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B. A. HOGE BERG
GOLF BALL TEEING MACHINE

2,530,698

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2 Sheets-Sheet 1

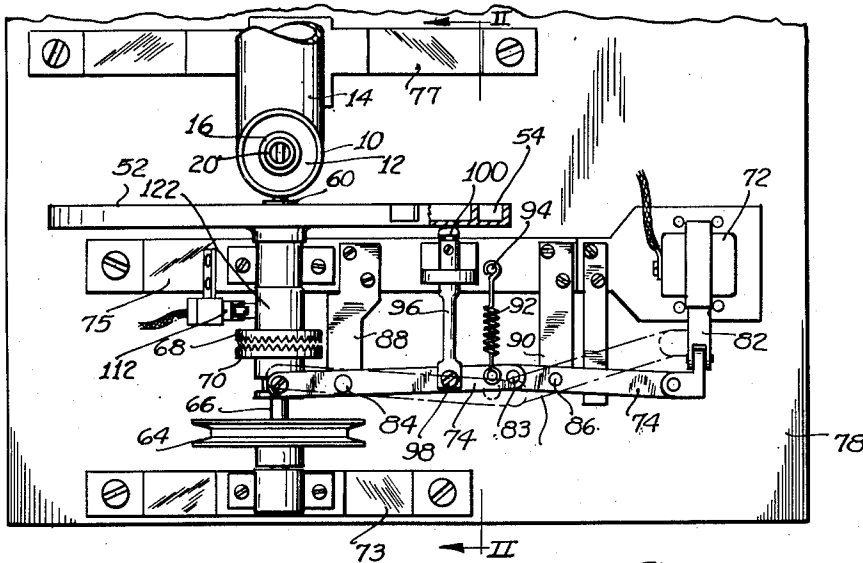


Fig. 1

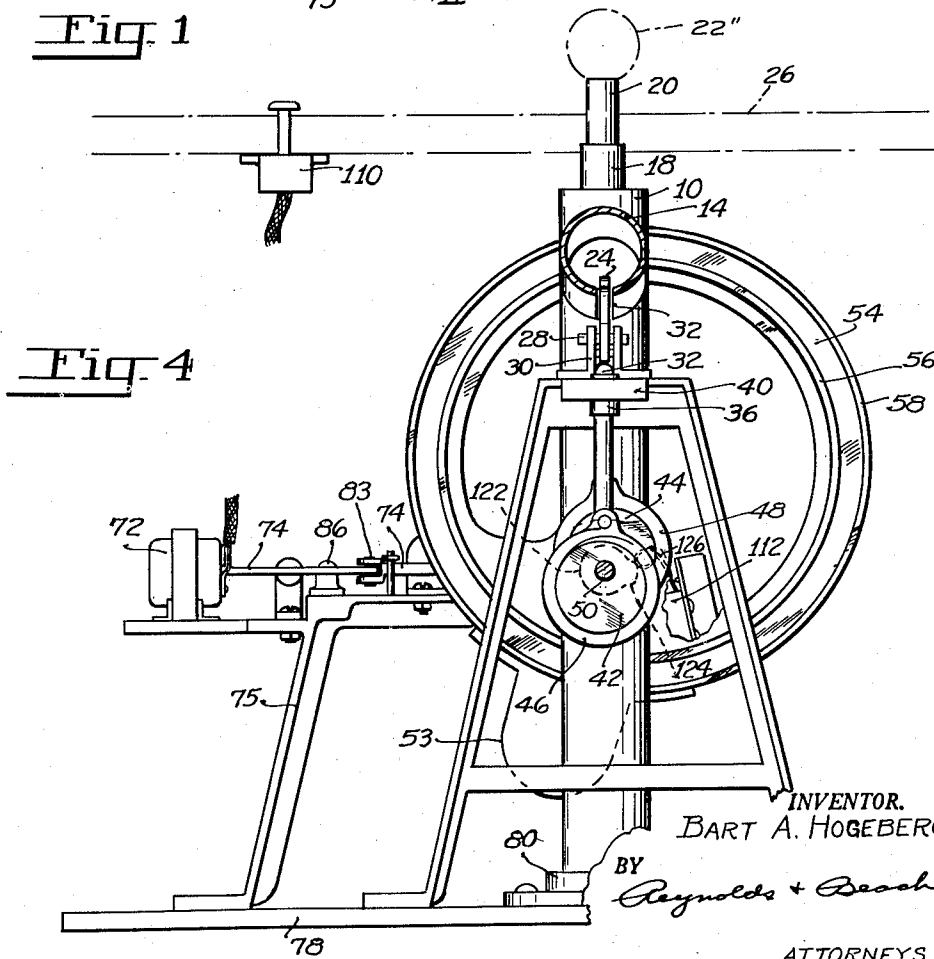


Fig. 4

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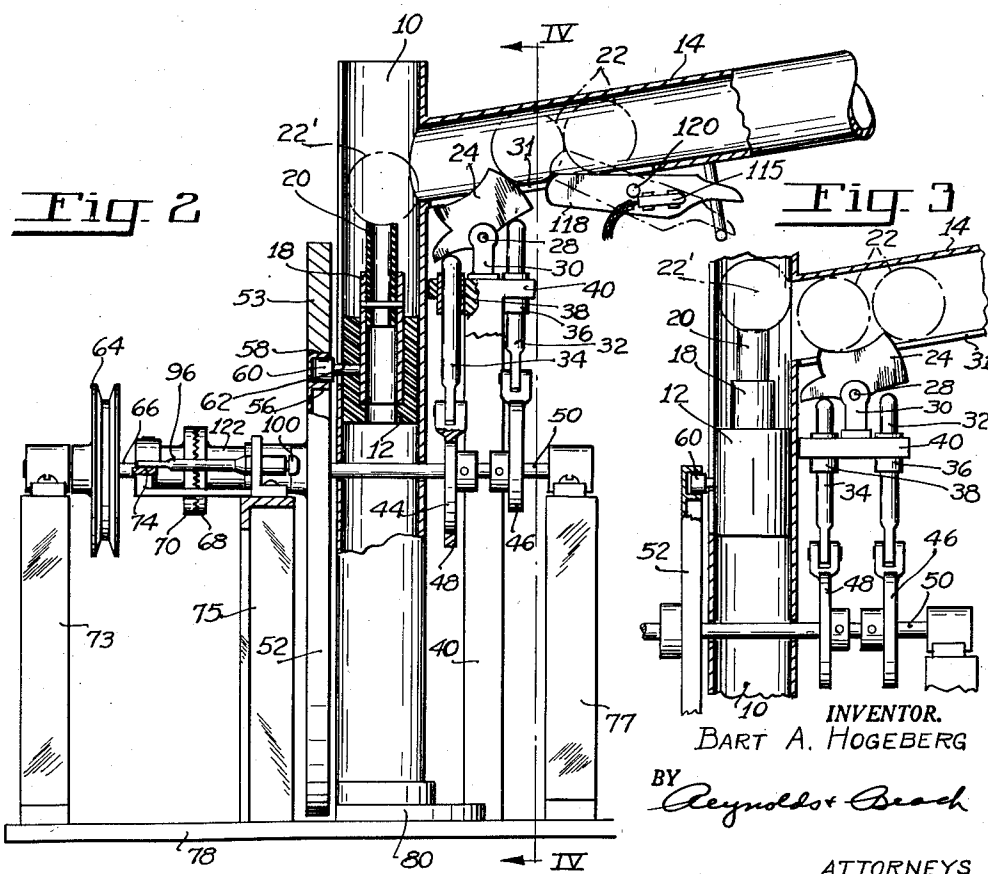
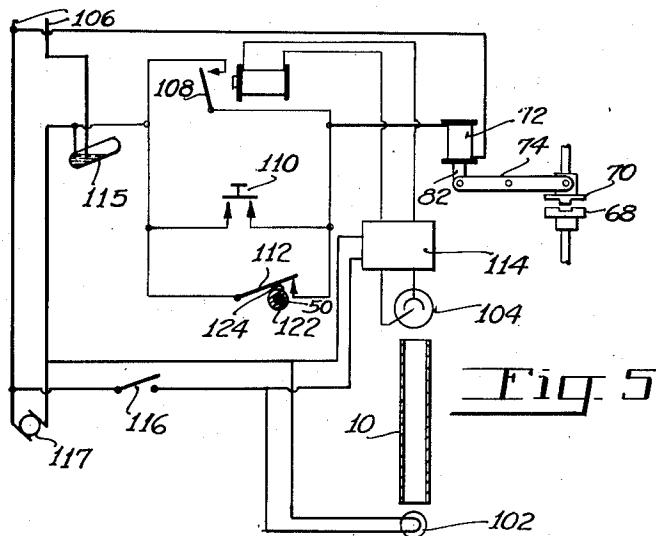
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UNITED STATES PATENT OFFICE

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GOLF BALL TEEING MACHINE

Bart A. Hogeberg, Seattle, Wash.

Application October 1, 1947, Serial No. 777,293

1 Claim. (Cl. 273—33)

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This invention concerns an improved golf ball teeing machine, preferably of the automatic type which is adapted to be set into operation automatically to tee another ball the instant a ball is struck from the tee. In my United States Letters Patent No. 2,335,280, issued November 30, 1943, a machine of this general type is disclosed, to which the improvements of the present invention particularly relate.

In the operation of a teeing machine generally of this type, golf balls are fed from a suitable ball hopper downwardly through a gravity type chute to a reciprocable teeing member which in its cycle of operation is depressed to receive a ball delivered to it by a gate located in the chute, and elevates the ball to its teed position where it is brought to rest and held. In the preferred, illustrated system of automatic control by which is governed the action of the mechanism operating and coordinating the movement of the teeing member and gate, the instant a ball is struck or otherwise moved from the tee a beam of light, intercepted by the ball on the tee, is allowed to pass from a light source to a photoelectric cell. The signal current resulting from light energization of the photocell effects the initiation of another teeing cycle during which the teeing member is again depressed, the gate operates to effect delivery of another ball, and the teeing member carrying such ball is raised into position for another play. The apparatus thus requires no attention from the player who may maintain his or her stance or position in relation to the tee point over the period of a number of plays, a procedure considered to be best in developing proper playing form.

The sport of golf has developed a number of practice ranges for golfers who require or desire this sort of practice, and their convenience is enhanced by the use of automatic teeing machines. In the usual arrangement of these ranges there is a series of driving stations commanding a playing field, and each station would have a separate teeing machine. On busy days the machines would often be kept in operation substantially continuously. Therefore it is evidently important that the machines be reliable and substantially free of operational interruptions. Nevertheless, with former machines interruptions were frequent, not only because of mechanical failure of parts in the apparatus, but because of damaged balls jamming or otherwise causing failure of the teeing machine. Sometimes the lodging of an irregular ball in the machine, or the jamming of the machine even by a

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more regular ball, such as one improperly placed on the tee of the machine and standing in the way of a ball about to be delivered onto the tee from the ball chute, resulted in unskillful attempts on the part of the player to remedy the difficulty, and consequently sometimes resulted in damage to the apparatus.

The present invention is concerned with this general problem and with other problems relating to the operational and maintenance difficulties of teeing machines. Broadly speaking, the invention is concerned with improving teeing machines to make them easier to install, operate, and maintain in operation, and less expensive in all of these respects.

Accordingly, the main object of the present invention is to provide improvements in golf ball teeing machines enabling golf balls to be handled in the machine in a more positive manner with minimum chance of interrupting operation of the apparatus or jamming the moving parts thereof, even though the balls may be old and worn, and in which such moving parts will act smoothly and reliably in passing the balls from a supply chute into their teed position.

Another important object is the provision in a machine such as the type disclosed in my Patent No. 2,335,280 of further refinements in the electrical control apparatus by which the energization and activation of the mechanism is governed, for instance by deenergizing the machine when the supply of golf balls in the supply chute becomes exhausted.

A more specific object of the invention is attained in the provision of a novel cradle-type rocking gate adapted to control the movement of golf balls in the bottom of the supply chute in positive manner, and with which there is no tendency for the oncoming balls to become lodged or jammed at the gate or a departing ball to jam the gate in the event a ball is already in the tee. Other objects relate to improvements in the details of construction of the teeing means of the machine and in the actuating mechanism for such means.

An automatic teeing unit embodying the novel improvements of the invention is illustrated in the drawings, representing one practical way in which the principles of the invention may be applied to golf ball teeing machines, but it will be appreciated that various design and structural details of the machine are unimportant in that they may be determined by the requirements of a particular installation or within the discretion of the designer. The present improvements lend

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themselves variously to use with machines of various forms and are not limited to the form illustrated herein.

Figure 1 is a plan view of an automatically controlled golf ball teeing machine, embodying features of the invention.

Figure 2 is an end elevation view in which some of the parts are shown in section and the view of the machine itself is taken along the section line II—II of Figure 1. Figure 3 is a fragmentary side elevation view of the machine taken partly in section, illustrating the operation of the golf ball supply chute gate and teeing member as viewed in the direction of Figure 2.

Figure 4 is a front elevation view of the same machine taken along the section line IV—IV of Figure 2.

Figure 5 is a schematic diagram of the improved electrical control system of the apparatus.

In its construction and operation the present machine is generally similar to my earlier machine described in the specification of my Patent No. 2,335,280, heretofore referred to. For this reason similar parts or characteristics of such parts will not be described in great detail herein, unless greater elaboration with respect to these parts or characteristics is considered necessary to show relationships with new or modified parts.

The machine generally comprises a vertical tube 10 in which reciprocates a lifting plunger 12 carrying a tee. The tee is of improved construction, being adapted for replacement of tees of different lengths to meet the requirements of various installations and individual golfer's preferences. It comprises a rigid lower sleeve 18 into the upper end of which is pinned a flexible tee member 20. This sleeve seats on a ledge in a cylindrical hole in the plunger 12. The tee itself, that is the ball holding element 20, being of rubber or other flexible material may be struck by a golf club or otherwise displaced without damage to the plunger 12 or its associated components, whereas the tee-supporting sleeve 18 is rugged and is thus adapted to distribute the shock of a club blow against the member 20 substantially over the length of the supporting lifting plunger 12. The sleeve 18 and the plunger 12 are apertured axially for the passage therethrough of a vertical beam of light from a light source (not shown, except diagrammatically in Figure 5) beneath or above the machine to a photoelectric cell at the opposite location.

From tube 10 near its upper end branches a ball supply chute 14 inclined downwardly toward such tube, which chute comprises a tube of substantially the same internal diameter as the tube 10. Golf balls 22 rolling down the chute toward the entrance to the tee tube 10 are checked by a cradle type rocking gate 24 and allowed to pass into the tee tube onto the tee 20 one at a time at each instance of depression of the plunger 12. A ball 22' is indicated in outline in Figure 2 in its position just after having passed the gate 24 and rolled through the chute exit and onto the tee. From this position it may be elevated by the lifting plunger 12 to the position 22'' indicated in Figure 4 where the tee 20 then projects the requisite distance above the level 25 of the driving mat or other base on which the player stands, or from which the ball is to be driven. The ball storage hopper from which balls are delivered into the chute 14 has not been shown in the drawings, but may comprise any suitable

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device into which the balls may be dumped and carried into the receiving end of the chute.

For controlling the delivery of balls from the chute 14 into the tube 10, there is provided the improved gate member 24. In its preferred form, the gate comprises a flat piece of metal or other suitable material of such profile that from the side it resembles a cradle adapted to be rocked in a vertical plane longitudinally of the chute, about a horizontal supporting pin 23 extending through such piece and carried in a suitable support such as the post 30. The bottom of the chute 14 is slotted lengthwise at 31, to receive the gate which extends upwardly into the chute passageway in the path of movement of golf balls rolling down the chute. The end surface of the gate remote from tee tube 10, adapted for positioning to meet and stop oncoming balls, is curved convexly approximately as the arc of a circle centered at the pivot point of the gate, whereas the gate's upper surface is concave or depressed to receive and hold a ball therein. At its end remote from tube 10 the upper surface rises to join the described convex end surface substantially at right angles. The end surface of the gate closer to the tube 10 is shaped primarily for clearing the end of the slot in chute 14, and it also rises to join the corresponding rising end of the upper concave surface.

Golf balls received in the cradle depression of the gate's upper surface by tilting the gate away from tube 10, are carried to such tube by rocking the gate toward it, and are released to roll down the chute when the upper edge of the cradle at the end closer to tube 10 has been lowered to the level of the chute bottom or thereabouts. During the time the gate is being rocked toward the tee tube to carry a golf ball to it, the plunger and tee are descending to receive the ball as it is released at the time the lifting plunger and tee are lowered sufficiently to receive it. When the gate is rocked away from the tee tube to pick up another ball it does so against very little frictional resistance because the radial distance between its rocking axis and its point of contact with the next ball remains substantially constant. Consequently it need not crowd the balls back in the chute. When the upper edge of the ball-receiving end of the gate reaches alignment with or passes below the bottom of the chute, the next succeeding ball is thus enabled to roll down into the cradle, which it does by its own weight and the force of the succeeding balls bearing upon it. Owing to the position of the ball in the gate when it is tilted away from the tee tube, the succeeding ball will be held back by the gate-held ball, as the gate begins its motion toward the tee tube, until the upper edge of the gate has risen far enough so that the rising end surface of the gate will block downward movement of such succeeding ball.

Among its particular advantages the gate of the type illustrated is positive in its control of ball delivery to the tube 10. Because of its shape and mode of operation it is not likely that it will become jammed against a ball on either stroke. This has proved to be true even though the balls are badly defaced or deformed, as they usually are after use in a practice golf driving range where the same ball will be driven countless times by novice players. Not only have former gate devices jammed frequently with such balls but the balls themselves have become lodged at the exit of the chute when they are supposed to roll promptly into the teeing device for presenta-

tion of a teed ball to the player. When a ball lodges in this manner or otherwise the machine naturally "misses" a stroke and the player is delayed until the ball can be freed. Usually, the apparatus is shaken or struck to free the lodged ball, oftentimes resulting in damage. An exceedingly important advantage therefore of my improved gate is its characteristic of thrusting a ball forward should it tend to lodge. This action derives from the rocking of the gate during which its end remote from the tee tube advances forwardly, pushing the ball ahead of it. Another exceedingly important characteristic of this type of gate is its ability to avoid jamming itself or the lifting plunger should a ball chance to be on the tee already when another ball is about to be delivered to the tee. This it accomplishes by virtue of its cradle shape and its location close to the exit of the chute such that a misplaced ball already on the tee, or possibly the lifting plunger itself, will act as a stop for the oncoming ball, preventing it from passing the forward edge of the gate. With the cradled ball thus detained, the rocking of the gate away from the tee tube will neatly carry such ball back in order to present it a second time to the tee. In Figure 3 the cradle is in substantially upright position and in Figure 2 the gate is shown at or near its ball delivery position.

While the gate 24 may be rocked by various well known types of mechanism, the type selected comprises the differentially reciprocative plungers 32 and 34, the respective upper ends of which are adapted to bear against the lower surfaces of the gate 24 extending outwardly on either side of its pivotal axis. The plungers 32 and 34 may be slidably retained by vertical sleeves 36 and 38 respectively, carried on a suitable supporting member 40 on which the post 30 is mounted. The plungers 32 and 34 are reciprocated by the action of eccentrics 42 and 44 and loosely mounted eccentric collars 46 and 48, respectively, to the latter of which the lower ends of the plungers are connected by pins extending through such ends and through bifurcations projecting upward from the upper edges of the respective eccentric collars.

The eccentrics 42 and 44 are mounted on a horizontally disposed main shaft 50 in opposite relation, and as the shaft 50 carrying the eccentrics is rotated by suitable means to be described, the plungers are thereby reciprocated vertically, rocking the gate 24 accordingly. Inasmuch as the eccentric collars 46 and 48 swing laterally during the rotation of the eccentrics, the pivotal, pinned connection thereof with the corresponding plungers is necessary. Depending upon the distances between the points of contact of the plungers with the lower surfaces of the gate and the pivotal axis of the latter, the amount of throw of the gate may be determined. With the plungers close-in they need reciprocate through only a short distance to give the gate sufficient movement.

At the same time the gate 24 is rocked by the rotation of the shaft 50, the lifting plunger 12 is operated by the rotation of a cam disc 52 likewise secured to the shaft 50, thus coordinating the respective actions of these members. The cam disc has a circular cam groove 54 formed between annular ridges 56 and 58 projecting from the inner surface of the disc facing the tube 10, the cam groove being located eccentrically of the shaft 50. As the disc is rotated, the rise and fall of a cam follower 60 carried in the groove are

communicated to the lifting plunger 12 by a follower arm 62 carried by and extending laterally outwardly from the plunger through a vertical slot in the wall of the tube 10. The follower comprises a roller slightly narrower than the cam groove 54 and adapted to roll on the inner surface of either cam ridge.

The radius of the circle of groove 54 will be determined by the required vertical travel of the tee between its depressed, ball-receiving position and its extended, ball-teeing position. Oftentimes infiltrating particles of dirt or other foreign matter, including burrs on the inner surfaces of the tube 10, have tended to obstruct the free descent of the plunger 12 or its equivalent, posing a problem in maintaining the machine in free operation at all times. For this reason, I have constructed the cam disc 52 in the illustrated manner, namely with double acting cam surfaces, comprising the inner walls of the circular cam projections 56 and 58 forming the cam groove 54. The lifting plunger 12 is thus brought down into the tube 10 positively by the engagement of the cam follower roll with the upper cam surface.

The cam disc 52 carries a counterbalancing weight 53 which is positioned at a point on the rim of the disc opposite the follower 60 to offset the weight of the lifting plunger 12 and tee 16. This adds to the smoothness of operation of the apparatus and prevents overloading the motor each time it operates, thus permitting a smaller motor to be used. Excessive strain or wear on the clutch or other parts is also avoided by this expedient. The shaft 50 is driven by a pulley 64 driving a shaft 66 which is adapted to be engaged and disengaged from the shaft 50 by a magnetically controlled clutch having serrated clutch plates 68 and 70. The clutch plate 68 is fixed on shaft 50, whereas the plate 70 may be suitably keyed to the shaft 66 for movement axially of such shaft. Such movement occurs through the action of a solenoid 72 and connecting compound lever system 74, as in the machine of my earlier patent. Further description as to the operation of the solenoid in clutching between drive shaft 66 and main shaft 50 will be made later herein.

The shafts and related assemblies may be carried on suitable supports such as the supporting members, 73, 75, and 77, appropriately mounted on a base 78, in common with the supporting base 80 of the tube 10. The teeing unit may receive driving power in various ways, such as through the pulley 64 either from a central drive shaft common to a group of teeing units arranged in a row beneath the driving stations, or by an individual drive unit such as a small electric motor. The individual electric motor drive is oftentimes employed because it is then possible to operate the teeing units separately, and save power when only one or a few out of a large group of units are running. For this reason, and because it adds to the self-sufficiency of a machine, the individual drive is preferred, and is shown in the circuit diagram of Figure 5. Because the motor may be of any suitable type it is not indicated in the other figures, it being simply necessary to connect it to the pulley 64 on shaft 66 through a suitable belt drive.

The clutch actuating assembly, comprising the solenoid 72 and the compound linkage 74, is the means of converting the electrical control signals into mechanical operation of the machine. Thus, such linkage is connected at one end to

the solenoid arm 82 and at the other to the clutch plate 70, the individual links comprising the linkage being pivotally connected together at their inner ends at 83 and pivotally mounted at intermediate points 84 and 86, on suitable supporting members 88 and 90 respectively. The clutch plate 70 is normally held spaced from the plate 68 by the force of a helical spring 92 extending between the linkage and the spring-anchor pin 94 fixed to the supporting member 75.

As in the earlier machine, during normal operation the drive unit, including pulley 64 and shaft 66, runs continuously while the machine is in use. Only when a ball is struck from its tee however, is the teeing device and gate set into operation. This is effected automatically by the photoelectric apparatus to be described in further detail at a later point herein through energization of solenoid 72 and the consequent clutch engagement. After the clutch has once become engaged it remains in this position for the period of time required by the machine to complete its teeing cycle of operation, at the end of which the clutch is disengaged and a brake applied, holding the apparatus at the selected stopping point where a golf ball is held in teed position. Thus, with the clutch in its shown position (Figure 1), the cam disc 52 is braked to hold the lifting plunger and tee in extended position for playing the golf ball on the tee, whereas, in the dot-dash position of the linkage (Figure 1) the brake is not applied, the clutch being engaged. The braking device comprises a reciprocative rod 96 connected at 98 to the linkage 74 and carrying at its inner end a brake shoe 100 adapted to bear against the flat side of the disc 52, which, under the force of spring 92, prevents the disc from turning. A similar device was used in the earlier machine.

The nature and operation of the improved control apparatus by which is governed the operation of the machine will now be described in detail, with particular reference to the schematic diagram of Figure 5. The instant a golf ball is struck from the tee a beam of light from a light source 102, normally intercepted by the ball, shines on a photoelectric cell 104 which is operative to effect the engagement of the clutch plates 68 and 70 by energization of the solenoid 72. This marks the start of a teeing cycle in which the lifting plunger 12 is first depressed, bringing the upper end of the tee below the exit of the chute 14, at which time the gate member 24 dumps another ball into the tube 16 and onto the tee 20. The ball is then elevated into teed position and the gate rocks away from the tube to take another ball. The clutch plates 68 and 70 thus remain in engagement for the period required for the lifting plunger 12 to depress and to again elevate the tee and the next ball it carries into playing position, at which time the clutch is disengaged by deenergizing the solenoid 72, and the brake applied to stop further movement of the teeing apparatus, marking the end of the cycle. A normally closed, cam operated switch 112 determines the point at which the switch opens to effect deenergizing the solenoid 72 with which it is connected in series in the solenoid supply circuit.

Electrical energy is supplied to the system through a pair of supply leads 106 across which is connected the winding of the solenoid 72, through a group of parallel switches 108, 110, and 112. The closure of any of these switches energizes the solenoid and causes the machine to op-

erate. The switch 108 is a relay type switch adapted to be controlled by electrical signals from the photoelectric cell 104, suitably amplified in an amplifier unit such as 114, while the switch 110 is a push-button type switch adapted to be operated by the player, perhaps with the head of his golf club, when the machine is not set for automatic operation by the photoelectric cell, or in the event that the photoelectric device should fail to operate for any reason, or should be disconnected by opening switch 116.

To operate the switch 112, a cam segment 124 formed on the clutch hub 122, mounted on the shaft 50, is adapted peripherally to engage the actuating member 126 of such switch, the latter being suitably mounted on the apparatus frame for this type of engagement. The rotational position of the cam 124 in relation to the shaft 50 and to the positioning of the cam disc 52 and of the gate controlling eccentrics 42 and 44, is adjusted to maintain the cam hump 124 out of contact with the arm 126 after the tee tube starts downward. As the tee tube lifting plunger 12 approaches its uppermost position, the hump engages the roller on arm 126 to open the switch 112. When the apparatus has been started on a subsequent teeing cycle, the cam hump is moved out of contact with the roller of arm 126 and does not contact it while the lifting plunger 12 again is depressed to receive another ball and lifts it to teeing position when the cam hump again opens switch 112.

As a further improvement, a main switch 115, such as of the tilting mercury contact type, is connected in one of the leads 106 through which current must flow in reaching the solenoid 72, the photoelectric cell amplifier circuits 114, the light source 102 and the individual drive motor 117. The switch 115 is carried by a switch actuating lever 118 pivotally mounted on a horizontal shaft 120 and adapted to extend into the chute 14 through the slot 31 in the bottom of it into the path of movement of golf balls 22 in the chute. With a supply of golf balls in the chute the switch lever 118 is depressed by the weight of the balls and the mercury switch 115 closed, energizing the electrical circuit. However, should the supply of balls in the chute become exhausted, the weight distribution of the lever 118 will swing the lever and switch to open the latter, turning off the apparatus, in which condition it will remain until a further supply of balls is dumped into the hopper and chute. It will appear that the properties of the mercury contact type of switch are well adapted for the purpose. Such a switch comprises a mercury reservoir having a pair of spaced contacts in one end adapted to be bridged by the mercury when the switch is tilted. The amount of swing is limited by a suitable stop member. Since the electrical apparatus is thus turned off automatically during periods when the teeing unit is not in use, a saving is effected in electrical energy and in wear on the apparatus parts. Without switch lever 118 a new supply of balls rolling down tube 14 with the gate in operation might result in a jam by one edge of the gate pressing up on a ball forcing it against the top of tube 14.

In the operation of the machine, therefore, until a supply of balls has been dropped into the chute for teeing, the electrical components will not become energized. With balls in the chute the switch 115 will be closed, turning on the motor and the amplifier circuits 114 for the

photoelectric cell 104. If the lifting plunger is not then in teed position, the normally closed switch 112 will inherently be closed, energizing the solenoid 72, effecting engagement of the clutch 70 and enabling the motor to rotate the cam disc 52 to elevate the lifting plunger. Meanwhile the gate member 24 is receiving another golf ball in readiness for the succeeding cycle of operation.

In accordance with the improved electrical control means associated with the apparatus, including switch 115, the system will be turned off without golf balls in the chute 14, and when in operation automatic or manual control may be employed at the election of the player, or in case the automatic apparatus is damaged the machine may not be rendered completely useless. To deenergize the automatic control, switch 116 is opened, turning off the light source 102 and cutting off the supply of current to the photoelectric cell amplifier 114. The push button switch 110 may then be operated by the player with his club in order that he need not leave his playing stance. Formerly the combination of automatic and manual controls was impractical because of the possibility of jamming the apparatus when the manual control was accidentally operated. According to my improved apparatus, however, in the event a player should operate the switch 110 accidentally before striking the ball presently teed, the apparatus would be saved from jamming by the recovery action of the gate when the ball to be delivered is held back by the ball then on the tee.

It will be evident, therefore, that the invention provides improvements which attain the desired ends by a machine of relatively simple and reliable construction, adapted to operate smoothly without danger of jamming or producing excessive wear on any of the parts. The same modifications producing the advantages described by reference to the illustrated form of teeing machine may likewise be applied to other types with similar success, within the principles of my invention.

I claim as my invention:

In a golf ball teeing machine, an upright tube, a golf ball teeing member guided for movement in said tube between an upper ball-teeing position and a lower ball receiving position, a golf ball supply trough inclined downwardly toward

said tube and communicating with it, and coating gate means comprising a cradle member having a concave upper surface and projecting into said supply trough immediately adjacent to said tube, means supporting said cradle member to rock toward and away from said tube about an axis substantially normal to said supply trough, and means operable to rock said cradle member away from said tube to receive therein a ball from said supply trough, and to rock said cradle member toward said tube to carry such ball and dispense it into said tube and onto said teeing member in its lower, ball-receiving position, the end of said cradle member remote from said tube being convexly curved approximately circularly about said axis on a radius sufficiently great to hold back the next succeeding ball in said supply trough at a substantially constant distance from said tube throughout rocking of the cradle member toward said tube, the end of said cradle member proximate to said tube being projectible inwardly into said trough at a location to engage a lodged ball projecting partially into said tube, and the length of said cradle member's concave surface at its end proximate to said tube being sufficient to recover and shift such ball in said trough away from said tube, on the backward rocking movement of said cradle member, to a position adjacent to said next succeeding held-back ball in the event that entry of the ball into the tube is prevented by an obstruction therein.

BART A. HOGEBERG.

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