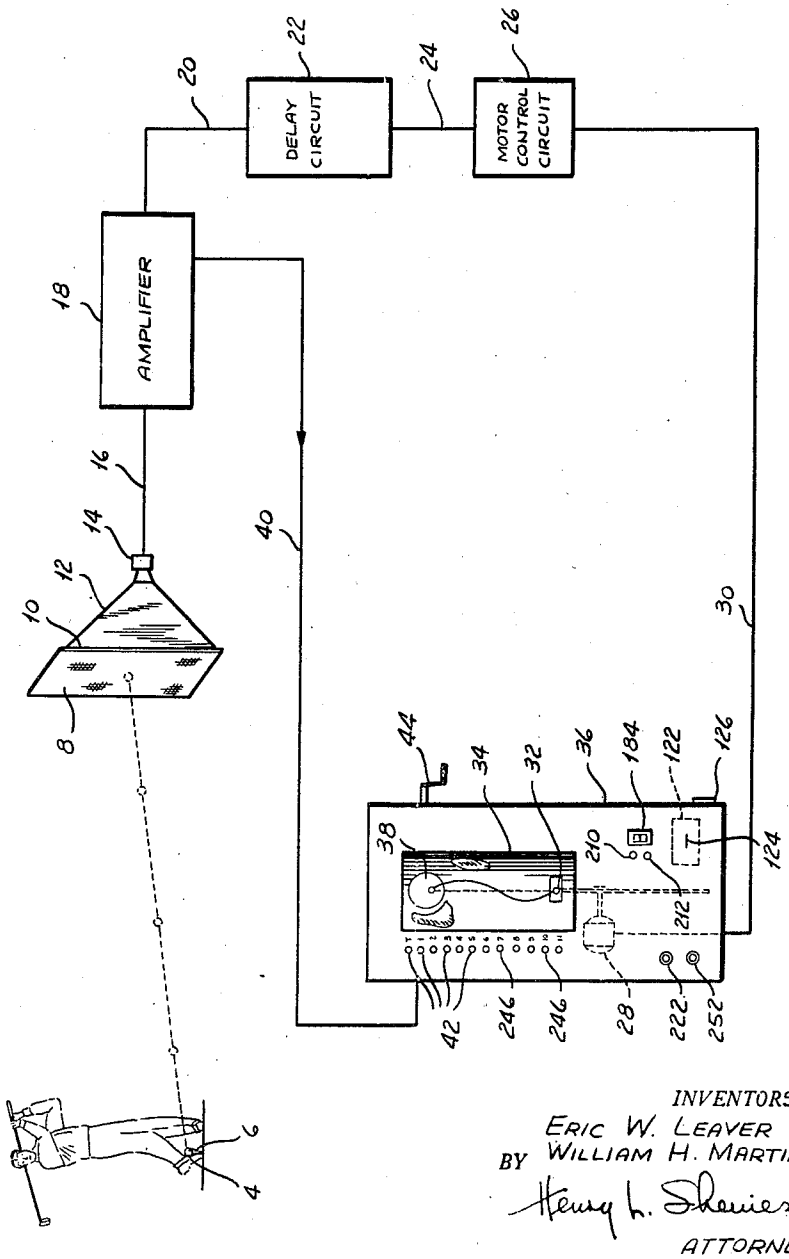
June 19, 1951 E. W. LEAVER ET AL 2,557,550

ELECTRONIC GOLF GAME

Filed May 14, 1948 2 Sheets-Sheet 1

Fig. 1



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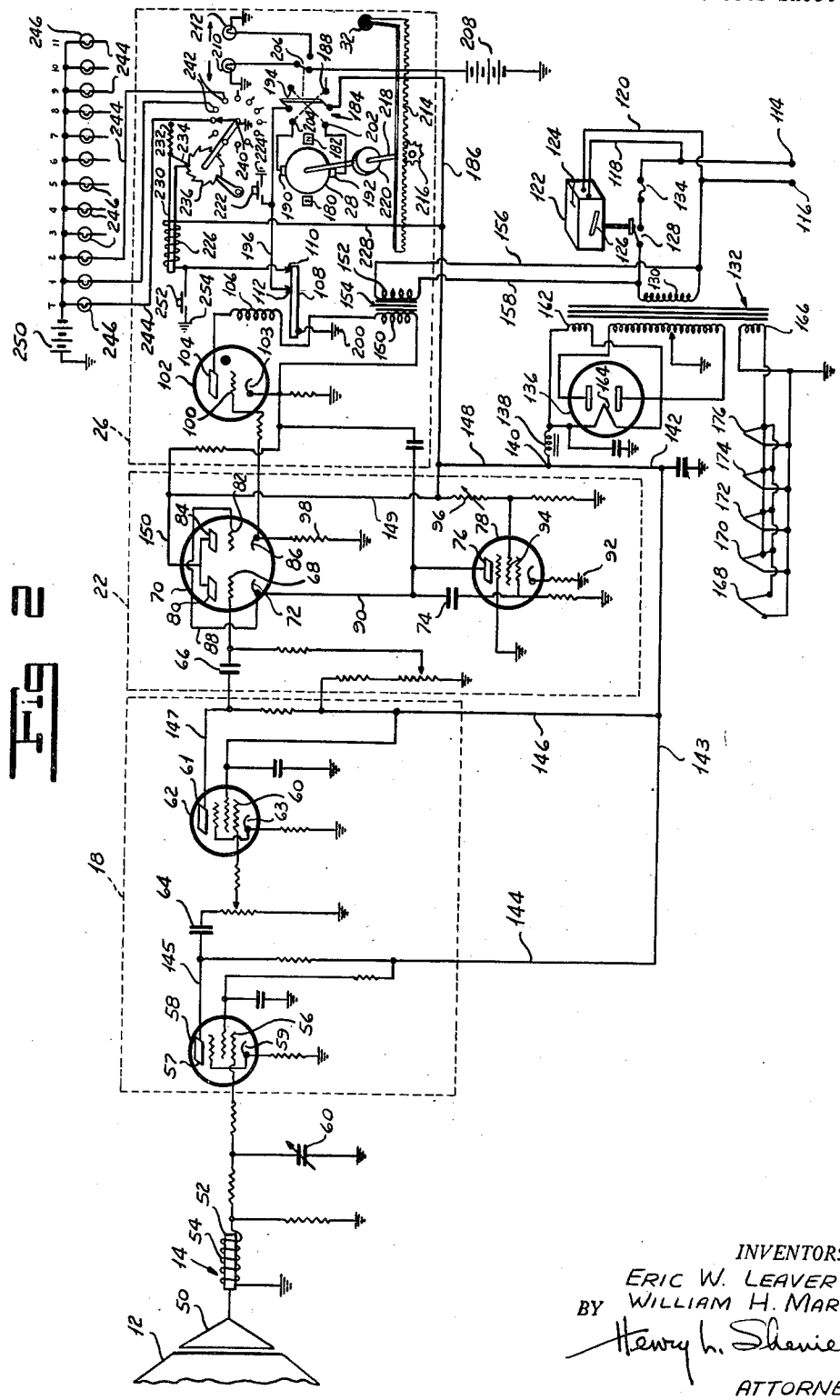


Fig. 2

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ELECTRONIC GOLF GAME

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8 Claims. (Cl. 73—379)

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Our invention relates to an electronic golf game and more particularly to a game played with an actual golf ball adapted to be struck by a club, simulating golf and adapted to be employed for healthful exercise and for the amusement of golfers in urban areas removed from actual golf courses.

It has been the practice in gymnasiums and the like to use indoor driving ranges in which an actual golf ball is adapted to be driven against a canvas backstop. While this practice provides exercise for golfers during inclement weather and in urban areas where golf courses are not easily accessible it is uninteresting, unstimulating and no means are provided for determning whether or not the stroke was actually a good one or the ball well hit.

One object of this invention is to provide a simulated golf game in which a ball is actually driven by a player against a canvas screen with which is associated means automatically to move a golf ball through a distance consonant with the velocity of the ball. The impact of the ball is converted into sound waves which are picked up by a microphone and amplified. The output of the amplifier is fed to a delay circuit which produces an output voltage proportional to the input magnitude. The output of the delay circuit, through the time which is a function of the velocity of the ball driven by the player, is fed to a motor control circuit which controls a motor adapted to drive a model ball along a pictorial representation of a golf hole. The arrangement is such that the ball moves a distance proportional to the distance the original driven ball would have gone if it had not been stopped by the canvas. An indicator is associated with the assembly automatically to show the number of strokes.

Another object of this invention is to provide an electronic golf game, simple and easy to construct and having many of the interesting features of actual golf.

Another object of this invention is to provide an electronic golf game in which the user may practice his strokes and improve them indoors in a limited space.

Another object of this invention is to provide an electronic golf game closely imitating actual golf which may be installed in gymnasiums, on shipboard, in amusement places, in clubhouses and the like.

In the accompanying drawings which form a part of the instant specification and which are to be read in conjunction therewith and in

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which like reference numerals are used to indicate like parts in the various views:

Figure 1 is a diagrammatic view showing one embodiment of the electronic golf game of the invention;

Figure 2 is a schematic view showing the electrical circuits involved.

More particularly, referring now to Figure 1 of the drawings, the player tees a ball 4 upon a tee 6 as is customary in the game. A canvas screen 8 is mounted an appropriate distance, say twelve to twenty feet, from the tee and is carried by a frame 10. Associated with the frame, there is provided a sound-collecting baffle 12 leading to a microphone 14. The microphone output is led by cable 16 to an amplifier 18. The amplifier output is fed by cable 20 to a delay circuit 22 which is designed to produce a voltage having a duration proportional to the magnitude of the input voltage. This voltage is led by cable 24 to a motor control circuit 26, the output of which governs a motor 28 through cable 30 to move a model golf ball 32 along the panorama of a golf course 34 exhibited to view through a window in a case 36. Model ball 32 moves toward the green 38 of the pictorial representation of the golf course a distance proportional to the distance the actual golf ball 4 would have gone had it not been stopped by the canvas screen 8. A part of the output of the amplifier on each stroke is led through cable 40 to operate a switching mechanism adapted successively to energize one of a plurality of small incandescent lamps 42 which act as stroke counters. The case 36 is positioned convenient to the player's view so that he can tell at a glance the position of the ball to enable him to gauge the club he is to use for the next stroke and also to inform him of the number of strokes employed in the playing of the hole. After one hole is played, the panorama 34 is changed to the next hole by means of the handle 44. Either nine or eighteen holes or any other appropriate number of holes of varying length may be depicted upon the canvas belt housed within the case 36.

Referring now to Figure 2, the microphone indicated generally by the reference numeral 14 comprises a cone 50 attached to an armature 52. The armature may be a permanent magnet and is lodged in a coil 54. The movement of the armature under the influence of the sound waves generated by the golf ball striking screen 8 generates an electromotive force in the coil which is impressed upon the grid 56 of a thermionic tube 58 through a low pass filter. The capacitor 60 is

tuned to eliminate undesirable high frequency components. This prevents the system from responding to false sounds due to external noise as, for example, by the golfer banging his club on the floor or the like.

The amplifier 18 comprises two stages. The signal is amplified first in the thermionic tube 58. The output signal from the tube 58 is impressed upon the grid 60 of a second thermionic tube 62 through a capacitor 64 and is amplified in the second thermionic tube 62. The output of the second thermionic tube is impressed upon the grid 68 of a double triode 70 through capacitor 66. The cathode 72 of the double triode 70 is connected to one side of a capacitor 74 and to the plate 76 of a thermionic tube 78. The signal received by grid 68 produces a surge of current in the circuit from plate 80 to cathode 72 of the thermionic tube 70. This current charges capacitor 74.

It will be noted that the grid 82 which controls the flow of current from the plate 84 to the cathode 86 is connected by conductor 88 to the cathode 72 which is connected by conductor 90 to the capacitor 74. The charge of the capacitor 74 is proportional to the magnitude of the input voltage impressed upon the grid 68 of the tube 70. As will be noted, the positive side of the capacitor 74 is impressed upon the grid 82 of the tube 70 and upon the plate 76 of the tube 78. The charge of the condenser 74 will flow to ground 92 through the plate to cathode circuit of the tube 78 at a rate determined by the bias of grid 94. This bias is determined by the IR drop through resistor 96. As long as the charge persists in capacitor 74, current will flow in the circuit from plate 84 to cathode 86 of tube 70. The resistor 98 is connected as a cathode follower so that, as long as the current is flowing through the resistor 98, a positive potential is impressed upon the grid 100 of the thyratron 102 producing a current in the circuit of plate 104 of the tube 102. A winding 106 of a relay is placed in this plate's circuit. When current flows in the plate circuit of tube 102, the armature 108 is attracted to ground contact point 110 and contact point 112. The armature, it will be observed, will be held in contact-making position as long as current flows in the plate circuit of tube 102 and this will occur as long as the capacitor 74 retains its charge. The time interval therefore through which current flows in the plate circuit of tube 102 will have a value proportional to the magnitude of the input voltage to the amplifier.

A source of alternating current potential of any convenient nature is impressed across terminals 114 and 116 and is led by conductors 118 and 120 to an electrical timer of any appropriate known design (not shown) positioned in housing 122 which is normally located in the case 36. A coin slot 124 is adapted to receive a coin and to actuate any appropriate coin-controlled apparatus (not shown) and thus free lever 126. The actuation of lever 126 initiates the timer action and closes switch 128, thus placing the primary winding 130 of a transformer, indicated generally by the reference numeral 132, across the potential terminals 114 and 116. A fuse 134 is provided to protect the circuits in event of an overload such as may be caused by a short circuit or the like. Thermionic tube 136 is connected as a full wave rectifier, the output of which passes through choke coil 138 to point 140 and provides the source of positive plate potential for all of the thermionic tubes except thyratron 102. Plate 57 of thermionic tube 58 is connected to point 140 through conductors 142, 143, 144 and 145. Plate 61 of thermionic tube 62 is connected to point 140 through conductors 142, 143, 146 and 147. Plates 80 and 84 are connected to point 140 by conductors 148, 149 and 150. The alternating potential source is impressed across the primary winding 152 of a transformer indicated generally by the reference numeral 154 when the switch 128 is closed, the primary winding 152 being connected in parallel with the primary winding 130 by conductors 156 and 158. The secondary winding 160 of the transformer 154 is placed in the plate-cathode circuit of the thyratron 102, furnishing the energy for its operation. A secondary winding 162 connected across the heater 164 of the rectifier 136 furnishes the potential to heat the cathode. A secondary winding 166 of the transformer 132 is connected across the heaters 168, 170, 172, 174 and 176 in parallel. The heater 168 heats the cathode 59 of the tube 58. The heater 170 heats the indirectly-heated cathode 63 of the tube 62. The heater 172 heats the indirectly-heated cathode 72 and the heater 174 heats the indirectly-heated cathode 86 of thermionic tube 70. The heater 176 heats the cathode 103 of the thyratron 102.

The motor 28 is provided with a field of unidirectional polarity comprising pole piece 180 and pole piece 182. A reversing switch indicated generally by the reference numeral 184 is adapted to reverse the direction of flow of the armature current through the motor 28. When the switch is thrown to the right, the potential from point 140, led through conductors 148 and 186, flows from contact point 188 to the brush 190, through the motor armature to the brush 192, and thence to contact point 194 through the conductor 196, through armature 108 to ground 200. When the switch is thrown to the left, current will flow through conductor 186, through the contact point 202 to the brush 192, through the motor armature to the brush 190, and thence through contact point 204, through the conductor 196, through the relay armature 108 to the ground 200. By reversing the flow of the armature current and maintaining the field in a constant direction, the direction of rotation of the armature of the motor 28 is reversed. The reversing switch is adapted to be manually actuated externally of the case 36. The reversing switch is manually connected to a switch 206 adapted to connect a battery 208 to one or the other of incandescent lamps 210 and 212. These lamps illuminate arrows on the casing to show the direction of travel of the model ball 32 by the motor 28.

The model ball 32 is secured to a reciprocal rack 214 adapted to be driven by a pinion 216 connected for rotary driving by motor 28 through a shaft 218. A clutch 220 is connected in the shaft and set to slip when the rack reaches the limit of travel in either direction in the casing. A push button 222 is adapted to complete the circuit through the motor armature to ground 224 manually so that the motor may be reset manually by operating the reversing switch 184 and the push button 222 manually as will be described more fully hereinafter.

The operation of the armature 198 of the relay, it will be remembered, completes a circuit to ground by means of contact 110 through the winding 226 of a solenoid, current flowing from the direct current source 140 through conductor 148, conductor 186, conductor 228, winding 226,

contact point 110, armature 108, to ground 250. A solenoid armature 230 is normally held to the right as viewed in Figure 2 by a spring 232. The armature is provided with a tooth 234 engaging a ratchet wheel 236. The ratchet wheel is adapted to rotate a movable conducting arm 240 successively to contact a plurality of contact points 242. Each contact point is connected by a plurality of of separate conductors 244 to respective incandescent lamps 246 so that the corresponding incandescent lamp will be placed across a battery 250 for energization of its filament. The winding 226 is adapted to be energized manually by a push button 252 which completes the circuit to ground 254. Each time the relay armature 108 is moved under the influence of the magnetic field set up in the relay winding 106 by the plate current flowing through the thyratron plate circuit, the winding 226 is energized, thus stepping the rotary arm 240 around one stop, lighting the incandescent lamps 246 in succession. In this manner, we provide a stroke counter which automatically counts the number of times the ball strikes the canvas and indicates the number of strokes. In operation, handle 44 is cranked to show the view simulating the first hole of the game. If desired, the fairway of the hole may be marked at intervals of fifty yards in order to serve as an indication of the length of each successive stroke. A coin is deposited in the slot 124 and lever 126 is operated. This starts the timer and closes the switch 128. The switch 184 is then thrown to illuminate either indicator 212 or 210 in order to move the model ball from the position it occupies to the tee of the panoramic view. The push button 222 is pressed to operate the motor to bring the model ball to the tee. If the indicator lamp 246 of the stroke counter is not at the tee, the push button 252 is pressed. Each time the push button is pressed, the armature 230 will reciprocate once, thus stepping the rotary switch arm 240 around successively to illuminate the stroke counter lamps. A succession of operations of the push button 252 will illuminate the lamp 246 indicating the tee. The switch 184 is then reversed to illuminate the indicator lamp 210 to show a direction of flight of the ball from tee to green. The parts are now in position for the player to play the first hole. The ball is at the tee; the indicator 210 indicates the flight toward the green; the stroke counter is likewise at the tee. The player places a ball 4 on the actual tee 6, takes an appropriate club and drives the ball to the canvas screen 8. The velocity of the impact of the ball will produce sound waves which are proportional to the speed of travel of the ball. If the ball hits the center of the canvas squarely, the amplitude of the displacement, that is the loudness of the sound waves, will be greater than if the ball hits the screen near its edge. In this manner, the driving of the ball in a direction from the true direction of the hole or hooking or slicing the ball will automatically reduce the yardage registered. In other words, a distance of 200 yards will be registered only when the ball is driven at the proper speed and in the right direction so that it would have gone 200 yards if it had not been stopped by the canvas screen 8. The low pass filter ahead of the first amplifier tube 58 eliminates unwanted high frequency components. The signal produced by microphone armature 52, as amplified by the amplifier 18, will have a voltage which is the function of the distance the ball would have traveled

on an actual fairway. This signal is fed to the delay circuit 22 which produces an output voltage having a duration proportional to the magnitude of the input voltage. This output voltage, applied to grid 100, operates the thyratron 102 in the plate circuit of which the winding 106 of the motor control relay is positioned. The relation between the duration of the output voltage of the relay circuit with respect to the magnitude of the input voltage is governed by the circuit values, including the value of the resistor 96. By adjusting the value of the resistance of this resistor, the system can be calibrated so that the yardage of simulated motion of the model ball 32 will closely conform to the actual yardage which the ball would have traveled on the fairway of a golf course. The energization of the thyratron actuates the relay of which armature 108 is a part, thus completing the armature circuit of the motor to drive the rack 214 and its model golf ball along the simulated fairway toward the hole. The movement of the armature 108 also completes the circuit through the winding 226 of the counter solenoid, thus illuminating the incandescent lamp to indicate one stroke. The player then gauges the distance to the hole, takes the proper club for this distance and drives a second ball against the canvas screen 8. If the ball overruns the green, the reversing switch 184 is operated and the third stroke returns the ball toward the green. Each stroke is automatically counted and, when the model ball 32 is in line with the hole, the player notes the number of strokes shown by the stroke counter upon his score card, resets the ball and the stroke counter as indicated above by means of push buttons 222 and 252, cranks the handle 44 to bring the second hole into view. This hole is likewise played.

It will be readily understood that many variations may be introduced to render the game more interesting. An actual putting green made of synthetic material may be placed adjacent the tee so that, after the ball lands on the area of the green of the panorama, putting may take place in fact instead of being simulated. Then too hazards may be placed on the fairway such as simulated bunkers or bodies of water requiring the taking of a penalty stroke registered by manually operating push button 222.

When the electric timer in the housing 122 opens the switch 128, it is necessary to insert an additional coin. This automatically penalizes an unskilled player since he is required to use more strokes and hence take longer to complete the course. The timing may be adjusted so that nine holes may be played by the average golfer.

It will be seen that we have accomplished the objects of our invention.

We have provided a simulated golf game in which a ball is driven by a player against a canvas screen with which there is associated automatic means for moving a golf ball through a distance proportional to the velocity with which the ball strikes the screen. The impact of the ball is converted into sound waves which are picked up by a microphone and amplifier. The output of the amplifier is fed to a delay circuit which produces an output voltage proportional in duration to the magnitude of the input voltage so that the output of the delay circuit represents a time which is a function of the velocity with which the ball is driven by the player against the canvas screen. The delay circuit controls a motor circuit which drives a model

golf ball along a pictorial representation of a golf hole a distance proportional to the distance the original golf ball would have gone had it not been stopped by the canvas. We have provided an electronic golf game, simple and inexpensive to construct, which has many of the interesting features of actual golf, thus enabling a player not only to practice his strokes indoors in a limited space but also providing a game closely simulating actual golf. Our electronic golf game may be installed in gymnasiums, in club rooms, in amusement places, on shipboard and in other places of limited space.

It will be understood that certain features and subcombinations are of utility and may be employed without reference to other features and subcombinations. This is contemplated by and is within the scope of our claims. It is further obvious that various changes may be made in details within the scope of our claims without departing from the spirit of our invention. It is therefore to be understood that our invention is not to be limited to the specific details shown and described.

Having thus described our invention, what we claim is:

1. An electronic golf game including in combination a diaphragm adapted when struck by a golf ball to generate sound waves, means for mounting said diaphragm in the path of the flight of a golf ball adapted to be driven from a tee, a microphone positioned adjacent said diaphragm, an amplifier, means for impressing the output signal of the microphone as the input signal to the amplifier, a delay circuit adapted to generate an output voltage having a duration proportional to the magnitude of the input voltage, means for impressing the output signal from the amplifier upon the delay circuit as the input signal thereto, a representation of a hole of a golf course, a model of a golf ball associated with said representation, an electric motor, means driven by the electric motor for moving the model golf ball, control means for said motor and means for governing said control means as a function of the output signal of said delay circuit, the construction being such that the model golf ball will move along the representation of a golf hole a distance proportional to the distance the driven golf ball would have gone if it had not been stopped by the diaphragm.

2. An electronic golf game as in claim 1 including in combination a filter network interposed between the microphone and the amplifier, tuned to eliminate undesirable high frequency components.

3. An electronic golf game as in claim 1 including in combination a stroke counter adapted to indicate the number of times a golf ball in flight is stopped by the diaphragm and means responsive to the output signal of the delay circuit for operating the stroke counter.

4. An electronic golf game as in claim 1 in which said delay circuit comprises a twin triode and a triode, a capacitor in the cathode to ground circuit of one of the cathodes of said twin triode, the positive terminal of said capacitor being connected to the anode of the triode and to the grid of the second half of said twin triode, means for impressing the output signal of said amplifier upon the grid of the first half of said twin triode.

5. An electronic golf game as in claim 1 in which said control means comprises a relay and said means for governing said control means comprises a thyratron and means for impressing the output of said delay circuit upon the grid of said thyratron.

6. An electronic golf game as in claim 1 including means for reversing the direction of rotation of said electric motor.

7. An electronic golf game as in claim 1 including in combination a stroke counter for counting the number of times a golf ball is stopped by the diaphragm, means responsive to the output signal of the delay circuit for operating the stroke counter, and manually-operated means for re-setting said stroke counter.

8. An electronic golf game as in claim 1 including manually-operable means for energizing said electric motor for re-setting the model golf ball to its initial position.

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