

July 8, 1969

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3,453,889

DRIVING INDICATOR APPARATUS

Filed Oct. 24, 1966

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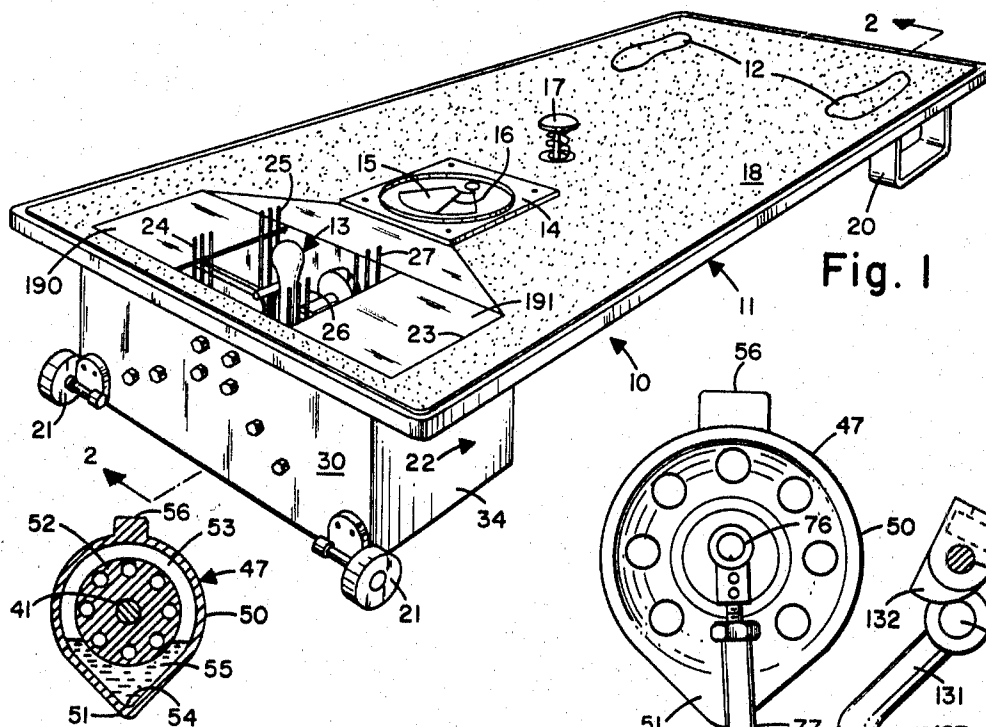


Fig. 1

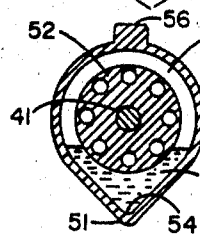


Fig. 3

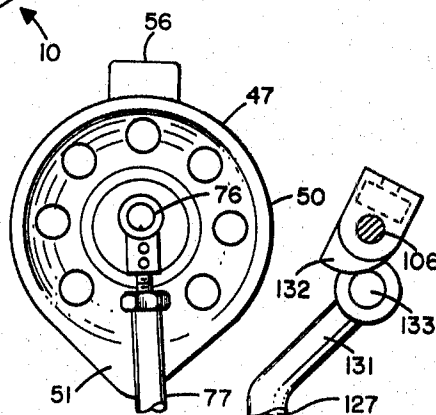


Fig. 7

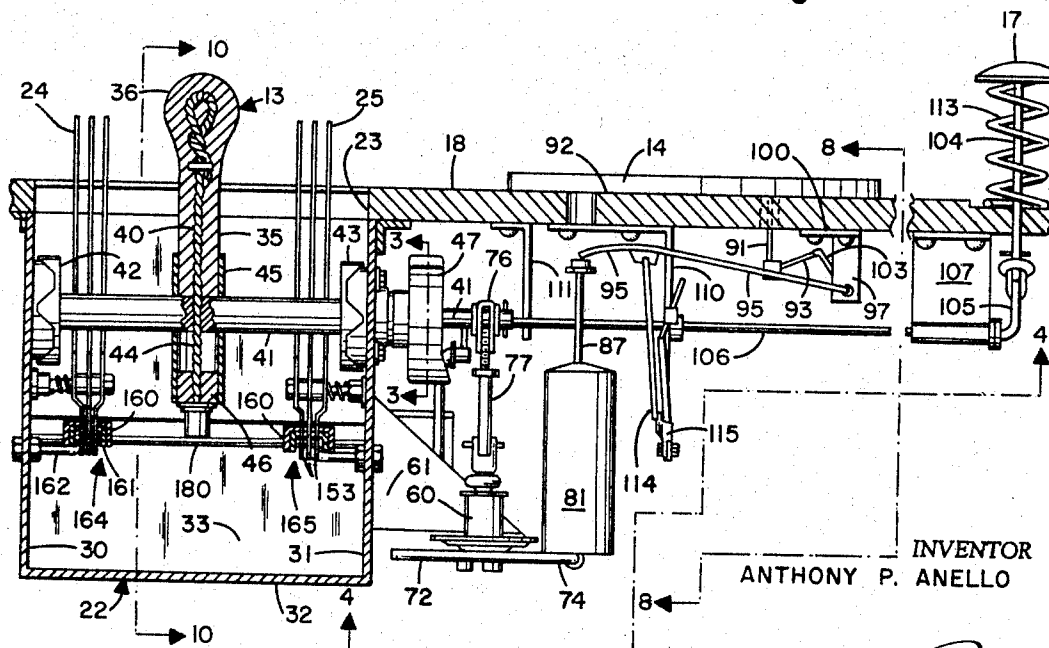


Fig. 2

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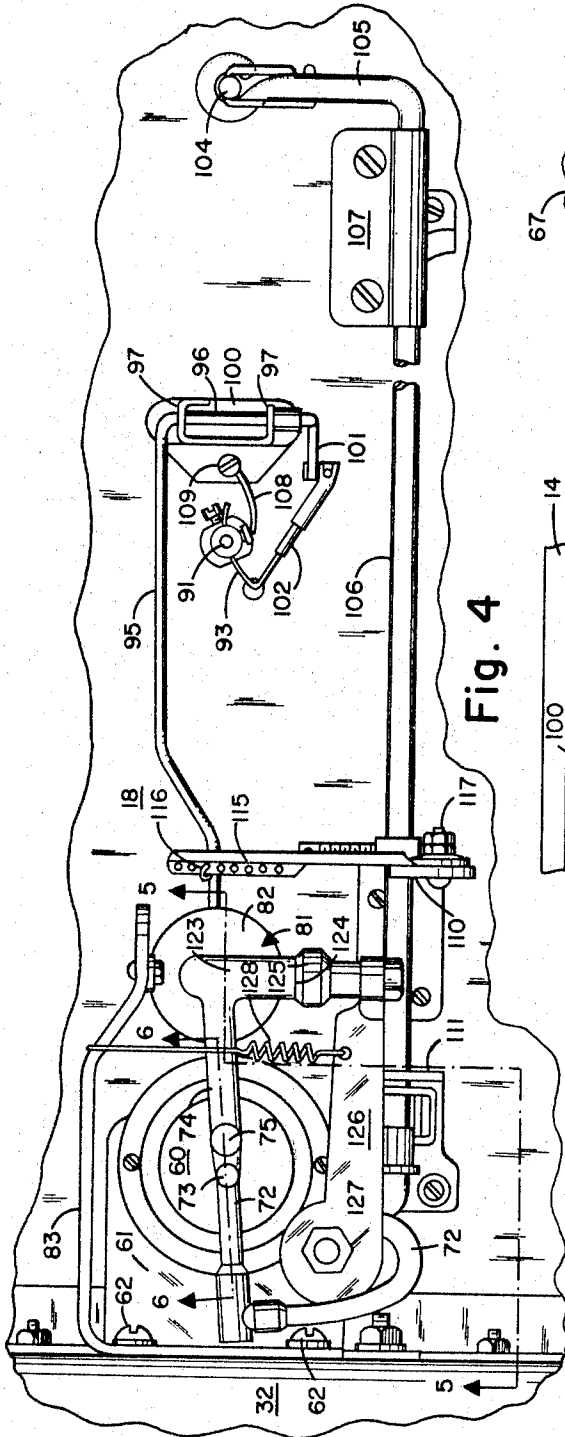


Fig. 4

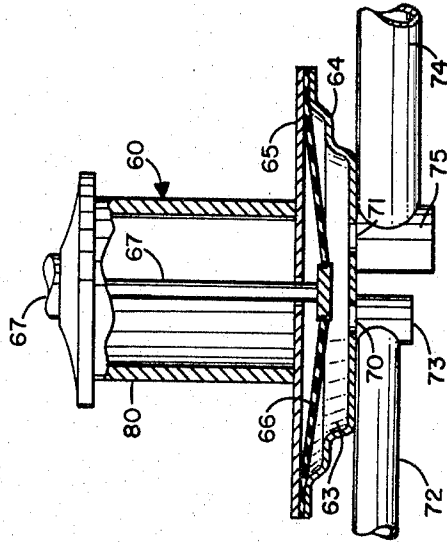


Fig. 6

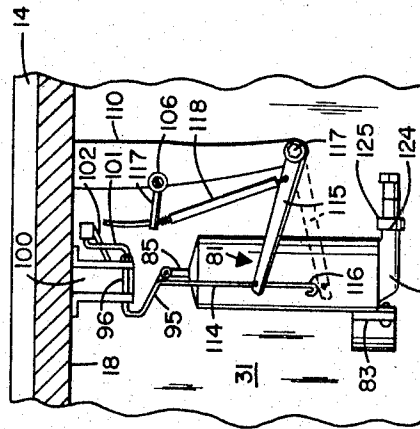


Fig. 8

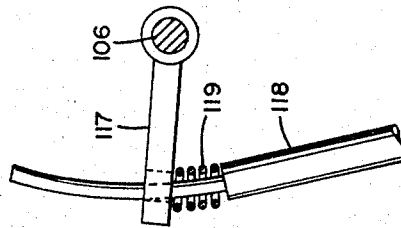


Fig. 9

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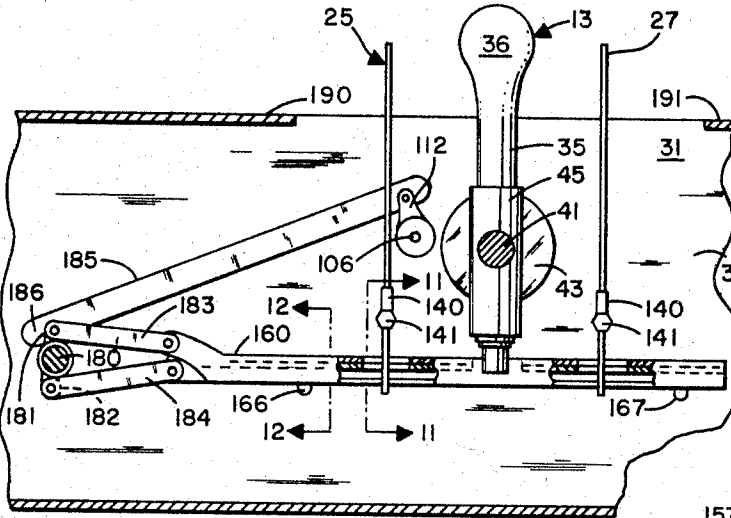


Fig. 10

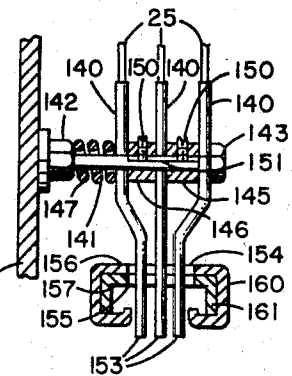


Fig. 11

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DRIVING INDICATOR APPARATUS

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5 Claims

ABSTRACT OF THE DISCLOSURE

A golf ball driving practice mechanism has a simulated golf ball which revolves when struck to actuate an air pump discharging into a cylinder and displacing a piston connected to a drive distance indicator. The cylinder is exhausted as the indicator is returned to zero.

The present invention relates to apparatus for practicing golf ball driving and comprising a simulated golf ball which is struck with a golf club in the same manner as golf balls are driven on a golf course, and which apparatus indicates the effective ball driving force applied to the ball and also indicates deviations in the path of travel of the golf club head from the optimum path of travel.

It has been proposed heretofore to provide golf practicing apparatuses adapted to measure the effective forces applied to simulated golf balls by practice golf drives and which type of apparatus comprises a platform structure on which a golfer may stand and strike a simulated golf ball attached to an arm supported on a rotatable shaft connected with a tachometer or the like so that when the simulated golf ball is struck by the golf club the arm and shaft are rotated and the tachometer indicates the relative speed or the number of revolutions made by the shaft and thereby indicates the force of the particular golf ball drive.

Apparatuses of the type mentioned have had the objection that the form of the simulated ball was such that should the club head engage the same lower than the ideal level, the club head would tend to be caught on the structure and be wrenched from the golfer's hand or be damaged. A principal object of the present invention, therefore, is the provision of a simulated golf ball for apparatus of the character mentioned which is formed so that the head of a golf club cannot be caught or damaged by striking the simulated ball regardless of the part thereof struck by the club's head and which provides a durable and highly satisfactory simulated ball.

Another disadvantage of the type of the prior known apparatuses described is the fact that if the simulated ball structure was unbalanced so as to maintain the ball in an upright position by gravity for striking with a golf club, considerable undesirable and destructive vibration would occur when the simulated ball was struck vigorously. On the other hand if the simulated ball device is dynamically balanced, it frequently would not remain in a position in which it could be driven by a practice club swing. It is another important object of the present invention to provide a practice golf ball driving apparatus of the type mentioned in which a simulated ball is supported on an arm extending laterally from a rotatable shaft and which arm and simulated ball are dynamically balanced relative to the axis of the shaft, and which shaft has associated therewith a unit having a center of gravity well below the axis of the shaft when the shaft is substantially at rest so as to weight the shaft and position it with the simulated ball uppermost and when the shaft is rotated relatively rapidly, the unit assumes a dynamically balanced condition relative to the axis of the shaft whereby vibration arising from rapid rotation of the shaft and arm is obviated.

Prior art apparatuses of the type mentioned have here-

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tofore included a mechanical connection between the simulated ball structure and the tachometer mechanism or other indicator and due to the high rate of acceleration of the simulated ball structure, these mechanical connections are subject to severe shocks and strains which would, within a relatively short time, render the indicator inoperative or inaccurate. Another important object of the present invention is the provision of a pneumatic drive connection between the simulated ball structure and an indicating mechanism whereby damaging shocks cannot be transmitted from the simulated ball structure to the indicator mechanism regardless of the force of impact of the golf club with the ball structure.

Other objects and advantages of the invention will be apparent from the following description of a preferred form thereof, reference being made to the accompanying drawings where:

FIG. 1 is a perspective view of portable apparatus for practicing driving of golf balls and embodying the invention;

FIG. 2 is a fragmentary view of the apparatus shown in FIG. 1 taken substantially on a plane through line 2—2 of FIG. 1 and looking in the direction of the arrows;

FIG. 3 is a fragmentary sectional view taken substantially along line 3—3 of FIG. 2;

FIG. 4 is a fragmentary view taken substantially along line 4—4 of FIG. 2, but on a larger scale;

FIG. 5 is a fragmentary sectional view taken substantially along line 5—5 of FIG. 4 and showing the apparatus inverted from the position shown in FIG. 4;

FIG. 6 is a fragmentary sectional view taken substantially along line 6—6 of FIG. 4 and inverted;

FIG. 7 is a sectional view taken substantially along line 7—7 of FIG. 5;

FIG. 8 is a fragmentary sectional view taken substantially along line 8—8 of FIG. 2 and on a smaller scale;

FIG. 9 is a fragmentary view of certain parts shown in FIG. 8 and on a larger scale;

FIG. 10 is a fragmentary sectional view taken substantially along line 10—10 of FIG. 2;

FIG. 11 is a fragmentary sectional view taken substantially along line 11—11 of FIG. 10 and on a larger scale;

FIG. 12 is a fragmentary sectional view taken substantially along line 12—12 of FIG. 10 and on a larger scale; and

FIG. 13 is a fragmentary view of certain parts of FIG. 10 shown in different positions and on a larger scale.

Referring to FIG. 1 of the drawings, an apparatus 10 is shown for use in practicing golf ball driving and which measuring the relative force imparted to a simulated golf ball and indicates inaccuracies of the path of travel of the head of the golf club used to strike the simulated golf ball. The apparatus comprises a portable platform structure 11 adapted to support a person standing at station 12 and which has a simulated golf ball 13 arranged to be struck with a golf club swung by the person standing at station 12 by swinging the club in a manner similar to that used in driving a golf ball in a game of golf. An indicator 14 is located on the platform 11 between the station 12 and the simulated ball 13 and it includes an upwardly facing dial 15 and an indicator pointer 16 by which the user of the apparatus can observe the relative force with which the simulated ball has been struck. The indicator 14 is adapted to be reset to zero by depressing a pedal or treadle 17 adjacent the indicator.

The platform 11 may be of any suitable construction and it includes a panel 18 supported above the ground or floor by two rear corner supports 20, only one of which appears in the drawings, and a pair of wheels 21 which are suitably attached to a box structure 22 secured to the

panel 18 at the other end of the panel. The box structure 22 supports and encloses certain parts of the apparatus, as is described more fully hereinafter. The wheels 21 permit easy transportation of the apparatus to a desired position for use. Preferably, the upper surface of the panel 18 has a suitable skid resistant surface.

The simulated golf ball 13, sometimes referred to herein as a ball, is disposed centrally of a generally rectangular opening 23 in the panel 18, and four sets of vertically extending deflectable pins or quills 24, 25, 26 and 27 are positioned so as to lie on opposite sides of the path of the head of a golf club swung in an arc to obtain the optimum impact with the ball 13. The quills 24-27 are also located forwardly and rearwardly of the ball 13 with respect to the direction in which the ball is driven by the golf club so that one or more of the pins or quills will be deflected should they be hit with the head of the golf club traveling in other than the optimum path of travel. Thus, the deflected pins will indicate to the golfer any deviations from the correct path of travel of the club head during a driving stroke. When the treadle 17 is depressed to reset the indicator 14 to zero, the quills 24-27 are returned to upright position should they be deflected.

The simulated ball 13 and the pins 24-27 are supported in the box structure 22 which has an open top, opposite side walls 30, 31, a bottom wall 32 and end walls 33, 34. The box 22 is suitably attached to the underside of the panel 18 in registration with the opening 23.

The simulated ball 13 is formed of a molded rubber member having a shank portion 35, an end portion of which is gradually flared to a semi-spherical end or ball form 36. The rubber is molded about a steel cable 40, and the end of the cable within the ball 36 being looped so as to firmly secure the rubber to the cable.

The simulated ball structure 13 is attached to a rotatable shaft 41 which extends transversely of the box 22 and is supported therein by suitable antifriction bearings 42, 43 which are secured to the side walls 30, 31 respectively. The cable 40 has a portion 44 extending from the shank 35 of the simulated ball structure 13 and through a transverse opening through the shaft 41. The shank 35 is encased in an end portion of a metal sleeve 45 which has a transverse opening in the sides thereof through which the shaft 41 extends. The cable portion 44 is embedded in a lead plug 46 which is molded in the lower end of the sleeve 45, as viewed in FIG. 2, so that the cable is firmly secured to the sleeve end. The plug 46 is such that the simulated ball structure 13 is dynamically balanced about the axis of the shaft 41 and when the ball is struck by a golf club swung in a simulated golf ball drive, the ball and shaft will be rotated without appreciable vibration.

It will be observed that the gradual increase in diameter of the shank 35 to the ball-like form 36 presents a relatively smooth surface which cannot catch the club head and tend to wrench the club from the hands of the person using the apparatus. Furthermore, the major portions of the ball structure 13 above the shaft 41 is of rubber which can be flexed and thereby withstand tremendous blows without damage thereto.

Because of the dynamic balance of the ball structure 13 on the shaft 41, some difficulty would be experienced in positioning the ball in position for striking with a golf club. According to the present invention, means are provided which tend to position the ball portion 36 upright when the shaft 41 is stationary or almost so, but which means are dynamically balanced when the ball and shaft are rotated rapidly. In the form shown, the shaft 41 extends through the bearing 43 in an opening in the wall 31 and a drum shaped member 47 having an axial opening receives the extended end portion of the shaft and is attached thereto. The circular wall 50 of the member 47 is cylindrical in form except for an eccentric portion 51, best seen in FIG. 3. A round core 52 is provided inside the member 47 and is spaced from the insides of the

wall 50 and forms with the wall 50 an annular passage 53 having a pocket 54 at the eccentric portion 51. A body of mercury 55 is contained in the passage 53 and normally tends to collect in the pocket 54 when the shaft rotates slowly so that when the shaft comes to rest the mercury will cause the shaft to be positioned with the pocket 54 below the center of the shaft. The member 47 is positioned on the shaft 41 so that the pocket 54 is on the side of the shaft opposite the side on which the ball portion 36 is disposed. When the shaft 41 is rotated at a moderate rate or faster, the mercury is distributed about the passage 53 to dynamically balance the member 47 about the axis of the shaft so that no vibration will occur. To counterbalance the weight of the eccentric portion 51, a weight 56 is disposed opposite thereto so that the member 47 is dynamically balanced.

When the ball 13 is struck by a swinging golf club, the force with which the ball is struck causes the shaft 41 to be driven through a number of rotations proportional to the degree of the effective force applied to the ball. The pointer 16 of the indicator 14 is swung in an arc over the indicator dial 15 through an angular movement which is proportional to the number of revolutions made by the shaft 41. According to the present invention, the pointer 16 is moved by a pneumatically driven motor supplied by air from a pump driven by rotation of the shaft 41. By this arrangement damaging or shocking forces are not transmitted to the delicate parts of the indicator.

In the form of the invention shown, a reciprocating air pump 60 is attached to a bracket 61 secured to the box wall 31 by screws 62. As best seen in FIG. 6, the pump 60 comprises a flat circular chamber 63 formed by a dish-shaped member 64 and a flat circular plate 65 secured across the open side thereof. A rubber diaphragm 66 has its periphery secured between the confronting edges of the member 64 and plate 65, and a plunger 67 is attached to the center of the diaphragm and extends through an opening through the plate 65.

The bottom wall 64 of the chamber 63 has an inlet port 70 and an outlet port 71. An air inlet tube 72 is connected with the inlet port 70 through a check valve 73, which admits air from the tube to the chamber, and a tube 74 is connected with the outlet 71 through a check valve 75 which permits air to pass from the outlet into the tube. The details of the check valves 73, 75 are not shown as they are of well known construction. Suffice to say, when the diaphragm 66 is oscillated by the plunger 67, air is drawn into the chamber 63 through the tube 72 and check valve 73 and is expelled from the chamber through the check valve 75 into the tube 74.

The plunger 67 is reciprocated to actuate the diaphragm 66 by a crank 76 provided on the end of the shaft 41, which extends beyond the member 47, by a connecting rod 77 interconnecting the crank with the plunger. A cylindrical housing 80, secured to the plate 65, forms a guide for the plunger 67. Preferably, tube 72 is curled upwardly and its open end is located so as to prevent the entrance of water, dirt and the like into the pump.

The air forced by pump 60 through the tube 74 drives a pneumatic motor 81 which in turn moves the pointer 16. As best shown in FIG. 5, the motor 81 comprises a cylindrical chamber 82 which is supported on an arm 83 of the bracket 61. The cylinder 82 contains a piston 84 to which a piston rod 85 is attached and which rod projects through a guide opening through the end wall 86 of the cylinder. The piston 84 has an O ring seal 87 thereabout which provides a sliding air seal between the edges of the piston and the walls of the cylinder. The bottom wall 88 of the cylinder has an opening 89 communicating with the tube 74 so that the air discharged by the pump 60 enters the cylinder beneath the piston 84 and moves the piston towards the opposite end of the cylinder. It is apparent that the extent of movement of the piston 84 is determined by the number of revolutions made by the shaft 41 which drives the pump 60.

The pointer 16 of the indicator 14 is attached to a pin 91 which is suitably journaled in the frame 92 of the indicator and the pin extends through an opening through the panel 18 and is adapted to be oscillated about its axis by an arm 93 attached thereto which is connected by linkage to the piston rod 85. This linkage comprises an arm 95 which has a crank portion 96 journaled in lugs 97 of a bracket 100 secured to the underside of the panel 18 and which crank portion has an arm 101 which is linked to the arm 93 by a link 102 pivoted to the arms which it interconnects.

The extended end of the arm 95 is pivotally attached to the upper end of the piston rod 85, and when the piston 84 moves upwardly in the cylinder 83 by air entering the cylinder through tube 74, the pointer 16 is swung across the face of an indicator dial 15 from a zero position. The zero position of the pointer 16 corresponds to the lowermost position of the piston 84 in the cylinder 82 and the piston is returnable to this position by depression of the treadle 17. The indicator 14 is urged towards the zero position by a wire cantilever spring 108 one end of which is secured to the underside of the bracket 100 by a screw 109.

Preferably, suitable guide bars and a cross beam attached to the upper end of the piston rod 85 may be provided to guide the piston rod in vertical, non-rotating movements; however, for sake of clarity, this expedient has not been shown.

The treadle 17 is attached to the end of a rod 104 which extends through an opening in the panel 18 and the lower end of which is pivotally attached to an arm 105 of a rocker shaft 106, one end of which is supported in a bearing bracket 107 secured to the underside of the panel 18 and the intermediate portions of which are journaled in bearing brackets 110, 111 likewise supported on the underside of the panel. The outer end of the rocker shaft 106 extends through an opening in the box wall 31 and has a crank arm 112 attached thereto. The rocker shaft 106 is biased to one angular position by a compression spring 113 interposed between the treadle 17 and the panel 18, as clearly seen in FIG. 2, and which urges the treadle upwardly.

The arm 95 has a rod 114 pivotally attached thereto and which slidably extends through an opening in an arm 115, and the extended end of the rod has an enlargement 116 which cannot pass through the opening in the arm. Thus, when the arm 115 is swung from a raised position, as shown in full lines in FIG. 8, to its lowermost position, as seen in dotted lines, the arm 95 is forced downwardly, which in turn moves the piston 84 to its lowermost position in the cylinder 82. When the arm 115 moves to its raised position, the rod 114 remains lowered by reason of the sliding relationship of the rod and arm, as best seen FIG. 8, arm 115 is pivoted to bracket 110 by a pin 117.

The arm 115 is connected with the rocker shaft 106 by an arm 117 attached to the shaft, and a link rod 118 which moves the arm in accordance with the rocking of the shaft 106. Thus, when the treadle 17 is depressed, the arm 115 swings to draw arm 95 downwardly and return the piston 84 to its lowermost position. To permit overtravel of the rocker shaft 106 relative to the arm 115, a lost motion connection is formed between the arm 117 and the link rod 118. This connection is formed by an end portion of the rod 118 extending through an opening in the arm 117 and having a compression spring 119 between the arm and rod, as shown in FIG. 9.

It will be appreciated that in lowering the piston 84 in the cylinder 82 the air beneath the piston must be expelled and for this purpose the tube 74 has a branch 123 which has an open end forming a valve port 124 which when open permits air from the bottom of the cylinder 82 to pass freely to atmosphere. The port 124, however, is normally closed by a rubber valve member 125 which is carried on a lever 126 pivotally supported on the lower end of a shaft 127 which is journaled in the bracket 61

and in a second bracket 130 secured to the wall 31 of the box 22. The lever 126 is biased to close the valve member 125 on the port 124 by a tension spring 128 connected between the bracket 83 and the lever. The shaft 127 is adapted to be turned by a crank arm 131 thereon which is engaged by a cam 132 attached to the rocker shaft 106. Preferably, a roller 133 is supported on the crank arm 131 to reduce friction between the cam and the crank arm. Thus, when the treadle 17 is depressed to return the indicator 14 to its zero setting, the valve 125 is swung by arm 126 from the port 124 to permit the piston 84 to freely expell the air from therebeneath as it is moved to the lower end of the cylinder.

Referring to the sets of pins or quills 24-27, the sets each comprise three wire-like elements each having enlarged flattened areas 140, as seen in FIG. 10. These flat areas each have openings through which a support shank 141 extends. The shanks 141 are secured in nuts 142 attached to the walls 30, 31 of the box 22, and referring particularly to FIG. 11, the shanks each have a head 143 at the extended end thereof. The outermost quill of the sets of quills abut the inner face of the head 143 and a friction collar 145 engages the opposite side of the quill to provide friction to hold the quill to whatever position it is moved. The intermediate quill on the shank 141 is between the collar 145 and a second friction collar 146. The innermost quill abuts the collar 146 and is urged thereagainst by a compression spring 147 surrounding the shank 141 and reacting against the nut 142. The quills are free to rotate on the shank 141 supported thereby to the extent permitted by the friction collars 145, 146 and the spring 147. The collars 145, 146 may move axially on the shank but are prevented from rotary movement by set screws 150 entering a longitudinal groove 151 on the shanks. Thus, should the club head move out of the proper path for striking the simulated ball 13 one or more of the pins or quills 24-27 will be deflected and remain deflected so as to indicate the extent of the misdirection of the club head.

In order to restore any of the deflected pins 24-27 to their upright and operative positions at the end of each practice stroke, the lower ends 153 of the quills are formed to lie adjacent one another as seen in FIG. 11, and these portions project through aligned slots 154, 155 formed through the yoke walls 156, 157 of two nested elongated channel members 160, 161. It will be understood that two sets 164 and 165 of channel members 160, 161 are provided and that the end portions 153 of the quills 24 and 26 extend into slots 154, 155 of the set 164 and the end portions of quills 25, 27 extend into slots 154, 155 of the set 165. The channel members 160, 161 have their open sides facing downwardly and each set of members is supported for longitudinal movement on a pair of pins 166, 167 which are secured to the walls 30, 31 respectively, and project laterally beneath the respective sets of channel members. The outer ends of the pins 166, 167 are turned upwardly and extend into the open sides of the channel members and each pin has a head 170 which overlies inwardly projecting side edge portions 171, 172 formed in channel members 160.

It will be seen, particularly by reference to FIGS. 10 and 13, that if the channel members 160, 161 are shifted in opposite directions from their positions shown in FIG. 10 to their positions shown in FIG. 13, i.e. with the member 160 shifted to the right and member 161 to the left, by equal amounts, the portions 153 of any quill out of vertical will be moved to a vertical position by either of the end edges 174, 175 engaging it to a vertical alignment with the quill pivot pin 141.

The channel members 160, 161 are adapted to be shifted as described, by depression of the treadle 17 and for this purpose, a shaft 180 is rotatably supported at its ends in suitable bearings, not shown in detail, attached to the inside of walls 30, 31 of the box 22. The shaft 180 has two sets of lugs 181, 182 to which one end of links

183, 184 are pivotally attached and the opposite ends of which links are pivotally attached to the ends of the channel members 160, 161, respectively. Thus, when the shaft 180 is oscillated, the channel members 160, 161 are shifted in opposite directions to raise any of the deflected quills to a vertical position.

The shaft 180 is rocked or oscillated by the rocker shaft 106, when the treadle 17 is depressed, through a link 185 which interconnects the arm 112 and an arm 186 on the shaft 180.

It will be appreciated that with the sets of quills 24-27 aligned as shown, the number of quills of any set which are deflected by the golf club will indicate the extent of deviation of the path of the club head in any given ball driving swing of the club, and depending upon which sets of quills are deflected, the type of deviation is readily discernible.

Preferably, the opposite end portions of the opening 23 in the panel 18 are bridged by rubber panels 190, 191 so that the club head will not be damaged should it be swung lower than proper.

It will be seen that by my invention a golf driving practicing machine is provided which accurately indicates the force of the drive, is dynamically balanced and yet permits gravitational positioning of the simulating ball structure, provides a fixed reading of the force as well as indicating misdirection of the golf club head and which mechanism may readily be reset by one operation.

Although but one form of the invention has been described, it is apparent that other forms, modifications, and adaptations thereof can be provided all falling within the scope of the claims which follow.

I claim:

1. In an apparatus for practicing driving golf balls, means forming a simulated golf ball structure adapted to be moved in a limited path when struck by a golf ball, pneumatic pump means actuated by movement of said simulated ball structure, an expansible chamber having a movable wall, means connecting the output of said pump means with the interior of said chamber, an indicator means, driving means interconnecting said movable wall and said indicator means characterized by said indicator means including a member having a range of movement from a zero position, and means operable for returning said indicator means member to said zero position, a normally closed valve means associated with said chamber and movable to open position by operation of the last mentioned means for discharging air from said chamber.

2. Apparatus as defined in claim 1 further characterized by said expansible chamber comprising a cylinder, a piston in said cylinder, a piston rod connected to said piston and extending from one end of said cylinder, the other end of said cylinder being in communication with the output of said pump means, said valve means having a valve port in communication with said other end of said cylinder, a movable valve member adapted to be moved to and from said port, and linkage means interconnecting said piston rod and said indicator means.

3. Apparatus as defined in claim 2 further characterized by said apparatus including a platform structure forming a support for a person, said simulated golf ball structure including a rotary shaft journaled on said platform structure and including an arm extending radially

therefrom and having a spherical form at the end thereof to simulate a golf ball, said shaft having a crank thereon, said pneumatic pump means being supported by said platform structure and including a reciprocable pump member drivingly connected to said crank whereby rotation of said shaft reciprocates said pump member, said indicator means including a frame supported on said platform structure and said indicator member comprising a pin supported on said frame, a crank portion rotatably supported by said platform structure, an arm for interconnecting said crank portion and said piston rod, a means for interconnecting said crank portion and said pin, a reset shaft rotatably supported on said platform structure, spring means urging said reset shaft to one position, a reset operating member connected to said reset shaft for rotating said shaft from said one position, a second arm connected to said reset shaft, a third arm, a rod connecting said third arm with said first mentioned arm, linkage means interconnecting said second and third arms and including a lost motion connection, a lever for moving said valve member, and linkage means between said reset shaft and said lever for moving said lever to remove said valve member from said valve seat when said reset shaft is rotated from said one position.

4. In apparatus for practicing driving golf balls, means forming a simulated golf ball structure adapted to rotate about an axis when struck by a golf club, a pneumatic pump including an oscillating fluid displacing pump member, means for connecting said pump member to said golf ball structure to cause said member to oscillate according to the individual rotations of said golf ball structure about said axis, an expansible chamber connected with the outlet of said pump, said chamber including a fixed end wall and a relatively movable wall, said movable wall adapted to be moved an appreciable distance from said end wall in response to the discharge of said pump by a plurality of oscillations of said pump member, and an indicator responsive to the movement of said removable wall to indicate the displacement of said movable wall relative to said fixed wall.

5. Apparatus as defined in claim 4 further characterized by said indicator means including a member having a range of movement from a zero position, and means operable for returning said indicator means member to said zero position, a normally closed valve means associated with said chamber and movable to open position by operation of the last mentioned means for discharging air from said chamber.

References Cited

UNITED STATES PATENTS

1,680,897	8/1928	Matteson	73-379
1,991,252	2/1935	Kane	73-379
2,275,568	3/1942	Smith	73-379
3,292,436	12/1966	Bahnsen	73-379

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U.S. Cl. X.R.

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