

July 1, 1969

E. B. NICHOLS

3,452,990

GOLF PRACTICE APPARATUS

Original Filed Jan. 14, 1963

Sheet 1 of 2

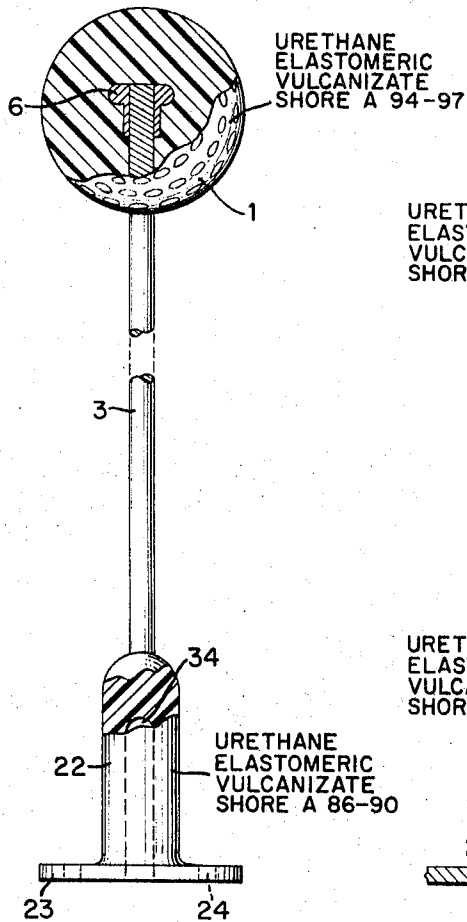


FIG. I.

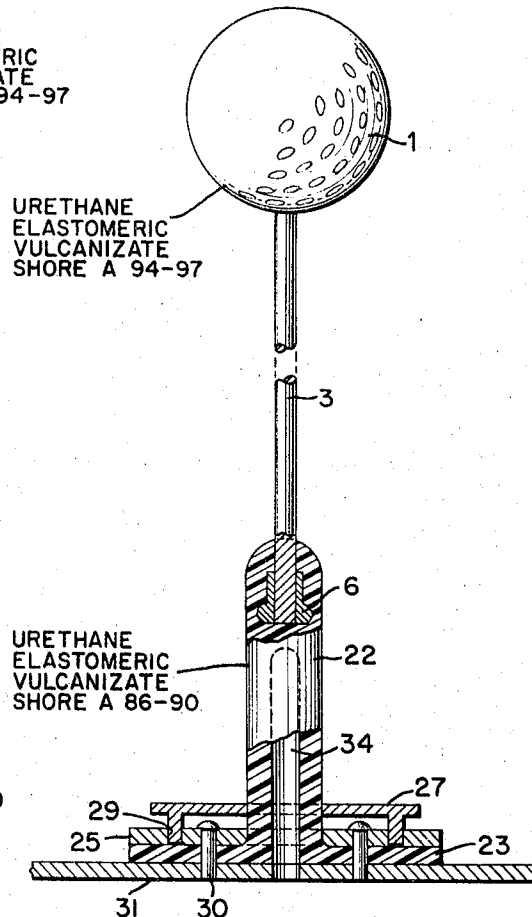


FIG. II.

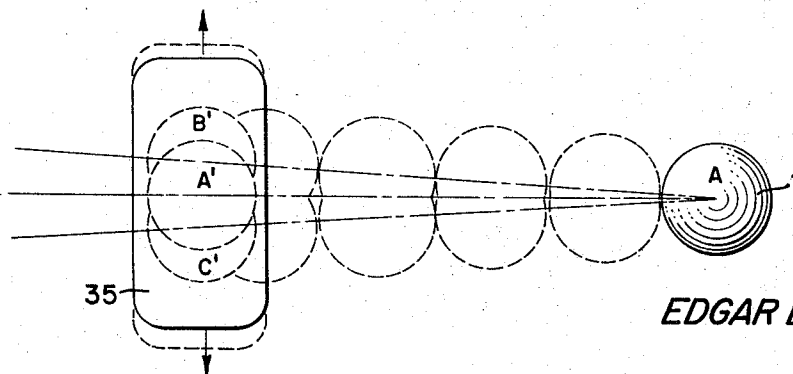


FIG. VI.

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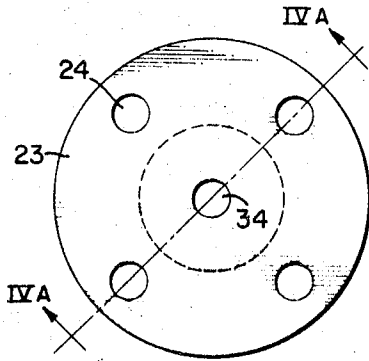


FIG. IV.

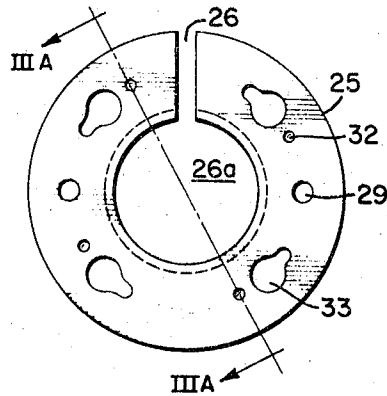


FIG. III.

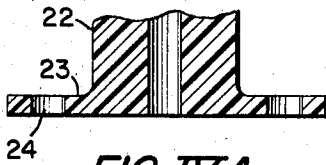


FIG. IV A.

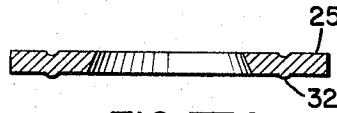


FIG. III A.

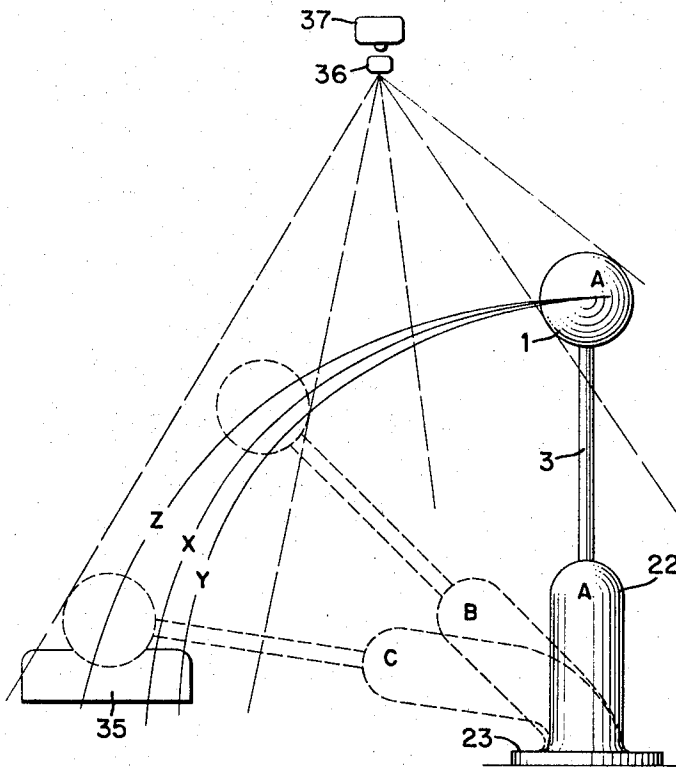


FIG. VII.

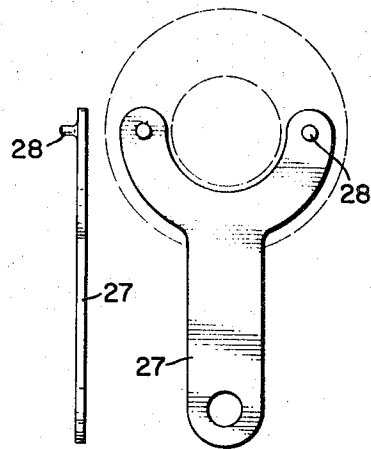


FIG. V A.

FIG. V.

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3,452,990

GOLF PRACTICE APPARATUS

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Continuation of application Ser. No. 251,172, Jan. 14, 1963. This application July 27, 1966, Ser. No. 568,351

Int. Cl. A63b 69/36

U.S. Cl. 273-185

1 Claim

ABSTRACT OF THE DISCLOSURE

A golf ball assembly detachably locked to a foundation member. The assembly includes a golf ball mounted on the upper end of an upstanding rod having its lower end secured to a flexible flanged base member. The assembly is detachably locked to the foundation member by a clamping ring which engages the flange portion of the base member and projections extending upward from the foundation member and through the flange portion of the base member. The golf ball and flanged base member are made of urethane elastomeric vulcanizates.

This application is a continuation of application Ser. No. 251,172 filed Jan. 14, 1963, now abandoned.

This invention relates to golf apparatus for practice, amusement, instruction and/or competitive use in the game of golf and more particularly relates to apparatus that is used in association with a machine for simulating the game of golf and recording the accuracy with which the player strikes the ball.

Electronic golf drive interpreters have been described in the art in accordance with which a captive ball is struck by the player with a golf club. A simulated fairway, traps, and green are positioned in front of the player, with means for showing thereon a visual indication representative of the distance, direction, and quality of his stroke; whereby the player is informed of the distance to which, the direction in which, and the hook, slice, or straightness with which an actual golf ball might have been carried by his stroke. In the operation of such devices, repeated impacts of the club against the ball are extremely destructive. The blow of the club head on a captive golf ball is greater than that received by a free ball since the latter is not restricted in its movement but is free to fly in any impelled direction. The captive ball and the mechanism that holds the ball to the recording device are due to the repeated blows of the fair and also the misdirected strokes of the club, useable for only a relatively short period of time. Objects of the present invention are to provide impact receiving units of the aforesaid general class that perform improved functions and that have a reasonably long life.

Other objects of the invention include: means for improving the utility of golf practice interpreters; means and methods for increasing the longevity of captive golf balls; the provision of ball holding means which function more completely and last longer than units of the prior art; the provision of a superior ball of a durable synthetic elastomer capable of withstanding repeated strokes without distortion or breaking; means for mounting the ball and permitting its rotation without loosening the ball from its captive position; the production of a captive golf ball which maintains its shape and resilience throughout long use; the production of a ball and rod assembly which are united by locking means to insure that the ball will be anchored securely against the action of the club; the provision of a balanced ball mounting on a rod to distribute the shock throughout the ball body and to extend the life of the ball; the provision of a rod and ball unit turnable in an anchor bearing which allows rotational freedom of action of either rod, ball or both about a vertical axis; the provision of molded or cast golf balls made of a resili-

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ent, durable synthetic elastomeric material. Other objects and advantages of the invention will hereinafter appear.

The invention will be further described with reference to the accompanying drawings in which like parts have like numbers throughout:

FIG. I is an elevation in partial section of one form of the invention and shows a simulated golf ball mounted on a rod and base, the ball, base and rod being used for replacing used units in golf driving interpreters;

FIG. II is a view in partial vertical section of the base of the unit aforesaid showing means of anchoring the rod to the base with locking means for clamping the assembly to a foundation;

FIG. III is a plan view of the locking means;

FIG. III-A is a cross section of the locking means;

FIG. IV is a plan view of the base which supports the rod and ball;

FIG. IV-A is an elevation in partial cutaway section of the base;

FIGS. V and V-A, respectively, are a plan view and side elevation of the type of clamping spanner wrench used to effect the assembly of the unit to the foundation (cf. FIG. II);

FIG. VI are stroboscopic plan and phantom views of the views of the various paths of travel and positions of the ball during play and

FIG. VII is a ball, rod and base assembly on a molded base of a urethane elastomer with stroboscopic views of three positions of the ball and rod and the simultaneous positions of the molded base, positions B and C showing bending and stretching of the elastomeric base.

In the manufacture and use of apparatus for the practice of golf such as is shown for example in the U.S. Patents 2,897,674 and 3,020,049 and others, simulated golf balls are anchored to permit only a relatively few degrees of free movement. The repeated impacts of the club head against the ball have cutting, displacing, compressing, and other disruptive effects, especially when the ball is struck blows that, were the ball free to move in all directions, it would take a direction other than that permitted by the apparatus. The utility of such apparatus is limited by the frequency with which the golf ball and the associated structure must be renewed and replaced. In accord with the present invention it has been found that by providing the improved simulated golf ball, its associated structure and improved materials of construction of base structure and ball, not only can the utility, durability and efficiency of the apparatus be increased but also the fidelity with which the apparatus interprets the accuracy of the player can be markedly improved.

The invention relates to a golf apparatus for simulating a game of golf and more specifically comprises a supporting member, a rod having upper and lower ends; to the upper end is a spherical element, a simulated golf ball, the supporting element extending above a foundation member and having upper and lower portions, a flange integrally secured to and extending outwardly from the lower portion, the material of the supporting element and flange is a urethane elastomeric vulcanizate having a Shore A durometer hardness of 86-90 (ASTM-D-676), more fully described hereinafter, the material of the spherical element is a urethane elastomeric vulcanizate having a Shore A hardness, durometer, of 94-97 (ASTM-D-676).

The aforesaid advances in this art provide three improved features of this invention. These features include firstly, an improved ball and rod assembly by which the directions taken by the ball in flight, at the moment of the impact of the club with the ball can be duplicated and be accurately measured and recorded. Second, an improved simulated golf ball and mounting is provided

which facilitates the assembly of the ball and rod and also permits easy mounting of the ball and rod assembly to the simulators of the art. Third, an improved golf ball and mounting is provided which by virtue of their material of construction withstands the repeated blows between club and ball struck by the player. The utility of the ball construction is according to the invention not restricted solely to use in the simulated golf game.

Simulated golf ball 1 is fixed rigidly to rod 3 for movement in accordance with the degrees of freedom of rod 3. The anchor head 6 assists in maintaining their rigidity for the urethane elastomeric compound is moulded around head 6 in the manner more fully described hereinafter.

Golf driving interpreters as have been shown are subject to loss of monetary return to the operator of the device and the loss of accuracy in measuring and duplicating visually the stroke for the player. Retention of initial ball dimensional stability and surface resilience are prerequisites to successful exploitation and use of such devices. Applicant has found that by fabricating the ball and the resilient base members of a specific type of synthetic moldable and/or castable elastomer and also by providing the striking parts of a prescribed hardness, their utility in combination is surprisingly improved in flexibility, toughness, stability, abrasion resistance and longevity.

For optimum utility in the aforesaid respects those parts of the assembly have these properties:

(1) Ball 1 is made from a vulcanizate of urethane resin ^a with methylene-bis-orthochloroaniline by the process described below, the vulcanizate having a Shore A durometer ^b hardness of 94 to 97 and preferably about 95.5.

(2) Base 22 is made from a vulcanizate of urethane resin ^c with methylene-bis-orthochloroaniline by the process described below, the vulcanizate having a Shore A durometer hardness of 86 to 90 and preferably about 88.

The vulcanizates are prepared by mixing, (in mixing equipment designed to homogenize liquid polymers) 10 to 30 parts and preferably about 15 parts by weight of methylene-bis-orthochloroaniline to 100 parts by weight of the resin. The mixture may be heated to about 100° C. to facilitate pouring and then is charged into the ball 1 or base 22 mold. The composite mixture can be processed by the well known plastic gum technique. The composite is cured in the mold with sharp detail at 300 to 400° F. and preferably 350° F. with pressure of 1,000 to 2,000 and preferably 1,500 p.s.i. for from 10 minutes to 24 hours.

Urethane elastomers generally having the aforementioned properties may be used in the preparation of the products of the invention. The art teaches a variety of vulcanizing agents that can be used such as the alkylene halogenated anilines and alkylene substituted aniline homologues such as the corresponding substituted ortho-toluidine and para-toluidine and especially such vulcanizates having the superior engineering properties conforming to those described by J. G. DiPinto and S. D. McCready in "Development Products Report No. 17" April 1960, of E. I. du Pont de Nemours & Co.

Applicant has discovered that the most outstanding durability of ball is produced by molding and/or casting it of "Adiprene" urethane elastomers generally (E. I. du Pont de Nemours & Co.) in a suitable cavity. The rod and anchor (either 6 or its equivalent) are placed in proper position in the cavity in accord with well estab-

lished procedure and the "Adiprene" introduced cross linked by the addition of a suitable cross-linking agent as has been described.

The flexible base 22, FIG. II, constructed from a urethane elastomer of 88 Shore A durometer, for example, is mounted by a plurality of screws to machine foundation 31. Flange 23, made integral with base 22, and likewise made of a urethane elastomer, has holes 24 through which capped rivets 30 or other holding means protrude for the purpose of fixing the ball and base assembly to the machine foundation 31. A clamping ring 25, FIG. III, with holes matching those of flange 23 are adapted by a reducing slot means 33 or other suitable means to receive capped bolts 30 which are firmly welded to the foundation 31. A clockwise part turn of ring 25 clamps base 22 and the rod ball assembly to the foundation 31, ring 25 being first positioned over base 22 by slipping slot 26 with central hole 26a around rod 3 and centering ring 25 over flange 23, holes 24 and rivets 30 in foundation 31. The ring is turned home by means of a suitable spanner wrench 27 FIG. V, pins 28 thereof being inserted in holes 29 of clamping ring 25 and the spanner turned clockwise.

In operation clamping ring 25 is turned clockwise to lock, by the partial turning detents 32 are pressed against flange 23 by the locking action of the reducing slots 33 against capped rivets 30. Detents 32 do not permit the base to turn, thereby assuring a rigid assembly under the severe action of the golf ball 1. When struck the golf ball tends to impress detents 32 more and more deeply at least one one side of the base in the initial direction of the balls reaction to the stroke of the club. The balance of pressure caused by the cam-like action of twisting the clamping ring 25, permits the urethane elastomer to act as a lock and prevents loosening of the base.

The base 22 is designed with a cooling aperture 34, FIG. II which extends through foundation 31, allowing quick release and return of air for cooling base 22 of excessive frictional heat due to the flexing during use.

FIG. VII represents stroboscopic views of the ball as and after being struck by the club. Camera 37 with a non-parallaxial view of the ball is triggered with the stroboscope 36 and photographs the ball in its restricted flight, its positions, and the position of cushion 35. A photographic print or video reproduction on a TV screen may be used. X shows the path of the ball as its is manually pivoted at the center and bottom of the base with the length of the base, the rod and the diameter of the ball as a radius. Y and Z show the paths of the ball after being struck by a club, base 22 stretching in proportion to the force of the stroke and the radius increasing to the extent of the stretch. Prior art showing general means for utilizing stroboscopic viewing for use in "Golf Practice Apparatus" is disclosed in A. L. McNeill U.S. Patent *ibid*. An accurate stroke directed along the center line of flight will propel the ball from its position of rest A to rubber cushion 35. A stroke that draws inward across the face of the ball to give a slice or otherwise propels the ball to the right forces the ball to position B' or its proximity on cushion 35 FIG. VI while a stroke that brushes outward across the face of the ball to give a cut or otherwise propels the ball to the left forces the ball to position C' or its proximity on cushion 35. FIG. VII gives stroboscopic side views of the ball-rod-base assembly prior to impact of the club, midway to and at impact of the ball with cushion 35, the force of the blow bending and stretching the base 22. Stretching action on base 22 extends the reach of the ball causing it to strike cushion 35 at a distance from the centerline of base 22 that increases with the increased force of the club stroke.

A high speed camera 37 is focused on the ball to analyze the stroke. The recorded spin around the vertical axis of the ball indicates either a slice or a hook and the degree of turn or spin, the amount of slice or hook, no spin or part spin about the vertical axis denoting a

^a This resin is a reaction product of diisocyanate and a polyethylene ether glycol having a viscosity of 6,000 to 8,000 cps. (Brookfield) at 30° C. and a specific gravity of 1.06. (Adiprene LD 167 of duPont is a suitable equivalent.)

^b Shore A test procedure is by ASTM D-676.

^c This resin is a reaction product of diisocyanate and a polyethylene ether glycol having a viscosity of 14,000 to 19,000 cps. at 30° C. and a specific gravity of 1.06. (Adiprene L-100 of duPont is a suitable equivalent.)

perfect stroke with respect to direction. The recorded deviation of the ball from the true line of flight A—A indicates strokes that will drive the ball to the right or to the left of the perfect line of flight i.e. respectively along lines A—B' or A—C' while intermediate deviations lessen amounts of error. The recorded top spin or under spin i.e. rotation of the ball about its horizontal axis may similarly be measured and visually recorded.

Any suitable means for detecting the aforesaid motions of the ball while in flight from its initial position and its final position on cushion 35 may be used such for example marks on the surface of the ball which will show such movements e.g. one or more dots, lines, crosses or the like.

The force with which the ball is struck may also be measured in any suitable manner, for example, by well established mechanical, hydraulic or electrical means to record the depression of cushion 35 caused by its reaction to the blow received by the ball.

The recordings, by photograph or by screen, of the stroboscopic camera 37 and the force of the stroke as received, by the detecting device used, on the cushion 35 are transferred by any suitable electronic translating means to the simulated golf course in view of the player. Those skilled in the electronic field can by well known means also provide instruments to show visually to the player by appropriately metered dials the precision of the player's stroke, the distance he would have driven a golf ball, and importantly to assist him in improving his game, the degree of hook or slice or top or bottom spin he has given to the ball whereby he has departed in his stroke from that of a perfection which would result from a perfectly swung club against the optimum points of impact of club with ball.

It will be apparent to those skilled in the art that various modifications and alterations may be made in the invention without departing from the teachings and scope thereof, and such deviations are to be construed as part of the invention.

What is claimed is:

1. Golf apparatus comprising a horizontally extending foundation member, a supporting element, a rod having upper and lower ends and a spherical element simulating a golf ball, said supporting element comprising a first portion elongated upwardly from said foundation member and having upper and lower ends, a circular flange integrally secured to and extending outwardly from the lower end of said first portion, the material of said first portion and flange being a urethane elastomeric vulcanizate having a Shore A durometer hardness of 86-90 (ASTM-D-676), means for locking said flange to said foundation member and preventing relative movement therebetween, means for securing the lower end of said rod to the upper end of said elongated portion, means for securing said spherical element to the upper end of said rod, the material of said spherical element being a urethane elastomeric vulcanizate having a Shore A durometer hardness of 94-97 (ASTM-D-676).

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GEORGE J. MARLO, *Primary Examiner*.

U.S. Cl. X.R.

73—379; 273—198, 200