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Gentiluomo

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[45] **Dec. 11, 1973**

[54] **AUTOMATIC GOLF BALL TEEING APPARATUS**

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[52] **U.S. Cl.** **273/201**

[51] **Int. Cl.** **A63h 57/00**

[58] **Field of Search** 273/33, 201, 202

[56] **References Cited**

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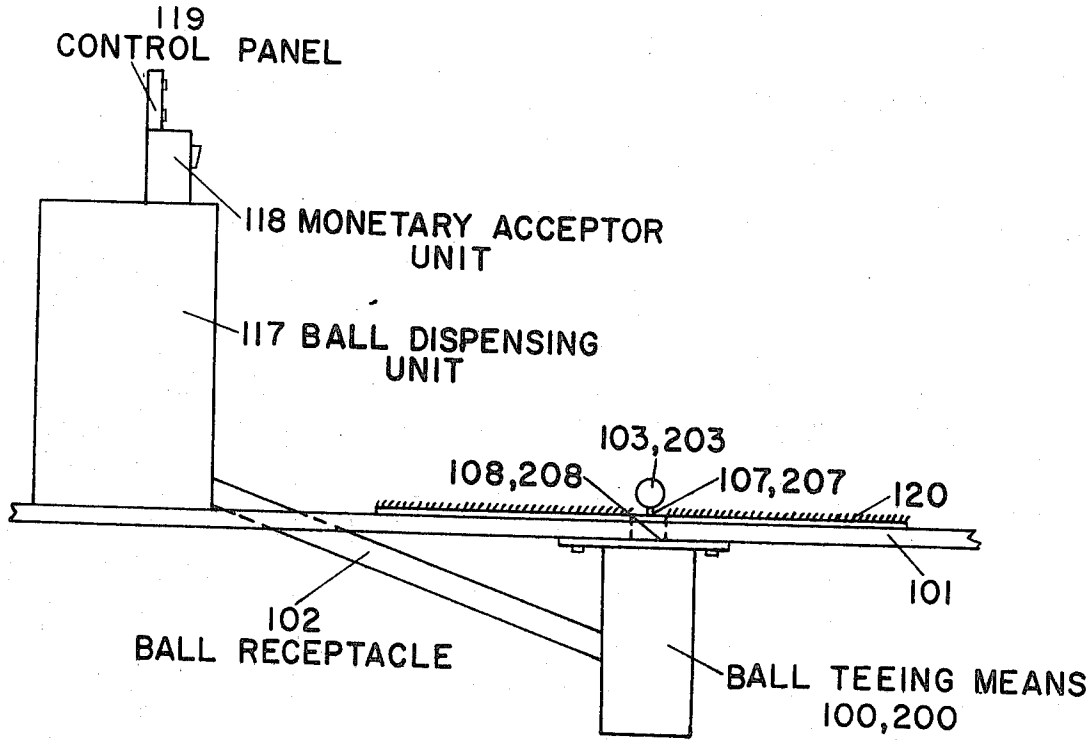
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Assistant Examiner—Theatrice Brown

[57] **ABSTRACT**

A golf ball teeing apparatus functional in providing either golf practice or golf game mode of operation through an open-loop control system to yield multi-position tee elevation, thus enabling the golfer to perform both tee and fairway shots from the same tee. The apparatus consists basically of a ball teeing means having a reciprocating tee to elevate the ball from a lowermost ball receiving position to either an intermediate ball hitting position or an uppermost ball hitting position, a ball dispensing means for storing a plurality of balls, a ball receptacle for receiving or storing balls for subsequent use by the ball teeing means, a vend initiating means for initiating apparatus operation, a counter to monitor the number of balls to be supplied to the ball teeing means per vend, and pushbutton and punched tape control means for inciting tee height positional commands to the teeing means.

22 Claims, 8 Drawing Figures



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SHEET 1 OF 2

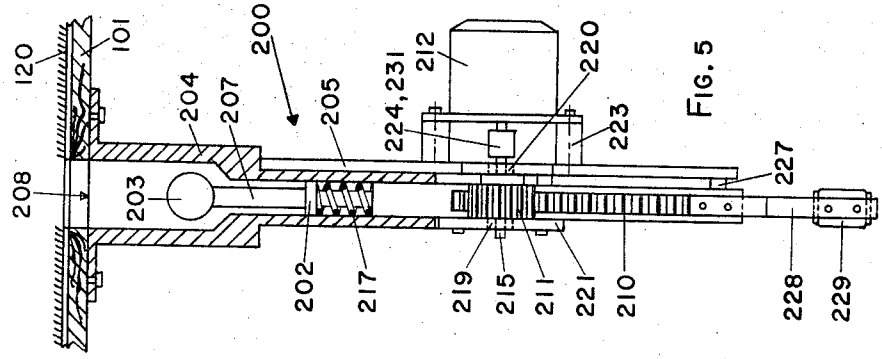


FIG. 5

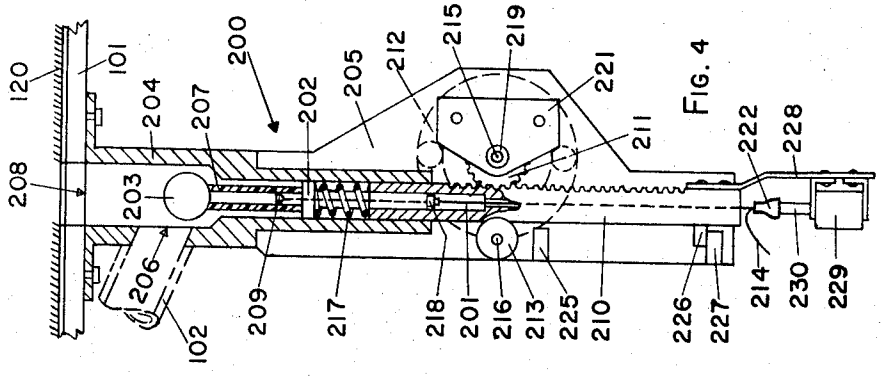


FIG. 4

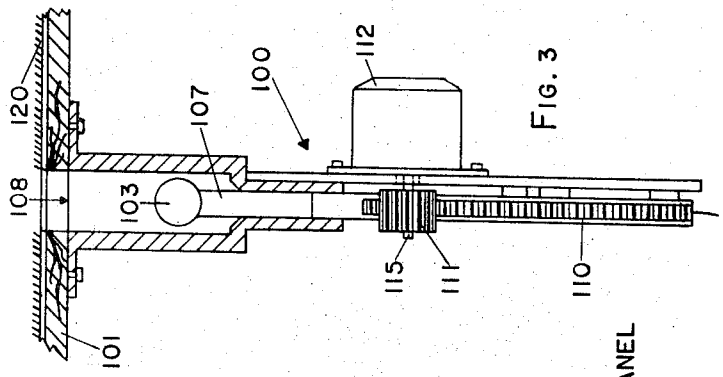


FIG. 3

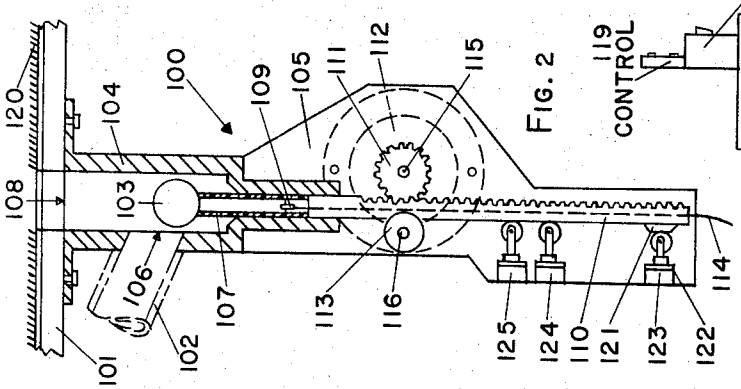


FIG. 2

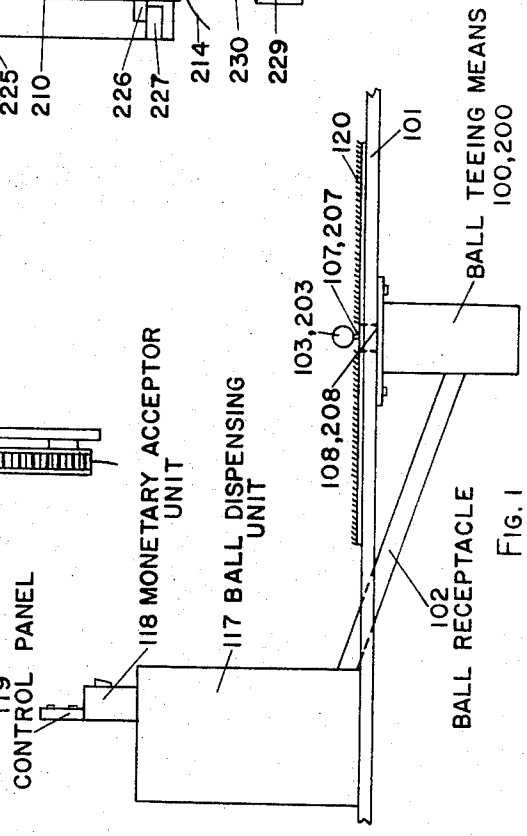


FIG. 1

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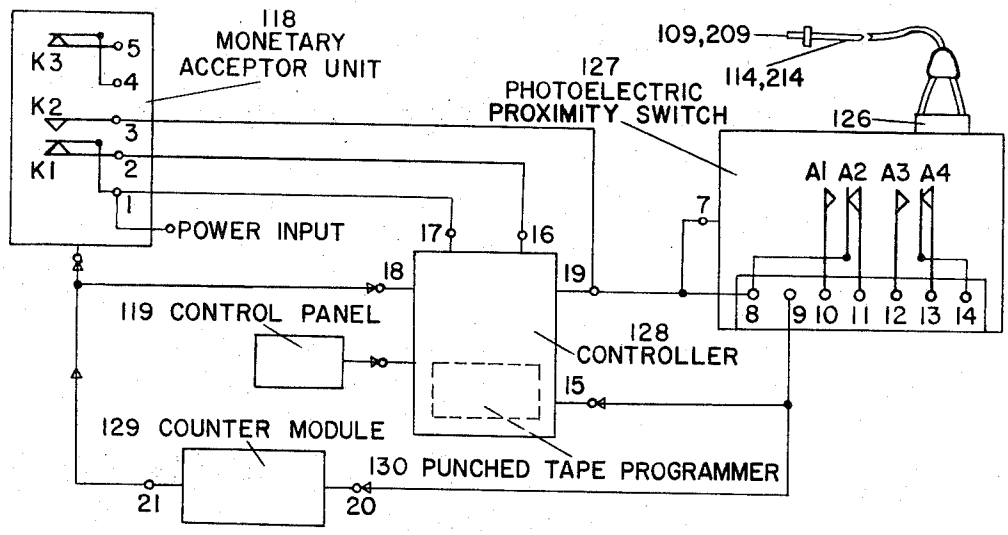


FIG. 6

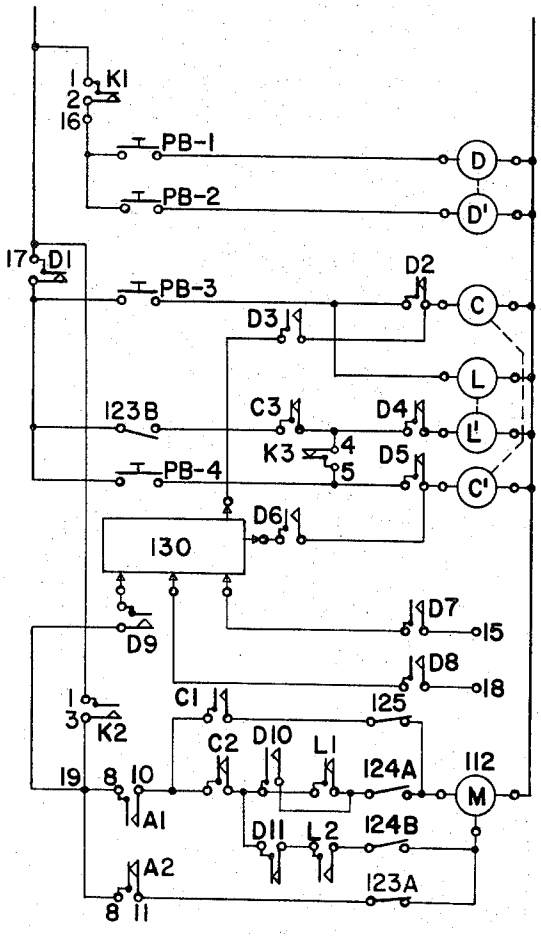


FIG. 7

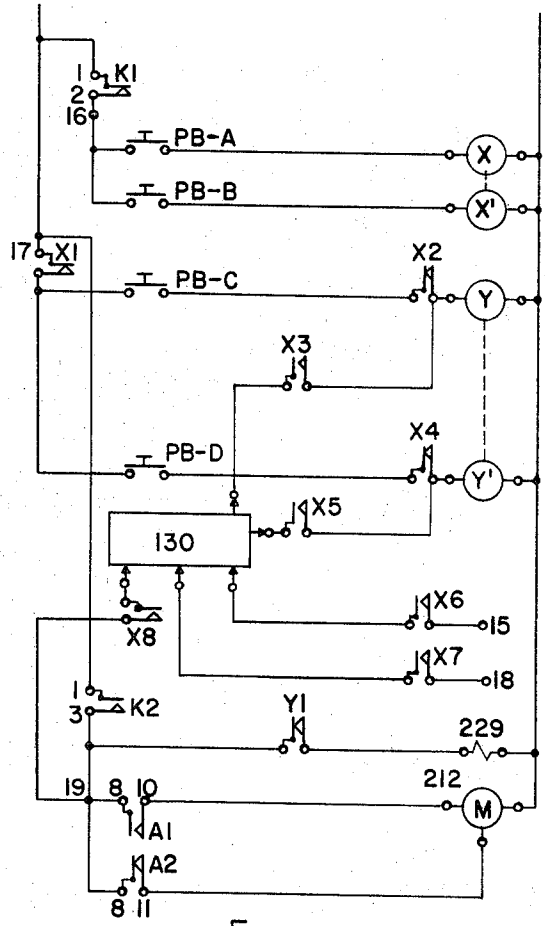


FIG. 8

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AUTOMATIC GOLF BALL TEEING APPARATUS

This invention is particularly adaptable for use in both indoor and outdoor golf ranges.

Accordingly, objects of this invention are as follows:

To provide a ball teeing apparatus featuring operational reliability.

To provide a ball teeing apparatus that can be utilized in both completely automated or non-automated type golf ranges.

To provide a ball teeing apparatus that can be utilized for either golf practice or golf game mode of operation.

To provide a ball teeing apparatus which can accommodate a conventional type ball dispensing means for dispensing balls to the ball receptacle.

To provide an automatic ball teeing apparatus that will relieve the golfer of the duty of setting balls manually to various heights common to both tee and fairway type shots.

To provide a ball teeing apparatus which can be activated into operation by a monetary acceptor unit or simple pushbutton control.

To provide a ball teeing apparatus in which tee shot and fairway shot tee elevation can be alternatively selected either manually by pushbutton or automatically through program control to provide for a plurality of game programmed arrangements.

These objects and other objects of this invention should be discerned and appreciated from the description and claims taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a schematic side elevation view of the invention.

FIG. 2 is a schematic side elevation view of an embodiment of the ball teeing means associated with the invention.

FIG. 3 is a schematic front elevation view of the embodiment shown in FIG. 2.

FIG. 4 is a schematic side elevation view of a second embodiment of the ball teeing means associated with the invention.

FIG. 5 is a schematic front elevation view of the embodiment shown in FIG. 4.

FIG. 6 is a functional schematic block diagram of the open-loop control system, less the prime mover.

FIG. 7 is a partial elementary electrical diagram of the control circuitry utilized with the first embodiment of the ball teeing means.

FIG. 8 is a partial elementary electrical diagram of the control circuitry utilized with the second embodiment of the ball teeing means.

Terms herein utilized shoud bear interpretation as follows:

Base Means is essentially a cup arrangement having means for containing a ball elevating means such that balls entering said cup arrangement can be elevated, through operation of the drive mechanism, to a ball striking position.

Ball Elevating Means encompasses a drive mechanism functionally associated with a tee fabricated from such commercially available items as a close-wound helical spring, spring reinforced flexible plastic hose, flexible plastic or rubber tube, plastic-coated rubber tube, etc. The tee described in this invention is fabricated from plastic.

Drive Mechanisms encompass such power transmitting devices as flexible connectors, rack and gear drives, linkages, mechanical and fluid remote control systems, etc. The rack and gear drive is used in the described embodiments of this invention.

Flexible Connectors appear in such arrangements as belt and pulleys, cable and sheaves, and chain and sprockets.

Ball Teeing Means includes essentially a base means and a ball elevating means.

Ball Dispensing Means - It is a device that either receives balls for immediate conveyance to the ball receptacle or stores a supply of balls for dispensing of a predetermined number to said ball receptacle when required.

Position Sensors and Switching Sensors encompass such devices as photosensors, acoustic sensors, limit switches, etc. The position sensors used in the described invention are limit switches, and the switching sensors used are photosensors.

Photoelectric Proximity Switch - It is a sensing control means driven by a signal from the switching sensor and functional in amplifying the said signal, if required, to a magnitude necessary to effectuate control of apparatus functions such as ball elevating means reciprocation, count of balls fed, and program tape indexing.

Photoelectric System - It is a system consisting of a photoelectric proximity switch, a light source-photocell unit, and a lens assembly when required.

Ball Receptacle - It is a device which receives and provides balls for immediate use by the ball teeing means or stores and provides balls for subsequent use when required by said ball teeing means.

Vend Initiating Means - Includes any device for initiating the operation of the disclosed apparatus. Said devices can prevail as pushbuttons, monetary acceptor units, etc. The monetary acceptor unit is described herein.

Controller - It is a device containing control components such as a punched tape programmer, relays, etc., or their equivalents, operable in providing required apparatus operation.

Counter Module - It is a predetermining type counter having its count register set to a predetermined number. As utilized, said counter monitors the number of balls to be provided to the ball teeing means per vend.

Open-loop Control System - It is a control system that has no means for comparing system output with system input for control purposes. In other words, the system input member does not receive information on what the system output member is doing, therefore, it cannot operate to provide correction for any variations in the output member, should any variations prevail.

Means to provide automatic switching between said lowermost-to-intermediate positional mode of operation and said lowermost-to-uppermost positional mode of operation- It encompasses means functional in providing for ball elevating means reciprocation between a ball receiving position and a plurality of definite preset ball hitting positions.

In the first embodiment, switches **123,124,** and **125,** and two-way cam **121** are utilized to effectuate the cited functions of the above defined means.

In the second embodiment, stops **225** and **227,** stop pin **226,** and stem **202,** spring **217,** and solenoid **229** interconnected to said stem are utilized to effectuate the cited functions of the above defined means.

Prime Movers encompass such elements as lineal electric motors, rotary electric motors such as brake-

gearmotors, clutch-gearmotors, motors with instant start-stop characteristics, etc., and lineal or rotary fluid actuators. The rotary electric motors used within the herein described embodiments are of the reversible type.

Gearmotor is a motor having an integrally associated gearhead.

Clutch-gearmotor is a motor having an integrally associated gearhead and clutch. Upon energization of the motor, the clutch is actuated simultaneously to connect the motor shaft to the gearhead input shaft for driving an external load. When the external load is to be stopped, the clutch is deenergized to disconnect the motor shaft from the gearhead input shaft.

Brake-gearmotor is a motor having an integrally associated gearhead and brake. upon energization of the motor, the motor magnetic field operates to shift the shaft having a cone shaped brake drum away from the stationary frame so that the rotor is free to rotate. When the motor is de-energized, the magnetic field collapses and the brake drum is driven by a spring against the frame to stop the motor shaft.

In explaining the invention in detail, it can be readily discerned that the said invention is capable of many equivalent embodiments of which the preferred are herein depicted and described.

In order to utilize the disclosed invention, it is essential that the ball teeing means be fixedly mounted with respect to floor **101** and operatively linked with a ball receptacle **102.** A conventional type ball dispensing means **117** can be used in conjunction with said ball receptacle if required.

I. First Embodiment (see FIGS. **1, 2, 3, 6,** and **7**)

The ball teeing means **100** is composed basically of a base means and a ball elevating means. The base means is defined essentially by cup assembly **104** o which a mounting plate **105** is fixedly secured. Said cup assembly **104** has a ball inlet aperture **106** located within its cylindrical sidewall for mounting of ball receptacle **102** in depending relation therefrom and in registry with said aperture **106,** an opening within the bottom for the journalling of both the upper portion of rack **110** and tee **107** which exists as a flexible material such as a plastic tube, and an opening **108** at the top to provide for ball exit when placed in registry with the opening within said floor **101.**

Tee **107** is fixedly mounted to the top of said rack **110** which is reciprocably mounted within the bottom opening of said cup assembly **104.** Centrally and fixedly mounted to the top of said reciprocably mounted rack **110,** and in depending manner within the central opening of said tee **107,** is the ball sensing means such as photoelectric switching sensor lens assembly **109.** The fiber-optic light guide **114** of said sensor is disposed downwardly through and emerging from the bottom of said rack **110,** thus providing accessibility for connection to the light source-photocell unit **126.** Said unit **126** is in turn connected to the photoelectric proximity switch **127.** The bottom end of said rack **110** contains a two-way cam **121** disposed on the non-toothed side in depending manner therefrom.

Brake-gearmotor **112** is fixedly mounted to the back side of mounting plate **105** with its rotatable shaft **115** protruding through and journalled within said mounting plate. Fixedly mounted on said shaft **115** is drive gear **111,** which is drivably engaged with said reciprocally mounted rack **110.** Shaft **116** journalled within flanged guide roller **113** is fixedly secured to mounting plate **105.** Said flanged guide roller **113** is rollably engaged with the non-toothed side of said rack **110.** The center distance between shafts **115** and **116** must be such that rack **110** can be reciprocated freely without binding between said gear **111** and said flanged guide roller **113.**

On the lower portion of mounting plate **105,** adjacent to the non-toothed portion of rack **110,** are located three position sensing switches. The lowermost position sensing switch **123** is fixedly secured to mounting plate **105** by means of bracket **122.** Said switch is directly opposite the two-way cam **121** when rack **110** is at its lowermost position. The intermediate position sensing switch **124** is fixedly secured to mounting plate **105.** Said switch **124** is located directly above and removed from switch **123** by an amount equivalent to the distance the rack **110** must rise to present ball **103** in position for execution of fairway shots by the golfer. In this position the relationship of the ball with respect to the artificial grass **120** would be comparable to a ball lying on the fairway turf of an outdoor golf course. The uppermost position sensing switch **125** is secured to mounting plate **105** and located directly above said switch **124** by an amount equivalent to the average height a golfer would tee up a ball above said fairway shot position so as to execute tee shots such as encountered on a golf course. All of said switches are transversely positioned adjacent to said rack **110** such that they will be actuated when two-way cam **121** assumes a position opposite the roller type actuator of anyone of said switches.

The ball dispensing means **117** is of the conventional commercially available type and is positioned with respect to floor **101** as shown in FIG. **1.** Fixedly mounted adjacent to said ball receptacle or said ball dispensing means is the vend initiating means such as monetary acceptor unit **118.** Said monetary acceptor unit is commercially available and can be obtained to handle either coins or paper money. Also, fixedly mounted adjacent to said monetary acceptor unit **118** is control panel **119,** which contains a plurality of pushbutton control switches.

Intermediate said ball dispensing means **117** and said ball teeing means **100** is a ball receptacle **102** functional in conveying balls from said ball dispensing means to said ball teeing means on demand. Said ball receptacle **102** is mounted to the lower portion of said ball dispensing means **117** and is inclined downwardly toward said ball teeing means wherein it mounts within opening **106** of said cup **104.**

Floor **101** at the tee line area is surfaced with arcticifial grass carpet **120** similar in appearance to grass found on golf course fairways or driving tees. Said grass carpet **120** has an opening in alignment with opening **108** of cup **104** to allow ball **103** to emerge when tee **107** is elevated to ball hitting position.

With reference to the drawings, it is readily discerned that the gearmotors, switches, solenoid, photoelectric proximity switch, counter, monetary acceptor unit and the punched tape programmer located within controller **128** are commercially available components. The photoelectric proximity switch is available having both a momentary and maintained output arrangement. Units having provisions for a momentary signal output are known as pulse-stretcher types wherein the output pulse can be either lengthened or shortened regardless

of whether the ball remains within the proximity switch detection field for prolonged periods of time.

"Tee Shot" and "Fairway Shot" selection can be accomplished either manually by pushbutton control or automatically through programming means such as punched tape control. For the practice of golf shots the golfer depresses either the "Tee Shot" or "Fairway Shot" selection pushbuttons, depending upon which type of shot said golfer wishes to practice. When the "Fairway Shot" selection is chosen, the ball teeing means will, when operative, elevate the ball to a position such that said ball can be hit by standard iron clubs under conditions similar to those encountered when hitting fairway shots on a golf course. When "Tee Shot" selection is chosen, the ball teeing means will, when operative, elevate the ball to a position such that said ball can be hit by the driver or number one club.

The ball teeing means depicted in FIGS. **2** and **3** may be readily modified by the following methods: (1) An instant start-stop type motor may be used to replace the brake-gearmotor, thereby eliminating the need for a brake; (2) A clutch-brake gearmotor in which the motor is made to continuously rotate, can be used in place of the brake-gearmotor. The control circuit can be modified so that the ball elevator means can be moved by disengaging the brake and engaging the clutch, and stopped by disengaging the clutch and engaging the brake; and (3) The brake-gearmotor can be replaced by a clutch-gearmotor in which the motor is made to continuously rotate. The ball elevator means can be moved and stopped by simply engaging and disengaging the clutch. Since there is no means available for braking the ball elevator means in this method, the position sensing switches can be adjusted to compensate for any over-travel. Due to gearhead torsional resistance, the ball elevator means will hold its position when said gearhead ceases rotating upon clutch disengagement.

FIG. **7** depicts the electrical controls set on the "Golf Practice" with "Fairway Shot" selection as the mode of operation for the first embodiment. This means that momentary depressing of the "Golf Practice" pushbutton PB–1 will energize latch relay coil D to close contacts **D1, D2, D4, D5, D11** and and open contacts **D3, D6, D7, D8, D9,** and **D10.** Momentary depressing of the "Fairway Shot" pushbutton PB–4 will convey a signal through K3 and D4 to energize latch relay coil L to close contacts L1 and open contacts L2. Also, said signal will travel through contacts D5 to energize latch relay coil C to close contacts **C2, C3,** and open contacts **C1.**

Next, upon placement of the proper amount of money in the monetary acceptor unit **118,** the vend will be initiated causing contacts K1 and K3 to open, and contacts K2 to close. Opening of contracts K1 will cut off power to the "Golf Practice" and "Golf Game" selection branch circuit. This means that after the vend has been ititiated the golfer no longer has the choice of switching between said selections. The purpose of open contacts K3 will become apparent during the discussion related to the function of switching selection from "Tee Shot" to "Fairway Shot". Upon closing of contacts K2, power will be provided to the motor control circuit to effectuate reciprocation of tee **107.**

Before initiation of said vend, tee **107** will be in the elevated position with no ball thereupon. Immediately at start of vend, contacts K2 will close to provide power to terminals **7** and **8** of the photoelectric proximity switch. With no ball on said tee, contacts A2 will be in the closed position for directing power through switch contacts **123A** to brake-gearmotor **112** to drive the ball elevating means downward. Tee **107** will therefore decend until two-way cam **121** actuates switch contacts **123A** open to terminate power to said brake-gearmotor and stop said tee in the lowermost ball receiving position. While in this position, a ball from ball receptacle **102** will be automatically released to gravitate upon tee **107.** Gravitation of said ball upon said tee will cause the photoelectric proximity switch to become activated and induce contacts A1 to close and contacts A2 to open. Closing of said contacts A1 will cause power to flow through contacts C2, L1, and switch contacts **124A** to brake-gearmotor **112.** Energizing of said gearmotor will cause the ball elevating means to rise until cam **121** actuates said switch contacts **124A** open. This will cause power to be terminated to said gearmotor **112** such that tee **107** is stopped at the intermediate ball hitting position common to "Fairway Shots".

Upon dislodging of ball **103** from tee **107,** the photoelectric proximity switch will operate to provide a pulse through terminal **9,** open contacts **A1,** and close contacts **A2.** Said pulse from terminal **9** will be fed to the ball feed counter module **129** to register a count therein. Said contacts A2 will cause power to flow through switch contacts **123A** which are closed when tee **107** is in the elevated position. Said power will in turn operate to reverse the direction of gearmotor rotation to drive the ball elevating means downward. Tee **107** will be lowered until two-way cam **121** contacts and opens said switch contacts **123A** to terminate power to said gearmotor and again stop said tee in the lowermost ball receiving position. While in this position, a ball from ball receptacle **102** will be automatically released to gravitate upon tee **107.** Gravitation of ball **103** upon said tee **107** will again cause it to rise. Cited mode of operation for lowering and elevating said tee will prevail on a repetative basis as described, supra. As previously indicated, a pulse will be fed to the ball feed counter module every time a ball is dislodged from said tee. Said plurality of pulses will be registered and when said count reaches the preset count, said ball feed counter wil release a termination pulse to the monetary acceptor unit to terminate the vend. In so doing, contacts K2 will open to terminate power to the controller and to the photoelectric proximity switch. This means that when the last ball of the vend is dislodged from the tee, contacts A2 will close slightly sooner than or at approximately the same instant contacts K2 open so that little or no power can be conveyed to the gearmotor to lower the tee. Therefore, at the initiation of a new vend, the tee will be in the elevated position. If desired, the said tee can be made to stop at the lowermost ball receiving position after vend termination by adapting minor control circuit modifications.

"Golf Practice" with "Tee Shot" selection is obtained by first momentarily depressing PB–1 and then PB–3. By reference to FIG. **7** it is readily discerned that depressing of PB–3 will energize latch relay coil C to close contacts C1 and open contacts C2 and C3. Also, latch relay coil L will be energized to open contacts L1 and close contacts L2. The remainder of the circuit will be in the condition dipicted in FIG. **7.**

Now, upon placement of the proper amount of money in the monetary acceptor unit **118**, the vend will be initiated causing contacts K1 and K3 to open, and contacts K2 to close. Opening of contacts K1 will cut off power to the "Golf Practice" and "Golf Game" selection circuit so that the golfer cannot switch selections after the vend is initiated. Closing of K2 will direct power to the motor control circuit to effectuate reciprocation of tee **107**.

Immediately at start of vend, contacts K2 will close to direct power to terminals 7 and 8 of the photoelectric proximity switch. With said tee **107** initially in the up position with no ball thereupon, contacts A2 will be in the closed position thus directing the power through switch contacts **123A** to brake-gearmotor **112** to drive the ball elevating means downward. Tee **107** will therefore be lowered until two-way cam **121** actuates switch contacts **123A** open to cut off power to said brake-gearmotor and stop said tee in the ball receiving position. In this position a ball will be provided from the ball receptacle **102** to gravitate upon said tee. This will cause the photoelectric proximity switch to become activated and induce contacts A1 to close and contacts A2 to open. Closing of said contacts A1 will cause power to be directed through relay contacts C1 and switch contacts **125** to energize brake-gearmotor **112**. Said gearmotor will cause the ball elevating means to rise until two-way cam **121** actuates switch **125** open. Opening of said switch contacts will cut off power to said gearmotor such that tee **107** is stopped at the uppermost ball hitting position common to "Tee Shots".

Upon dislodging of said ball **103** from tee **107**, the photoelectric proximity switch will operate to provide a pulse through terminal **9**, open contacts A1, and close contacts A2. Said pulse from terminal **9** will be fed to the ball feed counter to register a count therein. Said contacts A2 will cause power to flow through switch contacts **123A** which are closed when tee **107** is in the elevated position. Said power will operate to reverse the direction of gearmotor rotation to drive the ball elevating means downward. Tee **107** will be lowered until two-way cam **121** contacts and opens said switch contacts **123A** to cut off power to said gearmotor and stop said tee in the lowermost ball receiving position. While in this position, a ball will be again provided from the ball receptacle to gravitate upon said tee. This will cause the photoelectric proximity switch to become activated and again cause the tee to rise by the mode of operation already described. Cited mode of operation for lowering and elevating said tee **107** will prevail on a repetative basis as described, supra. As previously indicated, a pulse will be fed to the ball feed counter every time a ball is dislodged from said tee. Said plurality of pulses will be registered and when said count reaches the preset count, said ball feed counter will release a termination pulse to the monetary acceptor unit to terminate the vend. In so doing, contacts K2 will open to cut off power to the controller and to the photoelectric proximity switch. This means that when the last ball of the vend is dislodged from the tee, contacts K2 will open to terminate power to contacts A2 thus maintaining the tee in the elevated position.

To switch from "Fairway Shot" to "Tee Shot" selection during the vend, the golfer depresses the "Tee Shot" selection pushbutton PB-3. Since the tee **107**, with a ball thereupon,is in the intermediate ball hitting position before depressing of PB-3, photoelectric proximity siwtch contacts A1 will be closed and A2 will be open. Therefore, depressing of said pushbutton PB-3 will actuate latch relay coils C and L. This will cause relay contacts C2, C3, and L1 to open, and contacts C1 and L2 to close. Now, with contacts A1, C1, and **125** closed, power will be conveyed to gearmotor **112** to drive the ball elevating means upwardly until two-way cam **121** actuates switch contacts **125** open. With said contacts **125** open, power will be terminated to said gearmotor and the tee **107** will be stopped at the uppermost ball hitting position. Now, after the ball is dislodged from the tee, subsequent operation of the apparatus will follow the same sequence described under "Tee Shot" selection mode of operation and the tee will now reciprocate between the ball receiving position and the uppermost ball hitting position as described.

In switching from "Tee Shot" to "Fairway Shot" selection during the vend, it must be discerned that the condition of relay and switch contacts will be initially as described under the "Tee Shot" selection mode of operation with vend initiated so that contacts K1 and K3 will be open and contacts K2 will be closed. To recapitulate, contacts C1 and L2 will be initially closed and contacts C2, C3 and L1 will be initially open. Upon depressing of the "Fairway Shot" pushbutton PB-4, contacts C2 and C3 will close while contacts C1 will open. The condition of contacts L1 and L2 will be unaffected because during the vend contacts K3 will be open and power cannot be conveyed to latch relay coil L'to induce switch-over of said contacts. It now becomes apparent that the function of latch relay L-L' is to act as a monitor to divert power during said "Tee Shot" to "Fairway Shot" switch-over through the alternate branch line containing relay contacts D11 and L2, and switch contacts **124B**. Said alternate branch will provide power to gearmotor **112** such that tee **107** will be lowered until said contacts **124B** are actuated open to stop said tee in the fairway shot position. When the ball is dislodged from said tee **107**, contacts A2 will close to direct power through switch contacts **123A** to energize the gearmotor to drive the ball elevating means downwardly. When two-way cam **121** opens said contacts **123A**, the gearmotor will be de-energized to stop said tee in the lowermost ball receiving position. When said switch **123** is actuated, switch contacts **123B** of said single poly double throw switch will close. Closing of said contacts **123B** will direct power through relay contacts C3 and D4 to energize latch relay coil L' to open contacts L2 and close contacts L1,thus activating the other branch line leading from relay contacts C2 through contacts L1 and switch contacts **124A** to said gearmotor **112**. Therefore, said switch-over had reverted the control circuit back to that depicted in FIG. 7 for "Fairway Shot" selection with vend initiated. Now, when a ball is dislodged from said tee **107**, the apparatus will persue the mode of operation previously described under "Fairway Shot" selection mode of operation such that subsequent tee reciprocation will be between the ball receiving position and intermediate ball hitting position as disclosed.

For "Golf Game" selection as the mode of operation, the patron depresses only the "Golf Game" pushbutton. Tee shot and fairway shot tee positioning will be provided automatically according to a predetermined sequence dictated by programming means such as the punched tape programmer.

Momentary depressing of the "Golf Game" Pushbutton PB-2 will energize latch relay coil D' to open contacts D1, D2, D4, D5, D11 and close contacts D3, D6, D7, D8, D9, and D10. Opening of said contacts D1, D2, D4, D5, and D11 will isolate the "Fairway Shot" and "Tee Shot" pushbuttons from the circuit so that accidental depressing of said pushbuttons cannot affect the tee elevating sequence provided by the punched tape programmer 130. Closing of said contacts D3, D6, D7, D8, D9, and D10 will operatively connect said punched tape programmer into the circuit to provide for automatic positioning of said tee. The tape of said programmer is punched with control information such that holes in one channel represent the tee shot control function and holes in a second channel represent the fairway shot control function.

Placement of the proper amount of money in the monetary acceptor unit 118 will initiate the vend causing contacts K1 and K3 to open and contacts K2 to close. Opening of contacts K1 will isolate pushbuttons PB-1 and PB-2 from the circuit so that selection switching is not possible after vend initiation. Closure of contacts K2 will provide power to the photoelectric proximity switch 127. With no ball on the elevated tee, contacts A2 will be in the closed position thus allowing power to proceed through the lowermost position sensing switch contacts to the prime mover to drive the ball elevator means downward. The tee will therefore be lowered until the two-way cam actuates said position switch contacts open to cut off power to the said prime mover and stop said tee in the lowermost ball receiving position. While in this position, a ball from ball receptacle 102 will be automatically released to gravitate upon the tee. This will cause said photoelectric proximity switch to become activated and compel contacts A1 to close and A2 to open. Now, with the punched tape programmer in operation, the tape reader senses the hole in the first line of the tape and effectuates energization of either the tee shot latch relay coil C or the fairway shot latch relay coil C', depending on which channel the hole appears. If the tee shot relay coil C is energized, the load contacts C1 will close and direct power from contacts A1 through the uppermost position sensing switch contacts to the prime mover and drive the ball elevator means to tee height position. If the fairway shot relay coil C' is energized, the load contacts C2 will close and direct power from contacts A1 through the intermediate position switch contacts to the prime mover to drive the ball elevating means to fairway height position.

When the ball is dislodged from the tee, the photoelectric proximity switch 127 will operate to provide a pulse through terminal 9, open contacts A1, and close contacts A2. Said pulse from terminal 9 will be fed to the ball feed counter module 129 to register a count therein, and to the stepping drive of the punched tape programmer to advance the tape through the reader one line to provide the next tee height positioning command by again energizing either relay coil C or C'. Meanwhile, contacts A2 will cause power to be directed through the lowermost position sensing switch contacts to the prime mover to drive the ball elevating means downward until the two-way cam contacts and opens said switch contacts to terminate power to said prime mover and stop the said tee in the ball receiving position. While in this position, a ball from ball receptacle 102 will be provided to said tee thus causing the said photoelectric proximity switch to again close contacts A1 and open contacts A2. Now, depending on which one of said relay coils was energized when the tape was indexed to the second line, power will again be directed through either contacts C1 or C2 to energize the prime mover and drive the ball elevating means upward to either the tee height position or the fairway height position by the mode of operation previously explained for elevating said tee. This cited mode of operation for lowering and elevating the tee will prevail on a repetative basis every time a ball is dislodged from said tee. Termination of the vend will occur when the count registered on said ball feed counter reaches its preset count. When this occurs, said counter will release a termination pulse to the momentary acceptor 118 to terminate the vend. In so doing, contacts K2 will operate to terminate power to the controller 128 and the photoelectric proximity switch 127, thus stopping the tee in the elevated position. At termination of said vend, the programming tape will revert back to its initial starting point ready for re-cycling when another vend is initiated.

II. Second Embodiment (see FIGS. 1, 4, 5, 6, and 8)

This embodiment is composed essentially of a ball dispensing means 117, a ball receptacle 102, and a ball teeing means 200 interconnected in similar manner to the first embodiment. The base means of said ball teeing means is defined essentially by cup assembly 204 to which a mounting plate 205 is fixedly attached. Said cup assembly 204 has a ball inlet aperture 206 located within its cylindrical sidewall for mounting of ball receptacle 102 in depending relation therefrom and in registry with said aperture 206, an opening within the bottom for the journalling of both the upper portion of rack 210 and stem 202 which has tee 207 secured thereto, and an opening 208 at the top to provide for ball exit when placed in registry with the opening within floor 101.

Tee 207 is fixedly mounted to the top of said stem 202 whcih is reciprocably mounted within the bottom opening of said cup assembly 204. The lower portion of said stem 202 is slidably mounted within rack cavity 201 with compression spring 217 maintaining said tee 207 a fixed distance away from the top of rack 210 which is also reciprocably mounted within the bottom opening of said cup assembly 204. Centrally and fixedly mounted to the top of said stem 202, and in depending manner within the central opening of said tee 207, is the ball sensing means such as photoelectric switching sensor lens assembly 209. The fiber-optic light guide 214 extending from said lens assembly 209 is disposed downwardly through stem 202 and proceeds through a clearance hole within said rack 210 to emerge from the bottom thereof. Said guide 214 is secured to the bottom of stem 202 by strain relief bushing 218.

Fixedly mounted to the bottom end of rack 210 is bracket 228. Fastened to said bracket is an actuator such as solenoid 229 having its plunger 230 in alignment with said light guide 214 emerging from the clearance hole within said rack. Said light guide is secured to plunger 230 by fastener 222 such that said plunger extends from the solenoid body by an amount equivalent to the height a ball is teed up for a tee shot. Fixedly mounted to the non-toothed side of rack 210 is stop pin 226 which is so disposed as to contact upper stop 325 and lower stop 227 when said rack is reciprocated. Said lower stop is fixedly mounted to mounting plate 205

such that said stop pin is in contact therewith when tee **207** is in ball receiving position such as shown. The upper stop is fixedly mounted to said plate **205** above said lower stop at such a distance that tee **207** will be in tee shot position when said rack is elevated such that said stop pin contacts said upper stop **225.**

Gearmotor **212** is fixedly mounted at a set distance from mounting plate **205** by spacers **223.** Said spacers are of such length as to permit coupling **224,** such as a rubber tube, to connect shaft **215** to the gearmotor shaft such as shown. Said shaft **215** is journalled within bearing **220** located in mounting plate **205,** and bearing **219** located in bearing plate **221.** Said bearing plate is fixedly mounted to said mounting plate **205** such that said bearings **219** and **220** are in proper alignment with said gearmotor shaft. Fixedly mounted to shaft **215** between said bearing plate **221** and said mounting plate **205** is gear **211** which is drivably engaged with said reciprocally mounted rack **210.** Shaft **216** journalled within flanged guide roller **213** is fixedly secured to mounting plate **205.** Said guide roller is rollably engaged with the non-toothed side of said rack so that the center distance between shaft **216** and shaft **215** is such that said rack **210** can be freely reciprocated between said gear **211** and said roller **213.**

FIG. **8** depicts the electric controls set on the "Golf Practice" with "Fairway Shot" selection as the mode of operation for the second embodiment of the invention. Momentary depressing of pushbutton PB–A will energize latch relay coil X to close contacts X1, X2, X4, and open contacts X3, X5, X6, X7, and X8. Then momentary depressing of pushbutton PB–D will convey a signal through X4 to energize latch relay coil Y′ to close contacts Y1.

Upon placement of the required money in the monetary acceptor unit **118,** the vend will be initiated causing contacts K1 to open and K2 to close. Opening of contacts K1 will terminate power to the "Golf Practice" and "Golf Game" selection branch circuit. Closing of contacts K2 will direct power to the prime mover control circuit through terminal **8** of the photoelectric proximity switch **127.** With no ball on tee **207,** contacts A2 will be in the closed position and A1 in the open position. Now, power from said terminal **8** will be directed through contacts A2 to energize gearmotor **212** to drive the ball elevating means downward to the ball receiving position. Rack **210** will therefore descend until stop pin **226** abuts lower stop **227** to stop said rack movement and stall out gearmotor **212.** Now, it can also be readily discerned that power will be directed through Y1 to energize solenoid **229.** Energizing of said solenoid will pull light guide **214** downward to compress spring **217** and effectuate position of stem **202** with tee **207** to its lowermost position within cavity **201** of rack **210.** Said solenoid will remain energized during the "Fairway Shot" selection mode of operation. With the tee in the lowermost ball receiving position, a ball will be provided from the ball receptacle **102** to gravitate thereupon. This will cause the photoelectric proximity switch **127** to become activated to close contacts A1 and open contacts A2. Power will now be directed through contacts A1 to energize gearmotor **212** to drive the ball elevating means upwardly. Rack **210** will therefore rise until stop pin **226** abuts upper stop **225** to stop rack movement and stall out said gearmotor **212** to place the tee in the intermediate ball hitting position.

Upon dislodging of ball **203** from tee **207,** the photoelectric proximity switch **127** will operate to provide a pulse through terminal **9,** open contacts A1, and close contacts A2. Said pulse from terminal **9** will be fed to the ball feed counter module **129** to register a count therein. Now, the said tee will be again lowered by the mode of operation explained, and the cited modes of operation for lowering and elevating said tee **207** will prevail on a repetative basis as described supra. As previously indicated, a pulse will be fed to the ball feed counter module **129** every time a ball is dislodged from said tee. Said plurality of pulses will be registered and when said count reaches the preset count, said counter will release a termination pulse to the monetary acceptor unit **118** to terminate the vend. In so doing, contacts K2 will open to terminate power to the controller **128** and to said photoelectric proximity switch **127.** This means that when the last ball of the vend is dislodged from the tee, contacts K2 will open to terminate power through contacts A2 thus maintaining the tee in the elevated position.

It is to be noted that in this embodiment flexible coupling **224** can be replaced by a magnetic slip coupling **231** so that gearmotor **212** does not have to be stalled when said stop pin abuts either the upper or lower stops. Said gear-motor will continue running with said coupling providing a slipping action so that the coupling's magnetic field will hold the ball elevating means in the required position during coupling slip.

"Golf Practice" with "Tee Shot" selection as the mode of operation is obtained by momentary depressing of pushbutton PB–A to energize latch relay coil X to close contacts X1, X2, X4 and open contacts X3, X5, X6, X7 and X8. Then momentary depressing of pushbutton PB–C will convey a signal through contacts X2 to energize latch relay coil Y to open contacts Y1.

Upon placement of the required money in the monetary acceptor unit **118,** the vend will be initiated causing contacts K1 to open and K2 to close. Opening of contacts K1 will terminate power to the "Golf Practice" and "Golf Game" selection branch circuit. Closing of contacts K2 will direct power to the gear-motor control circuit through terminal **8** of the photoelectric proximity switch **127.** With no ball on tee **207,** contacts A2 will be in the closed position and A1 in the open position. Now, power from said terminal **8** will be directed through contacts A2 to energize gearmotor **212** to drive the ball elevating means downward. Tee **207** will therefore descend until stop pin **226** abuts lower stop **227** to stop rack movement and stall out gear-motor **212.** With no power to solenoid **229,** spring **217** will move to its extending position to effectuate positioning of stem **202** with tee **207** to its uppermost position within cavity **201** of rack **210.** Solenoid **229** will remain de-energized during the "Tee Shot" selection mode of operation with plunger **230** extended from within solenoid **229.** With tee **207** in the lowermost ball receiving position, a ball will be provided from the ball receptacle **102** to gravitate upon said tee. This will cause the photoelectric proximity switch **127** to become activated to close contacts A1 and open contacts A2. Power will now be directed through contacts A1 to energize gearmotor **212** to drive the ball elevating means upwardly. Rack **210** will therefore rise until stop pin **226** abuts upper stop **225** to stop rack movement and stall out said gearmotor **212** to place said tee in the uppermost ball hitting position.

Upon dislodging of ball 203 from tee 207, the photoelectric proximity switch 127 will operate to provide a pulse through terminal 9, open contacts A1, and close contacts A2. Said pulse from terminal 9 will be fed to the ball feed counter module 129 to register a count therein. Now, the said tee will be again lowered by the mode of operation explained, and the cited modes of operation for lowering and elevating said tee 207 will prevail on a repetitive basis as described supra. As previously indicated, a pulse will be fed to the ball feed counter module 129 every time a ball is dislodged from said tee. Said plurality of pulses will be registered and when said count reaches the preset count, said counter will release a termination pulse to the monetary acceptor unit 118 to terminate the vend. In so doing, contacts K2 will open to terminate power to the controller 128 and to said photoelectric proximity switch 127. This means that when the last ball of the vend is dislodged from the tee, contacts K2 will open to terminate power through contacts A2 thus maintaining the tee in the elevated position.

The switch from "Fairway Shot" to "Tee Shot" selection during the vend, the golfer depresses the "Tee Shot" pushbutton PB-C. Since tee 207, with a ball thereupon, is in the intermediate ball hitting position before depressing of PB-C, photoelectric proximity switch contacts A1 will be closed and A2 will open. Therefore, depressing of said pushbutton PB-C will actuate latch relay coil Y to open contacts Y1. Opening of contacts Y1 will cut off power to solenoid 229. With no power to said solenoid, spring 217 will move to its extended position to effectuate positioning of stem 202 with tee 207 to its uppermost position within cavity 201 of rack 210 thus switching said tee elevation to the uppermost ball hitting position. Said solenoid will now remain de-energized during the "Tee Shot" selection mode of operation with plunger 230 extended from within solenoid body 229. Now, after the ball is dislodged from the tee, subsequent operation of the apparatus will follow the same sequence described under "Tee Shot" selection mode of operation, and the tee will now reciprocate between the lowermost ball receiving position and the uppermost ball hitting position. To switch from "Tee Shot" to "Fairway Shot" selection during the vend, the golfer depresses the "Fairway Shot" pushbutton PB-D. Since tee 207, with a ball thereupon, is in the uppermost ball hitting position before depressing of PB-D, photoelectric proximity switch contacts A1 will be closed and A2 will be open. Therefore, depressing of PB-D will actuate latch relay coil Y' to close contacts Y1. Closing of said contacts Y1 will energize solenoid 229, to pull plunger 230 within solenoid 229. Retraction of said plunger will cause spring 217 to compress and effectuate positioning of stem 202 with tee 207 to its lowermost position within cavity 201 of rack 210 thus switching said tee elevation to the intermediate ball hitting position. Said solenoid will now remain energized during the "Fairway Shot" mode of operation thus holding said stem 202 in a lowermost position within said cavity 201. Now, after the ball is dislodged from the tee, subsequent operation of the apparatus will follow the same sequence described under "Fairway Shot" selection mode of operation, and the tee will now reciprocate between the lowermost ball receiving position and the intermediate ball hitting position.

For "Golf Game" selection as the mode of operation, the patron depresses only the "Golf Game" pushbutton. Tee shot and fairway shot golf tee positioning will be provided automatically according to a predetermined sequence dictated by programming meano such as the punched tape programmer 130.

Momentary depressing of the "Golf Game" pushbutton PB-B will energize latch relay coil X' to open contacts X1, X2, X4 and close contacts X3, X5, X6, X7, and X8. Opening of said contacts X1, X2, and X4 will isolate the "Fairway Shot" and "Tee Shot" pushbuttons from the circuit so that accidental depressing of said pushbuttons cannot affect the tee elevating sequence provided by the punched tape programmer 130. Closing of said contacts X3, X5, X6, X7, and X8 will operatively connect said punched tape programmer into the circuit to provide for automatic positioning of said tee. The tape of said programmer is punched with control information such that holes in one channel represent the tee shot control function and holes in a second channel represent the fairway shot control function.

Placement of the proper amount of money in the monetary acceptor unit 118 will initiate the vend causing contacts K1 to open and K2 to close. Opening of contacts K1 will isolate push-buttons PB-A and PB-B from the circuit so that selection switching is not possible after vend initiation. Closure of contacts K2 will provide power to the photoelectric proximity switch 127 and the motor control circuit. With no ball on the elevated tee, contacts A2 will be in the closed position thus conveying power to gearmotor 212 to drive the ball elevating means downward. Control of said ball elevating means will now follow the same sequence described for switching from "Tee Shot" to "Fairway Shot" and from "Fairway Shot" to "Tee Shot" modes of operation with said switching provided automatically by punched tape programmer 130.

In the "Golf Game" mode of operation, the function of pushbuttons PB-C and PB-D is replaced by said punched tape programmer. With said programmer in operation, the tape reader senses the hole in the first line of the tape and effectuates energization of either the tee shot latch relay coil Y or the fairway shot latch relay coil Y', depending on which channel the hole appears. If coil Y is energized, load contacts Y1 will open to set the elevation of stem 202 for tee shot operation. If coil Y' is energized, load contacts Y1 will close to set the elevation of stem 202 for fairway shot operation. Now, as previously mentioned, reciprocation of tee 207 will depend upon whether or not there is a ball thereupon to effectuate operation of contacts A1 and A2 of said proximity switch 127. With no ball on said tee, contacts A1 will be closed thereby causing gearmotor 212 to drive said tee downward. With a ball on said tee, contacts A1 will be closed thereby causing gearmotor 212 to drive said tee upward.

Everytime a ball is dislodged from the tee, a pulse from the proximity switch 127 will be provided to terminal 15 of controller 128 and to terminal 20 of the ball feed counter module 129. The pulse to said counter will register a count therein, and the pulse to said controller will be directed to the stepping drive of the punched tape programmer to advance the tape through the reader one line to provide the next tee height positioning command for energizing either relay coil Y or Y'. Cited mode of operation for lowering and

elevating the tee and adjusting of stem position within rack cavity will prevail on a repetative basis and termination of the vend will occur when the count registered on said counter **129** reaches its preset count. When this occurs, said counter will release a termination pulse to the monetary acceptor unit **118** to terminate the vend. In so doing, contacts K2 will open to terminate power to the controller **128** and the photoelectric proximity switch **127**, thus stopping the tee in the elevated position. At termination of said vend, the programming tape will revert back to its initial starting point ready for re-cycling when another vend is initiated.

It is to be noted that in both embodiments there exists means to provide automatic switching between a lowermost-to-intermediate positional mode of operation, and a lowermost-to-uppermost positional mode of operation. This means that when the ball elevating means is reciprocating or set to reciprocate between the lowermost ball receiving position and the intermediate ball hitting position, it can be automatically switched for reciprocation between the lowermost ball receiving position and the uppermost ball hitting position, or vice versa.

Having thusly described the invention, I claim:

1. A golf apparatus comprising in combination, a ball teeing means including a ball elevating means reciprocally mounted therein; and an open-loop control system operatively associated with said ball elevating means to effectuate positioning thereof between a lowermost ball receiving position and an intermediate ball hitting position, or between a lowermost ball receiving position and an uppermost ball hitting position, said control system being further characterized as having means to provide automatic switching between said lowermost-to-intermediate positional mode of operation and said lowermost-to-uppermost positional mode of operation, thus enabling the golfer to expeditiously execute both tee and fairway shots.

2. The apparatus as defined in claim **1**, further characterized as including a ball receptacle so oriented with respect to said ball teeing means as to prvide balls thereto.

3. The apparatus as defined in claim **2**, wherein said open-loop control system is further characterized as including operatively associated position sensors disposed within said ball teeing means fo effectuating said positioning of said ball elevating means between said ball receiving and said intermediate or said uppermost positions, and between said intermediate and said uppermost positions.

4. The apparatus as defined in claim **3**, wherein said ball elevating means is further characterized as including a drive mechanism therewithin, and said open-loop control system is further characterized as including a prime mover operatively associated with said drive mechanism for providing motion thereto.

5. The apparatus as defined in claim **4**, wherein said ball elevating means is further characterized as including a tee at its uppermost end, and said open-loop control system is further characterized as including ball sensing means disposed within said ball teeing means for sensing balls delivered to and dislodged from said tee.

6. The apparatus as defined in claim **5**, wherein said open-loop control system is further characterized as including a counter module functionally associated with said ball sensing means for counting a predetermined number of balls dislodged from said tee by the golfer.

7. The apparatus as defined in claim **6**, wherein said open-loop control system is further characterized as including operator selection means therewithin for initiating the golf practice mode of apparatus operation.

8. The apparatus as defined in claim **7**, wherein said open-loop control system is further characterized as including operator selection means therewithin for initiating the golf game mode of apparatus operation.

9. The apparatus as defined in claim **8**, wherein said open-loop control system is further characterized as including programming means therewithin to automatically provide control commands for positioning of said functionally associated ball elevating means.

10. The apparatus as defined in claim **9**, wherein said open-loop control system is further characterized as including an initiating means therewithin for commencing apparatus operation.

11. The apparatus as defined in claim **10**, further characterized as including a ball dispensing means functionally associated with said ball receptacle for providing balls thereto.

12. The apparatus as defined in claim **1**, wherein said ball teeing means is further characterized as including restraints therewithin for stopping said ball elevating means at said cited positions.

13. The apparatus as defined in claim **12**, wherein said ball elevating means is further characterized as including a drive mechanism therewithin, and said open-loop control system is further characterized as including a prime mover operatively associated with said drive mechanisms for providing motion thereto.

14. The apparatus as defined in claim **13**, wherein said ball elevating means is further characterized as including a reciprocally mounted tee at its uppermost end, and an actuator functionally associated with said tee for switching it automatically between said intermediate and said uppermost position.

15. The apparatus as defined in claim **14**, further characterized as including a ball receptacle functionally associated with said ball teeing means to provide balls thereto.

16. The apparatus as defined in claim **15**, wherein said open-loop control system is further characterized as including ball sensing means disposed within said ball teeing means for sensing balls delivered to and dislodged from said tee.

17. The apparatus as defined in claim **16**, wherein said open-loop control system is further characterized as including a counter module functionally associated with said ball sensing means for counting a predetermined number of balls dislodged from said tee by the golfer.

18. The apparatus as defined in claim **17**, wherein said open-loop control system is further characterized as including operator selection means therewithin for initiating the golf practice mode of apparatus operation.

19. The apparatus as defined in claim **18**, wherein said open-loop control system is further characterized as including operator selection means therewithin for initiating the golf game mode of apparatus operation.

20. The apparatus as defined in claim **19**, wherein said open-loop control system is further characterized as including programming means therewithin to automatically provide control commands for positioning of said functionally associated ball elevating means.

21. The apparatus as defined in claim 20, wherein said open-loop control system is further characterized as including an initiating means therewithin for commencing apparatus operation.

22. The apparatus as defined in claim 21, further characterized as including a ball dispensing means functionally associated with said ball receptacle for providing balls thereto.

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