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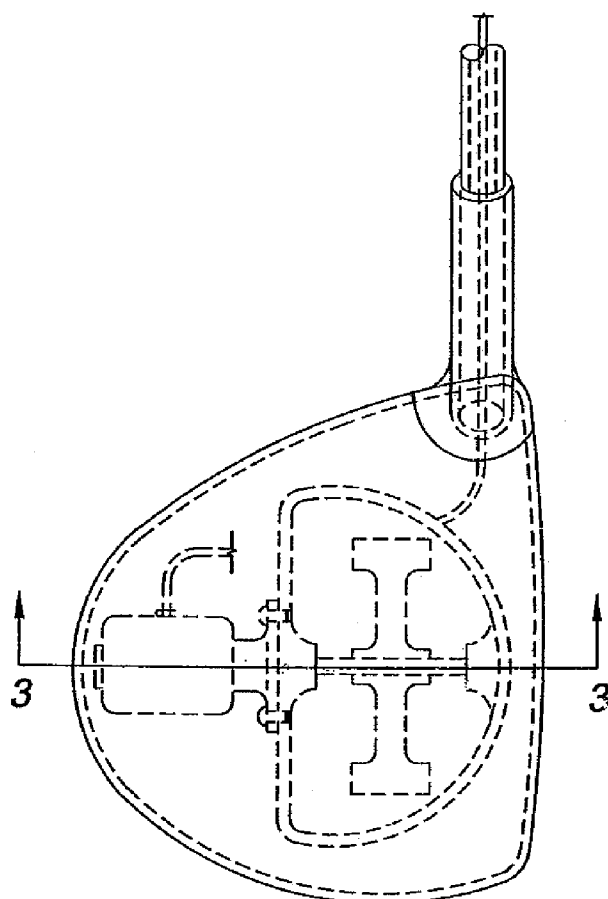
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(54) Title: GOLF SWING APPARATUS AND METHOD



(57) Abstract: An apparatus and method for improving the consistency and effectiveness of a golfer's swing. In a first aspect of the invention, a gyroscope is mounted in the head (23) of a golf club that has a rotor (30) that is rotated by a small electric motor (33). A pair of dry cell batteries and a push type "on/off" switch in a grip of the golf club turn the motor on and off. The rotational plane of the rotor is parallel to the face (46) of the golf club head that strikes a golf ball. When the rotor is rotated, changes in the plane of rotation or spin axis of the rotor are resisted by the angular momentum of the rotor, thereby producing reaction torques which are sensed by a golfer. The reaction torques inform the golfer of the release of the club and changes in the path of travel. In a second aspect of the invention, the gyroscope is mounted directly on an end of a golf club shaft.

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GOLF SWING APPARATUS AND METHOD

FIELD OF THE INVENTION

This invention relates to an apparatus and method for improving a golfer's swing and more particularly to an apparatus and method for controlling the motion and point of release of a golf club.

BACKGROUND OF THE INVENTION

Golf, once considered as a pastime of the rich, has become a national sport for all levels of society. Methods and books for improving golf swings are notoriously present in the art. Although swings have been extensively analyzed and documented, as yet there is little agreement on an apparatus or method for optimizing a golf swing.

US Patent Nos. 4,971,328; 5,221,088; 5,249,967; 6,261,189; and 7,097,459 are exemplary of the types of apparatus which exist in the art for improving a golfer's swing. US Patent No. 4,971,328 discloses a golf swing apparatus for comparing a light beam emitted from a golf club head during a golfer's swing with a guide strip on the ground. US Patent No. 5,221,088 discloses a golf swing apparatus wherein foot and grip sensors emit audible signals, via a pair of earphones which are indicative of the weight applied by the feet and the pressure applied to the hand grip. The signals are compared with a specified range of signals. US Patent No. 5,249,967 discloses a video golf swing training apparatus for comparing live images of a golfer's swing with self generating templates. US Patent No. 6,261,189 discloses a golf swing apparatus in which club shaft and body movements are monitored with infra red rays and sensors. If the rays fall out of an optimized area, an audible signal is generated. US Patent No. 7,097,459 discloses a golf swing apparatus wherein colored reference points are placed on a golf club shaft and golfer's head and the like. A moving image is taken of the golfer's swing, converted into a plurality of still images which are stored in a computer. Items to be checked are expressed by numeric values which are compared with judging data inputted to the computer.

Golf swings fall into three categories, namely putts, short chips and full swings. Putts and chips are ideally played without much body movement; however, most other shots are variants of the full swing. Two major areas which distinguish golfers are the consistent results and effectiveness of the full golf swing.

5 A full golf swing is a complex rotation of the body for aiming and accelerating a golf club head to a great speed. The transfer of momentum from a golf club to a golf ball determines the travel of the golf ball. Professional golfers can achieve a club head speed of more than 100 MPH at the bottom of a swing. Some champion golfers have attained speeds above 100 MPH. For a right-handed
10 golfer, a swing consists of a back swing to the right, a downswing to the left in which a golf ball is struck with a driver club and a follow through. At the initial point in time, referred to as "the address", a player 20 stands with his left hip and shoulder pointing in the intended direction of ball flight, with the ball between his feet.

15 The club is held with both hands with the golf head resting on the ground behind the ball, hips and knees somewhat flexed and the arms hanging from the shoulders. As shown in Fig. 1, the back swing 21 is a rotation to the right, consisting of a shifting of the player's body to the right, a turning of the pelvis and the shoulders, a lifting of arms and flexing of elbows and wrists. At the end of the
20 back swing, the hands are above the right shoulder, with the club pointing more or less in the direction of ball flight.

During the downswing 22, the club head is accelerated downwardly, increasing in momentum until it strikes the ball. The follow-through stage after the ball is struck with the head face, consists of a continued rotation to the left. The
25 golfer's weight has shifted almost entirely to his left foot, his body is fully turned to the left and his hands are above the left shoulder and the club hangs down over his back.

A backspin is imparted to the ball during almost every shot because of the golf club's loft. The spinning ball experiences an upward force which makes it fly
30 higher and farther than a ball without spin. The spinning also affects the behavior of the ball when it strikes the ground, usually preventing the ball from rolling at all, perhaps even backwards. Sidespin occurs when the club face is not perpendicular

with the plane of the swing when the ball is struck, causing the ball to curve to the left, for right-handed players referred to as a “draw” or to the right, referred to as a fade. Accomplished golfers will sometimes use sidespin to steer the ball around obstacles, but it is difficult to control or to predict the amount of spin.

5 It has been recognized that the rotation of a golfer’s wrist and the orientation of a golfer’s wrist during a golf swing influence the outcome of the golf swing. It has also been recognized that two aspects of a swing substantially affect the outcome of the full swing. One aspect is the beginning of the rotation of the golfer’s wrists, often referred to as “the release”, which occurs near the end of the downswing. As
10 used herein, the terms “release”, “point of release”, “release of a golf club head” and “release of a golf club” refer to the rotation of a golfer’s wrists at an end portion of a downward swing. Tests have shown that for optimum results, a release should occur shortly before a ball is struck. An early release negatively affects the velocity of the club head when impact occurs and hence the distance the ball travels. Early
15 releases, called “casting” can also significantly affect the outcome of a swing, causing a loss of power.

A second aspect is the orientation of the club face with respect to the plane of club head travel (swing). Unless the golfer intends to use sidepin, the club head face should be parallel to the plane of travel of the club head. Although a great deal of
20 attention has been given to the posture of a golfer during the “presentation” and swing. Heretofore, an effective apparatus and method have been unavailable for controlling the motion of a golf club head and informing a golfer of the point of release.

25 SUMMARY OF THE INVENTION

The two bell weathers of this invention are consistency and effectiveness, aspects which all professional golfers work to improve. Results have shown that the invention can significantly improve a golfer’s game. One object of the invention is to improve the consistency and effectiveness of a golfer’s swing. Another object of
30 the invention is to extend the driving range of a golfer’s swing. Another object is to improve the accuracy of a golfer’s swing. Another object is to provide a training aid for improving a golfer’s swing. With these objects in mind, an apparatus and

method are provided for controlling motion of a driver golf club and informing a golfer of the point of release of a golf club head. The invention resides in the application of a gyroscope to a golf club swing. The law of conservation of angular momentum requires a rapidly spinning rotor to maintain its plane of rotation unless
5 acted upon by an external torque. If acted upon by an external torque, a reaction torque will occur which is sensed by a golfer.

In a first aspect of the invention a gyroscope and a small electric motor are mounted inside of a driver golf club head. The small electric motor is connected to the gyroscope's rotor and driven by batteries mounted in a grip (handle) of the golf
10 club. An "on/off" switch in an outer end portion of the grip actuates the motor and hence the rotation of the rotor. The motor is connected to the batteries by a pair of wires that are routed inside of a tubular golf club shaft.

The rotation of the gyroscope rotor is actuated before the swing is initiated. During a downswing of the driver golf club, the angular momentum of the rapidly
15 spinning rotor tends to maintain the club head face parallel to the plane of the swing. When the head is released to rotate the head face into a plane which is perpendicular to the plane of the swing, and back to parallel on the follow through, a reaction torque is produced which is sensed by the golfer. A reaction torque, at a lesser level, is also sensed if the parallel relationship of the head face to the plane of the golf
20 swing is not maintained.

In a second aspect, the invention is intended to be used as a golf swing training aid. The gyroscope is mounted at the end of the golf club shaft. A pair of dry cell batteries and an "on/off" switch are mounted in the grip at the opposite end of the shaft.

25 In employing the teaching of the present invention, a plurality of alternate constructions can be provided to achieve the desired results and capabilities. In this disclosure, only a single embodiment is presented for the purpose of disclosing my invention. However, this embodiment is intended as an example only and should not be considered as limiting the scope of my invention.

30 The foregoing features, benefits, objects and best mode of practicing the invention and additional benefits and objects will become apparent from the ensuing detailed description of a preferred embodiment, and the subject matter in which

exclusive property rights are claimed is set forth in the numbered claims which are appended to the detailed description of the preferred embodiment.

BRIEF DESCRIPTION OF THE DRAWINGS

5 The invention will be better understood and further object, characterizing features, and details and advantages thereof will appear more clearly with reference to the diagrammatic drawings illustrating a presently preferred specific embodiment of the invention by way of non-limiting example only.

Fig. 1 shows a golfer and the path of a golf swing.

10 Fig. 2 is a partial plan view of a driver golf club and an electric motor driven gyroscope according to the present invention.

Fig. 3 is a partial cross-section showing the interior of the grip of the golf club.

Fig. 4 is a longitudinal cross-sectional view through a golf club grip.

15 Fig. 5 is a partial bottom view of the golf club.

Fig. 6 is a partial plan view of a driver golf club shaft and an electric motor driven gyroscope mounted at an end of the shaft according to the present invention.

Fig. 7 is a cross-sectional view taken on the line 7-7 in Fig. 5.

20 DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

Referring now to the drawings wherein like numerals designate like and corresponding parts throughout the several views, in Figs. 2 through 4, inclusive, a driver golf club 24 and gyroscope 25 are mounted in a golf club head 23. Except for a small protuberance 26 on the head 23 of the club 24 and a small button 27 at the
25 end of a grip 28 (handle), the appearance of the driver golf club 24 is conventional. The golf club 24 is comprised of the head 24, a gyroscope 25, a pair of batteries 28, a switch 29, a hollow shaft 29 and the grip 28.

As shown in Figs. 2 and 3, the gyroscope 25 is comprised of a rotor 30 mounted for rotation and a fixed frame 31. A shaft 32 which drives the rotor 30 is
30 straddle mounted in the frame 31 and is connected to a small electric motor 3. With reference to Fig. 5, the frame 31 is mounted on a removable cover 34 which is attached to the bottom of the head 23 with threaded fasteners 35. The motor 33 is

attached to the frame 31 with a pair of threaded fasteners 36. As shown in Fig. 3, the rotational plane of the rotor 30 is parallel to the face 46 of the club head 23 which strikes a ball.

5 A pair of wires 37 extend from the motor 33 through the hollow shaft 29 to the pair of dry cell batteries 38 in the grip 28. The "on/off" switch 39 at the end of the grip 28 closes a circuit of the batteries 38 and electric motor 33.

Referring now to Figs. 6 and 7, a golf swing training aid 40 is shown in which the golf club head is eliminated. The gyroscope 25 and electric motor 33 are mounted in a 2-piece frame 42 which is attached to the end of a tubular drive golf club shaft 42 for use as the golf swing training aid 40. The 2-piece frame 41 is
10 comprised of a motor mounting half 43 and a cover half 44. One end of a tubular golf club shaft 42 is attached to the cover half 43. The motor mounting half 43 and cover half 44 are connected with threaded fasteners 45.

The preferred manner of using the invention is as follows. The gyroscope 25
15 is activated by pushing the exposed button 27 of the "on/off" switch 39. At the initial point of the swing, referred to as "the address", the driver club 24 is held with both hands, the golf head 23 resting on the ground behind a ball, hips and knees somewhat flexed and arms hanging from the shoulders. A right handed player stands with his left hip and shoulder pointing in the intended direction of ball flight and the ball between his feet, the swing begins with a back swing 21 to the right,
20 followed by a downswing to the left 22 in which the golf ball is struck with the head 23 of the driver club 24 and ends with a follow through.

During the back swing rotation to the right, the player's body is shifted to the right, a turning occurs of the player's pelvis and shoulders, his arms lifted and his
25 elbows and wrists twisted. At the top of the back swing 21, the downswing 22 occurs in which the head face 46 and rotational plane of the gyroscope rotor 30 remains substantially parallel to the plane of the swing. The angular momentum of the rapidly spinning rotor 30 resists deviations of the club head face 46 from being parallel to the plane of the swing.

30 As the golf head 23 approaches the bottom of the downswing 22, the golfer releases the golf head 23, i.e. rotates his wrist to orient the club head face 46 perpendicular to the plane of the swing for striking the golf ball. When the release

occurs, there is an equal and opposite reaction to the rotation of the wrist which is felt by the golfer 20. At the end of the release, the rotational plane of the rotor 30 has a parallel relationship with the plane of the swing. After impact with the ball, the right handed player follows through by a continued rotation to the left. The
5 swing ends when the player's weight has shifted almost entirely to his left foot, his body is fully turned to the left, his hands above the left shoulder and the club hanging down over his back.

Thus, a player can sense deviations of a club head face 46 from the plane of a swing and can relate the point of release to the outcome of a golf swing with my
10 apparatus and method. Although only two embodiments of my invention have been described, it is not my intention to lit the invention to the disclosed embodiments since other embodiments can be developed by obvious changes by persons skilled in the art without departing from the spirit thereof.

CLAIMS

1. A swing training aid assembly comprising:
a shaft; and
5 a gyroscope mounted to an end section of said shaft opposite a grip section of said shaft.
2. The assembly as recited in claim 1, further comprising a head mounted to said shaft to at least partially surround said gyroscope.
- 10 3. The assembly as recited in claim 1, wherein said shaft is hollow.
4. The assembly as recited in claim 3, further comprising at least one battery mounted within said hollow shaft adjacent said grip section of said shaft.
- 15 5. The assembly as recited in claim 4, further comprising an electric motor to drive said gyroscope, said at least one battery in electrical communication with said gyroscope to provide power therefor.
- 20 6. The assembly as recited in claim 4, further comprising a grip mounted over said grip section of said shaft.
7. The assembly as recited in claim 6, further comprising a switch mounted to said grip to operatively control said electric motor.
- 25 8. The assembly as recited in claim 7, wherein said switch includes an ON/OFF switch.
9. The assembly as recited in claim 1, wherein said shaft defines a shaft axis
30 and said gyroscope rotatable about a gyroscope axis generally transverse to said shaft axis.

10. The assembly as recited in claim 1, wherein said shaft defines a shaft axis and said gyroscope rotatable about a gyroscope axis perpendicular to said shaft axis.
11. A golf swing training aid assembly comprising:
- 5 a hollow shaft which defines an axis;
a gyroscope mounted to an end section of said hollow shaft opposite a grip section of said shaft, said gyroscope rotatable about a gyroscope axis non-parallel to said shaft axis;
an electric motor to power said gyroscope; and
- 10 a power supply mounted within said hollow shaft to power said electric motor.
12. The assembly as recited in claim 11, further comprising a head mounted to said shaft to at least partially surround said gyroscope, said head formed from at
- 15 least two separable portions.
13. The assembly as recited in claim 12, wherein said head defines a head face
14. The assembly as recited in claim 13, wherein said gyroscope axis is generally
- 20 perpendicular to said face.
15. The assembly as recited in claim 13, wherein said head face is operable to strike a golf ball.
- 25 16. The assembly as recited in claim 11, further comprising a grip mounted over a portion of said grip section of said shaft opposite said gyroscope.

17. A method of controlling a swing training aid assembly comprising the steps of:
- (A) gyroscopically establishing a swing plane of a golf swing training aid assembly with a gyroscope mounted to an end section of said shaft opposite a grip
- 5 section of said shaft; and
- (B) providing feedback relative to said step (A) which represents deviation of a face of the golf swing training aid assembly from a perpendicular relationship with the swing plane.
- 10 18. A method as recited in claim 17, wherein said step (A) further comprises:
- (a) defining a gyroscope axis of a gyroscope mounted to the golf swing training aid, the gyroscope axis non-parallel to a shaft axis of a shaft.
19. A method as recited in claim 17, wherein said step (B) further comprises:
- 15 (a) providing the feedback in response to angular momentum provided by a gyroscope mounted to an end section of a shaft.
20. A method as recited in claim 17, wherein said step (B) further comprises:
- (b) providing the feedback in response to a release of the golf swing
- 20 training aid assembly during a downswing.

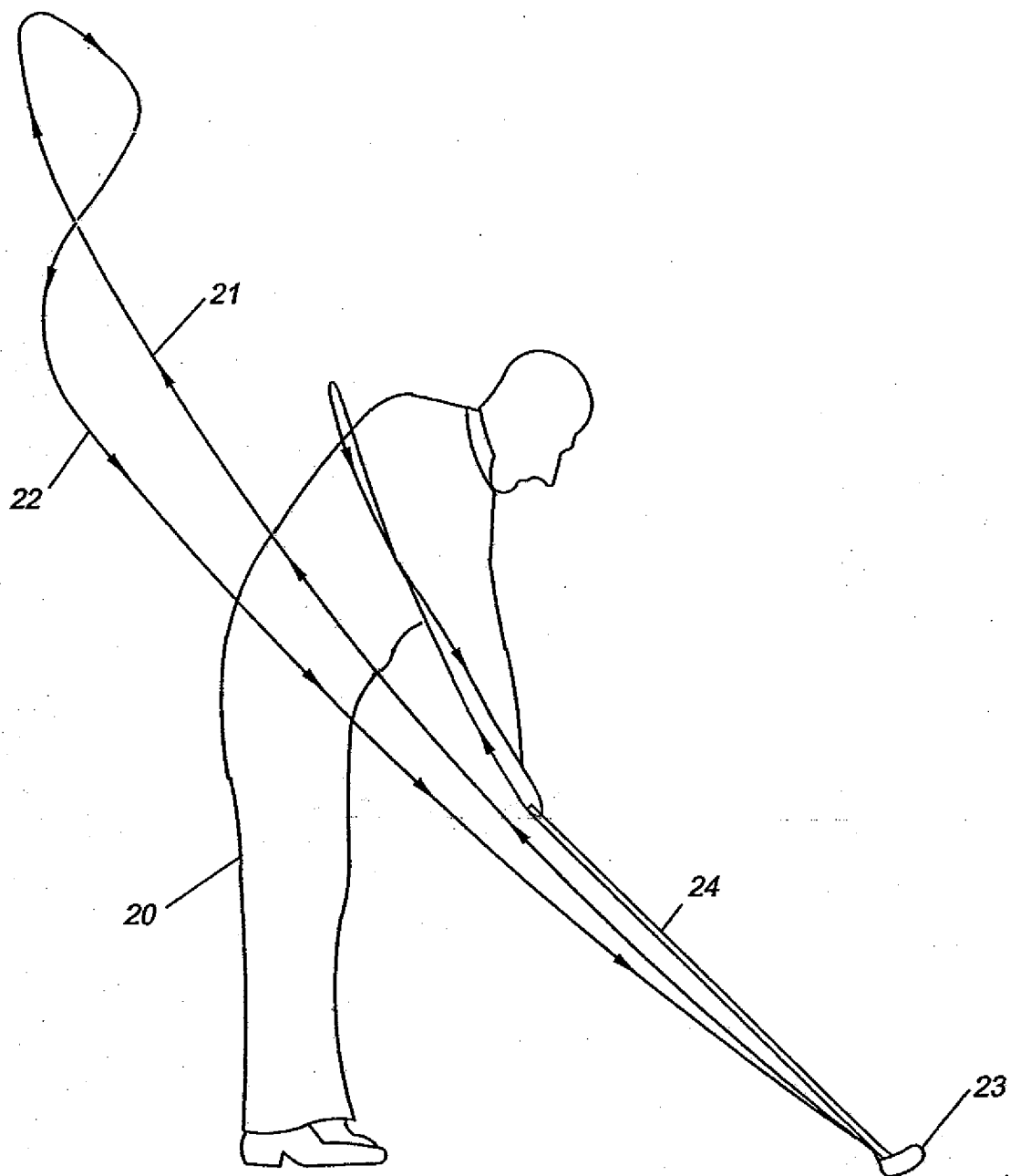


FIG. 1

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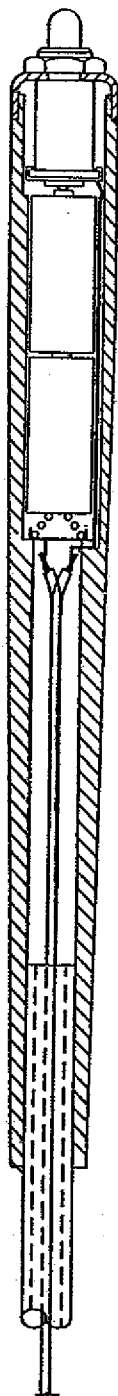


FIG. 4

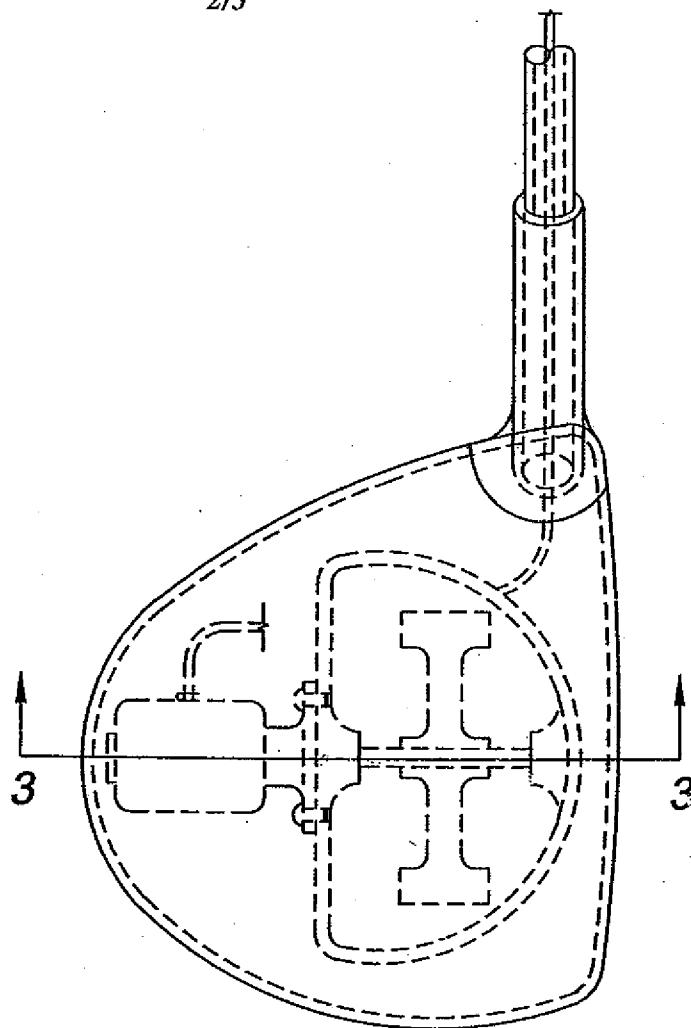


FIG. 2

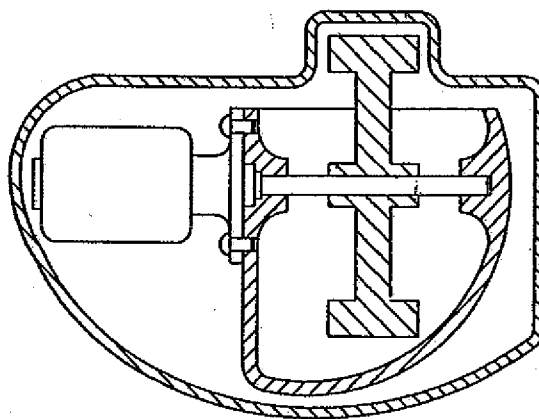
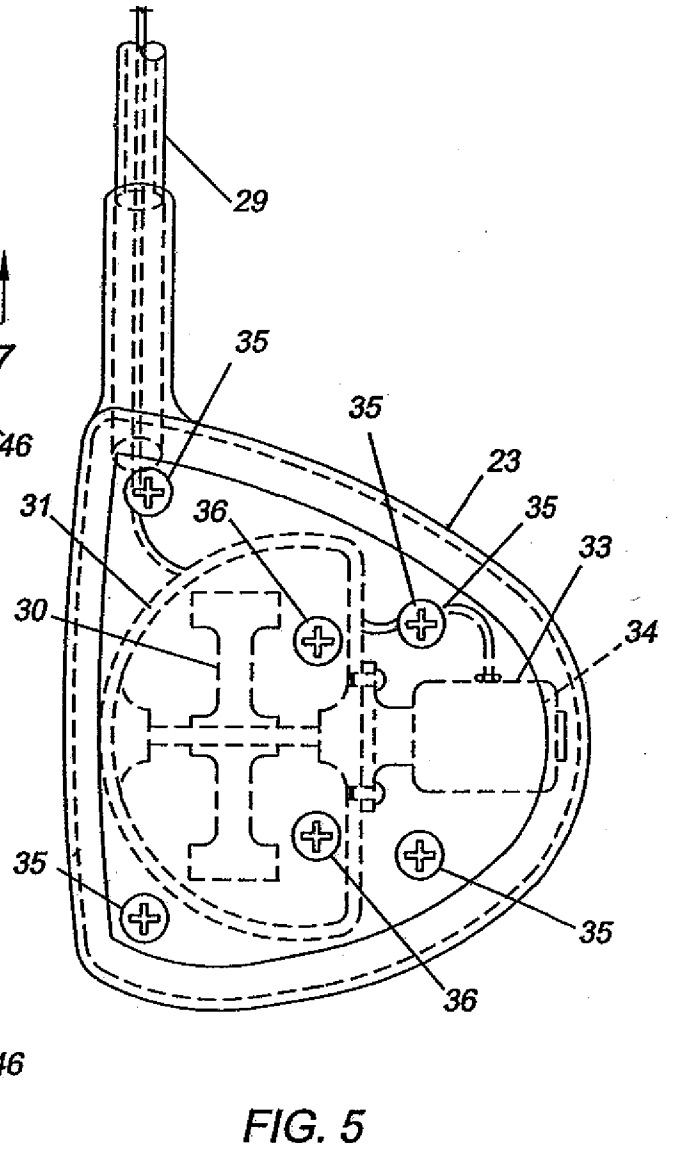
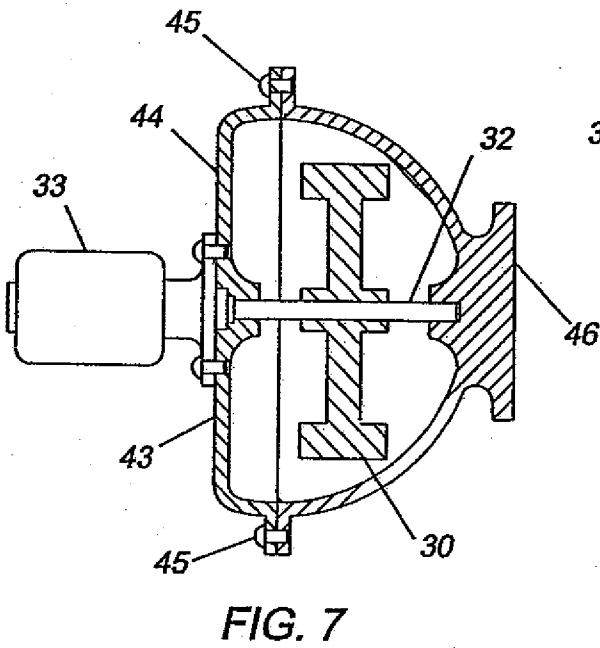
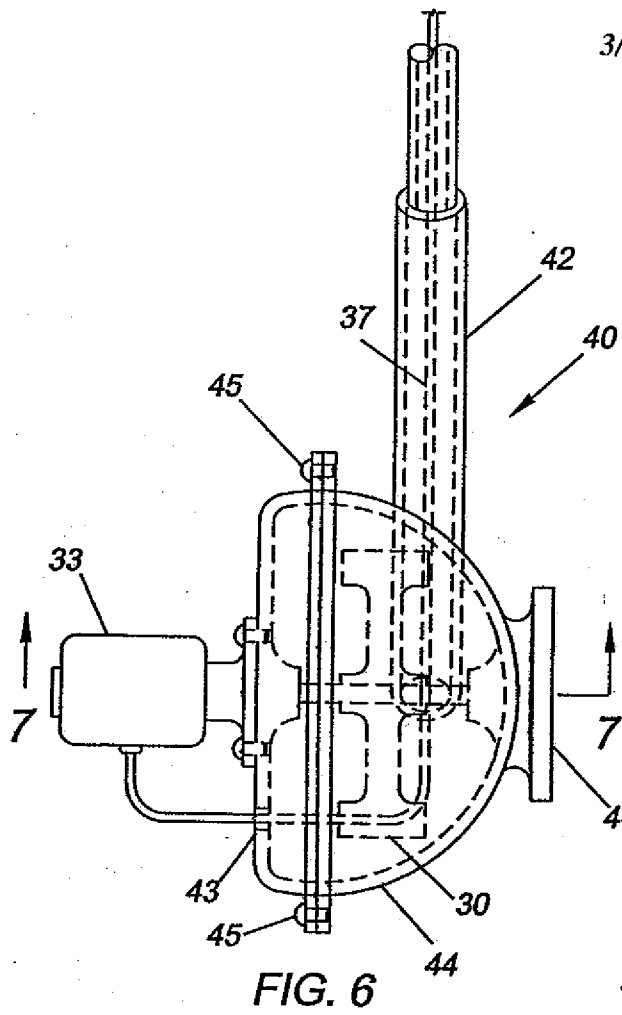


FIG. 3

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INTERNATIONAL SEARCH REPORT

International application No

PCT/US2007/072195

A. CLASSIFICATION OF SUBJECT MATTER
INV. A63B69/36

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A63B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	JP 09 000672 A (INOUE TSUTOMU) 7 January 1997 (1997-01-07) An automated computer translation of this Japanese publication can be found on the website of the Japanese Patent Office: http://www.ipdl.ncipi.go.jp/homepg_e.ipdl abstract; figures	1-3,9-16 5,6
X A	US 5 941 779 A (ZEINER-GUNDERSEN DAG H [US]) 24 August 1999 (1999-08-24) column 2, line 6 - line 31 column 2, line 60 - column 3, line 59; figures 1,2	1-3,9-16 5,6
X A	US 4 017 083 A (JOHNSON JAMES A) 12 April 1977 (1977-04-12) column 1, line 65 - column 2, line 30; figures 1,2	1-3,9, 11-16 5-8
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☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- *G* document member of the same patent family

Date of the actual completion of the international search

15 November 2007

Date of mailing of the international search report

26/11/2007

Name and mailing address of the ISA/

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Authorized officer

Williams, Mark

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2007/072195

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2002/173365 A1 (BOSCHA) 21 November 2002 (2002-11-21) paragraphs [0042], [0062] - [0081]; figures 1-4 -----	1-16
X	US 2006/029916 A1 (BOSCHA) 9 February 2006 (2006-02-09) paragraphs [0036] - [0042], [0049], [0053], [0069]; figures 3-3b,10 -----	1-9, 11-16
A	US 2005/079922 A1 (PRIESTER ET AL.) 14 April 2005 (2005-04-14) paragraphs [0080] - [0102]; figures 4-9 -----	1,3-8,11

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box II.2

Claims Nos.: 17-20

The application does not meet the requirements of Article 6 PCT because claims 17 to 20 are not clear. The application also does not meet the requirements of Article 5 PCT because the method claimed in claim 17 and dependent claims 18 to 20 is not supported by the description. These deficiencies are such that no meaningful search is possible.

The wording of independent claim 17 is unclear. In particular, in the wording of step (A), "gyroscopically establishing a swing plane of a golf swing training aid assembly..." cannot be understood clearly. Whilst some information on the use of the claimed swing training aid assembly is given in the description, notably on page 4, lines 13-20 and page 6, line 14 to page 7, line 13, it is not explained how a swing plane may be established gyroscopically.

Step (B) of claim 17 is also unclear. This step is worded as follows: "providing feedback relative to step (A) which represents deviation of a face of the golf swing training aid assembly from a perpendicular relationship with the swing plane". This wording is not supported in the description, and furthermore, it appears to contradict the passage at page 6, lines 27-29 of the description, which states: "The angular momentum of the rapidly spinning rotor 30 resists deviations of the club head face 46 from being parallel to the plane of the swing."

Therefore the method of claim 17 is unclear, and furthermore, the claimed method lacks support in the description.

The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure. If the application proceeds into the regional phase before the EPO, the applicant is reminded that a search may be carried out during examination before the EPO (see EPO Guideline C-VI, 8.5), should the problems which led to the Article 17(2) declaration be overcome.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2007/072195

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☒ Claims Nos.: 17-20
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
see FURTHER INFORMATION sheet PCT/ISA/210
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers allsearchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search reportcovers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2007/072195

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 9000672	A	07-01-1997	NONE
US 5941779	A	24-08-1999	NONE
US 4017083	A	12-04-1977	NONE
US 2002173365	A1	21-11-2002	US 2002173364 A1 21-11-2002
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