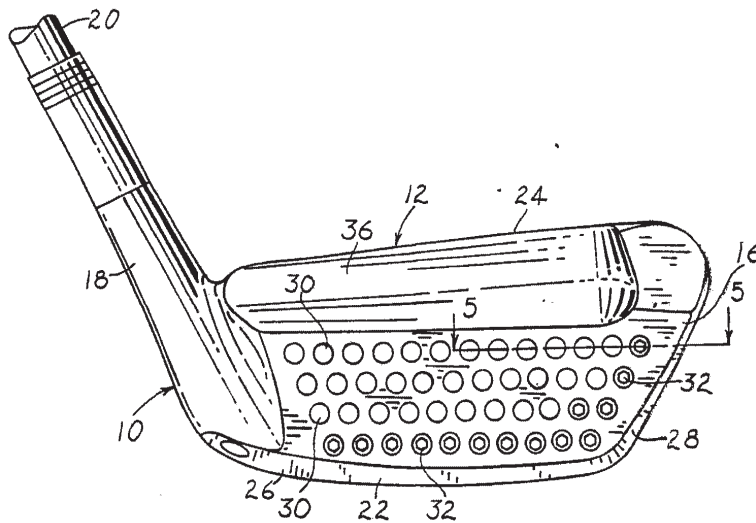




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(21) International Application Number: PCT/US92/01896 (22) International Filing Date: 28 February 1992 (28.02.92) (30) Priority data: 662,869 1 March 1991 (01.03.91) US 764,888 24 September 1991 (24.09.91) US (71)(72) Applicants and Inventors: SANDERS, Gregory, L. [US/US]; 2709 Markwardt, Joplin, MO 64801 (US). LOBBEY, James, R. [US/US]; P.O. Box 1792, Joplin, MO 64802 (US). COLLINS, Truman, F. [US/US]; 3550 Cherry Street Road, Springfield, MO 65809 (US). (74) Agents: WERESH, John, A. et al.; Hovey, Williams, Timmons & Collins, 1101 Walnut Street, Suite 1400, Kansas City, MO 64106 (US).		(81) Designated States: AT (European patent), AU, BE (European patent), CA, CH (European patent), DE (European patent), DK (European patent), ES (European patent), FR (European patent), GB, GB (European patent), GR (European patent), IT (European patent), JP, LU (European patent), MC (European patent), NL (European patent), SE (European patent). Published <i>With international search report.</i>

(54) Title: SYSTEM FOR ADJUSTING A GOLF CLUB**(57) Abstract**

A system for adjusting a club including a club head (10) and a shaft (20). The club head (10) is provided with a body (12) having an impact surface (14), a back face (16) and a hosel (18). The back face (16) of the club head (10) is provided with a plurality of cavities (30) separated from one another in a horizontal direction extending between the heel (26) and toe (28) of the body (12), and in a vertical direction extending between the sole (22) and upper edge (24) of the body (12), each of the cavities (30) extending into the body (22) without intersecting the impact surface (14) and terminating at an inner end (31) located no more than 3/16 inch from the impact surface (14). The club includes a plurality of weights (32), and securing means for securing each of the weights (32) within one of the cavities (30) against the inner end (31) in order to permit adjustment of the weight of the club head (10).

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SYSTEM FOR ADJUSTING A GOLF CLUB

Related Applications

5 The present application is a continuation-in-part of U.S. Patent Application, Serial No. 662,869, filed March 1, 1991.

Background of the Invention

1. Field of the Invention

10 The present invention relates generally to golf clubs and, more particularly, to a system for adjusting the various hitting characteristics and physical dynamics of a golf club.

2. Discussion of the Prior Art

15 In the art of golf club design, it is known that variations in the physical characteristics of a particular club head construction may be achieved by altering the distribution of weight relative to the impact surface of a club head.

20 For example, by distributing a majority of the weight of the club head below the center of gravity thereof, it is possible to provide a construction which enables better lift or higher trajectory of a golf ball to be achieved. Further, the area of the impact surface within which contact must take place in order for maximum energy transfer to occur between the club head and a golf ball, known as the "sweet spot", may be enlarged by distributing the weight of the club head at the heel and toe thereof and removing weight from the central region of the club head.

25 One problem encountered in known conventional constructions arises from the necessity of designing one particular set of hitting characteristics and physical dynamics which may not be varied once the club head has been initially cast or forged. Thus, if a golfer obtains a set of golf clubs constructed with a particular group of hitting characteristics and physical dynamics and finds that these characteristics are not well suited to his particular swing, it is not possible to precisely redistribute the mass of the club head in order to conform to his individual swing characteristics. The

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same problem is encountered even with clubs which are customized for an individual golfer. As swing characteristics vary over a period of time, the response of even a customized club is adversely affected.

5 In an attempt to overcome these problems, some known adjustable golf club constructions have been designed to offer individuals the opportunity to change certain limited hitting characteristics of their clubs as their own swing characteristics and abilities vary from time to time. This has been accomplished generally by offering weight ports or holes placed within the club head and systems for varying the placement of weight within
10 those weight ports.

But even these known adjustable systems offered to date have limitations in their scope and practicality and are cumbersome, if not impossible, in their application by the average golfer.

15 One problem encountered in known adjustable golf club constructions arises in the necessity of filling all weight ports with materials of varying density or size. Since all weight ports in this type of system must be filled, the golfer is required to juggle a multiplicity of weight pins or discs, sometimes used in combination and made of several materials varying in density and/or size, between the ports in order to shape the hitting
20 characteristics of the club. At the same time, it is necessary to attempt to balance the total weight of the various pins to achieve the correct or desired swing weight, creating an extremely cumbersome operation for the player to carry out.

25 Another problem encountered in known adjustable golf club constructions primarily limits a player's ability to only controlling and coarsely adjusting horizontal hitting characteristics of a golf club. That is the dispersion of a desired amount of weight between the heel and toe of the club head. While this may be somewhat effective in controlling the lateral dispersion of energy, it offers no opportunity to permit correction of

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problems related to trajectory or the vertical dispersion of energy. Frequently, golfers may find it desirable under varying physical conditions, such as high winds, wet grass, etc., to reduce the high trajectory of a ball, while under other circumstances, these same golfers may wish to produce a shot with a higher than normal trajectory.

Where known adjustable weighing systems are applied to golf clubs commonly referred to as woods, whether of metal construction, graphite construction or otherwise, the application of weights usually is applied from the sole of the club head, centered between the hitting surface or face of the club and the rear surface of the sole. Alternately, the weight is applied from the rear surface of the club head parallel to the sole, toward the hitting surface of the club. One type of problem encountered with these systems relates to the relatively coarse adjustment of hitting characteristics and the undesirable movement of the center of gravity of the club head away from the hitting surface and sweet spot. The increase in distance between the center of gravity and the sweet spot magnifies the negative or undesired effect on a golf shot which is struck with the club face a few degrees off of perpendicular to the line of flight. If the center of gravity is located in close proximity to the hitting surface and sweet spot, a more effective and precise control may be maintained on miss-hit shots.

Objects and Summary of the Invention

It is an object of the present invention to address the above mentioned problems associated with known adjustable systems, and to provide an adjustable weighing system that can not only customize and optimize the physical dynamics of a club for a given golfer, but which can also allow the golfer to precisely and easily change those physical dynamics as his strength or swing characteristics change.

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In accordance with one aspect of the invention, weights are provided which may be added to or removed from a series of cavities on the back face of the club head. The cavities are provided at various points on the back face so as to permit the greatest amount of variation possible in the physical dynamics of the club, as determined by laboratory testing of the center of gravity and Moment of Inertia of the golf club, in order to suit the needs of a majority of users.

For example, in one possible construction of a golf club including the present invention, the club head contains 46 cavities in the back face which are separated from one another in a horizontal direction extending between the heel and toe of the club head, and in a vertical direction extending between the sole and upper edge of the club head. In this manner, the cavities are strategically placed to offer a player the optimum opportunity to adjust the hitting characteristics of the club to suit his individual needs. Using Binomial Expansion Theorem 2.8, as expounded in John E. Freund's "Published Mathematical Statistics", with 46 cavities and from 1 to 46 weights available for use, the number of different possible weight variations becomes a function of 2 to the 46th power, offering a golfer the maximum possibility of 70,368,744,177,664 different patterns and values of weighting, with no duplications.

In accordance with a preferred embodiment of the invention, a fewer number of weights than 46 are employed to provide the desired swing weight and are strategically positioned within the necessary cavities in order to define the desired hitting characteristics. More specifically, a player would first select the number of weights necessary to raise the weight of the golf club to the desired swing weight, and would then position these weights in a number of the holes selected to provide the desired hitting characteristics. However, with as few as 12 weight pins in use and with a lesser number of cavities than 46, the possible number of combinations

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would still number in the tens of thousands, thus permitting a wide variation in the characteristics possible.

5 It is an object of the present invention to provide in every individual club head or head design, the optimum number of cavities, distributed so as to provide the greatest flexibility in adjusting horizontal and vertical dynamics, with a lesser number of weights of precise swing weight value to total the optimum swing weight for an individual golfer. In this manner, it is possible to attain proper swing weight and physical dynamics without filling all cavities. It is a basic function of the present invention that
10 all cavities are not filled, for a variety of reasons. By not filling all of the cavities, it provides a system which supplies the greatest range of variables to golfers of all degrees of skill, with a wide range of desired effects. Hooking, slicing, drawing, fading, high trajectory, soft landing shots, low trajectory, hard running shots, etc., are just a few of the examples that may
15 be induced or corrected by the system. A golfer not only has the latitude of adding weight to a particular area of the club mass, but by removing a weight from one particular position, and replacing it into an opposite position, you are exactly doubling the effect of the change on the physical dynamics of the club.

20 Another important benefit of the system resides in the convenience and simplicity it provides the golfer in adjusting his club. By not filling all cavities and by using weight pins of a constant swing weight value, it is easy to determine the exact number of weights needed to achieve the desired total swing weight, and by not varying this number in application
25 to a club, the physical dynamics may be easily altered while maintaining a constant swing weight.

Moreover, the same principals would apply in altering swing weight, without changing physical dynamics, by simply removing a number

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of weight pins equaling the desired reduction in swing weight from opposite areas of the club head.

5 It is another object of the present invention to provide an adjustable system of altering swing weight and physical dynamics of a golf club head, while maintaining an extremely close proximity between the sweet spot and the center of gravity.

10 In existing golf art, a misconception has been expressed equating sweet spot to center of gravity. These are in reality two entirely separate physical points on a golf club head. The sweet spot is that point on the striking surface of the club head at the geographic center of the surrounding mass of the club head, while the center of gravity is a point actually inside the mass of the club head. This proximity can vary from mere fractions of an inch in the case of iron clubs, to as much as two or three inches in wooden clubs. The further the center of gravity is from the sweet spot, the more it magnifies the margin of error on a miss-hit shot.

15 For this reason, the placement of the nearest point of a weight pin to the hitting surface of a club head shall be maintained at 3/16 inch or closer, in order to maintain precise control over the hitting characteristics of a club regardless of the degree of error with which the club is swung.

20 In accordance with these and other objects, a golf club having a system for adjusting swing characteristics and physical dynamics of the club includes a club head having a body provided with an impact surface and a back face generally opposed to the impact surface. A shaft engages a hosel extending from the body, and the back face of the club head is provided with a first plurality of cavities separated from one another in a horizontal direction extending between the heel and toe of the body, and in a vertical direction extending between the sole and upper edge of the body.

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Each of the cavities extends into the body toward the impact surface without intersecting the impact surface and terminating at an inner end located no more than 3/16 inch from the impact surface. The system for adjusting physical dynamics of the club includes a plurality of weights, and securing means for securing each of the weights within the cavities against the inner end in order to permit adjustment of the weight of the club head and distribution of the weight within the body.

By this construction, numerous advantages are achieved. For example, by providing a plurality of cavities across the back face of the club head, and by employing a number of weights which may be secured within the cavities, it is possible to redistribute the weight of the club head in any manner desired in order to obtain a preferred swing weight and favorable physical dynamics for any given type of swing. Further, such redistribution of the club head weight may be carried out at any time in accordance with U.S.G.A. regulations, in order to permit alteration of the weight and characteristics of the club head repeatedly over the course of time.

Brief Description of the Drawing Figures

A preferred embodiment of the present invention is described in detail below with reference to the attached drawing figures, wherein:

Fig. 1 is a rear elevational view of a club head constructed in accordance with a preferred embodiment of the invention;

Fig. 2 is a front elevational view of the club head shown in Fig. 1;

Fig. 3 is a top plan view of the club head shown in Fig. 1;

Fig. 4 is a perspective view of a weight constructed for use with the club head of the preferred embodiment; and

Fig. 5 is a sectional view of the club head taken through line 5-5 in Fig. 1.

Detailed Description of the Preferred Embodiment

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A golf club constructed in accordance with a preferred embodiment of the present invention is shown in Fig. 1, and includes a club head 10 having a body 12 provided with an impact surface 14, shown in Fig. 2, a back face 16 generally opposed to the impact surface, shown in Fig. 1, and a hosel 18 extending away from the body. The club head 10 is preferably formed of conventional materials of the type commonly used in club heads of known construction.

A shaft 20 is connected to the club head 10 at the hosel 18 and is provided with a handle at an opposite end thereof adapted to be gripped by a golfer in order to permit swinging of the club. The body 12 includes a sole 22 along a lower edge thereof adapted to rest against the ground when the golf club is properly positioned prior to being swung. An upper edge 24 is disposed opposite the sole 22 and a heel 26 is defined adjacent the hosel 18. The club head 10 also includes a toe 28 disposed generally opposite the heel 26.

The back face 16 of the club head 10 is provided with a plurality of cavities 30 separated from one another in a horizontal direction extending between the heel 26 and toe 28 of the body 12, and in a vertical direction extending between the sole 22 and upper edge 24 of the body. In the illustrated preferred embodiment, each of these cavities 30 is of a generally cylindrical shape and includes a threaded inner surface. Each of the cavities 30 extends into the club head 10 in a direction generally perpendicular to the back face 16 and terminates at an end surface 31 located at a point short of the impact surface 14 of the club head 10, as shown in Fig. 5, such that none of the cavities extend completely through the club head. Preferably, the end surface of each cavity is located as close as possible to the impact surface 14 without actually intersecting the surface and without adversely effecting the integrity of the surface or weakening the material used in the club head. The maximum distance at which the end

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surfaces of the cavities are located from the impact surface in order to achieve the desired results where conventional materials are used has been found to be 3/16 inch, although it is possible to locate the end surface closer to the impact surface with many materials.

5 As shown in Fig. 1, the cavities 30 may be arranged in an aligned pattern across the back face 16 such that a number of horizontal and/or vertical rows of cavities are presented. For example, at least three and preferably four horizontal rows of cavities may be provided, each of which extends substantially the entire distance between the heel 26 and toe 10 28 of the club head 10. In the illustrated embodiment, the horizontal rows of cavities 30 are separated from one another in the vertical direction by a distance sufficient to permit coverage of at least the lower one half of the area of the back face 16. In order to provide a suitable number of cavities to permit a desirable range of variations to be made in the hitting 15 characteristics of the golf club, at least three cavities are provided within each row, with one of the cavities being located adjacent the heel, another of the cavities being located adjacent the toe, and the third cavity being disposed intermediate the first and second cavities.

Turning to Fig. 4, a weight 32 is shown that is adapted for 20 insertion into one of the cavities 30 of the club head shown in Fig. 1. Preferably, the weight 32 includes a threaded outer surface sized for cooperation with the threaded interior surface of the cavities 30, and means are provided for permitting the weight to be inserted and removed from one of the cavities. For example, in the illustrated embodiment a plurality of 25 inner flattened surfaces 34 are provided in one axial end of the weight and are adapted to be engaged by an Allen wrench or the like.

Although, in the preferred embodiment, the weights 32 are illustrated as being threaded, it is possible to provide other types of securing expedients in place of the threaded surfaces so long as some means is

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provided for securing each of the weights within the cavities in order to permit adjustment of the weight of the club head and distribution of the weight within the body. For example, it is possible to provide some form of a snap-fit connection between the weights and the various cavities.

5 Regardless of the shape of the cavities and weights, it is preferred that the weights be formed in known incremental swing weight values so that precise changes in the swing weight of the club may be made.

10 Further, although 46 cavities are provided in the illustrated embodiment, and are arranged in four horizontal rows, it is possible to provide any desired number of cavities in the club head and to position these cavities in any desired arrangement permitting precise adjustments to be made in the physical dynamics or hitting characteristics of the golf club.

15 The system could feasibly employ a minimum of nine cavities to achieve the desired results, with a possible variation in the placement of the weight ports as follows: By arranging the cavities in at least three rows with at least three cavities in each row, as discussed above, it is possible to adjust the position of the weights on the club head to achieve any desired hitting characteristics. For example, hooking, slicing, drawing, fading, high trajectory, soft landing shots, low trajectory, hard running shots, etc., are just
20 a few of the examples that may be induced or corrected by properly positioning weights within the at least nine cavities provided in the preferred construction. However, any reduction in the number of weights and cavities will understandably reduce the ability to achieve an extremely precise adjustment in swing weight or physical dynamics.

25 As shown in Fig. 3, it is possible to remove material from the club head within a region 36 adjacent the upper edge thereof in order to reduce the weight of the club head 10 thus increasing the effect that redistribution of the weights has on the physical dynamics of the golf club.

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In use, a golfer attempting to conform the physical dynamics and swing weight of a golf club constructed in accordance with the present invention to his own personal swing characteristics secures a number of the weights 32 in various cavities 30 disposed on the back face 16 until the
5 desired swing weight is obtained. Thereafter, if it is desired to change physical dynamics such as the position and size of the "sweet spot" or the center of gravity of the club head, some of the weights 32 positioned in the cavities may be removed and repositioned in others of the cavities, thus redistributing the weight relative to the impact surface 14.

10 For example, if a golfer has a tendency toward hitting relatively low golf shots and desires to increase the angle at which the ball leaves the impact surface 14 upon contact with the club head, weight may be distributed along the sole 22 of the club head by positioning the weights in the lowermost cavities and by leaving the upper cavities empty. Thus, the
15 center of gravity of the club head is lowered, achieving the desired results.

Alternately, if a golfer has a tendency toward drawing or fading the ball away from a straight travel path, the weights may be moved between the heel 26 and toe 28 of the club head in order to reduce the effect of such drawing or fading tendencies.

20 Finally, if the golfer consistently makes contact with a golf ball within a certain prescribed area on the impact surface 16, the weights 32 may be redistributed in the cavities 30 in an arrangement which ensures maximum energy transfer to the ball when the ball is struck by the impact surface within the prescribed area.

25 Although the invention has been described with reference to the illustrated preferred embodiment, it is noted that substitutions may be made and equivalents employed herein without departing from the scope of the invention as recited in the claims. Also, this same system while illustrated on the preferred embodiment of a mid-iron, would apply, with

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modification, to woods, metal or otherwise, putters, and irons or other known constructions such as cavity-backed or perimeter weighted irons.

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What is Claimed Is:

1. A system for precisely adjusting physical dynamics of a golf club, the system comprising:

5 a club head having a body provided with an impact surface, a back face generally opposed to the impact surface, and a hosel extending away from the body, the body including a sole, an upper edge disposed opposite the sole, a heel located adjacent the hosel and a toe disposed generally opposite the heel;

10 a shaft engaged with the hosel, the back face of the club head being provided with a first plurality of cavities separated from one another in a horizontal direction extending between the heel and toe of the body, and in a vertical direction extending between the sole and upper edge of the body, each of the cavities extending into the body

15 toward the impact surface without intersecting the impact surface and terminating at an inner end located no more than 3/16 inch from the impact surface; and

20 a second plurality of weights, and securing means for securing each of the weights within one of the cavities against the inner end in order to permit adjustment of the weight of the club head and distribution of the weight within the body.

2. A system as recited in Claim 1, wherein the weights are

25 cylindrical and each weight is sized and shaped for receipt in any one of the cavities.

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3. A system as recited in Claim 2, wherein the securing means includes cooperating threaded surfaces on the weights and within the cavities such that any weight sized for receipt in a cavity is secured within the cavity by engagement between the cooperating surfaces.

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4. A system as recited in Claim 1, wherein the cavities are provided on the back face of the body over a horizontal region extending substantially the entire distance between the heel and toe of the body.

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5. A system as recited in Claim 4, wherein the cavities are provided on the back face of the body over a vertical region extending at least one-half the distance between the sole and the upper edge of the body.

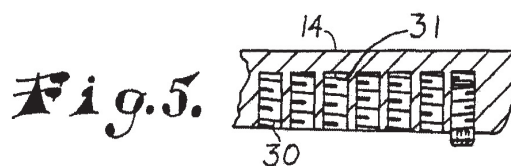
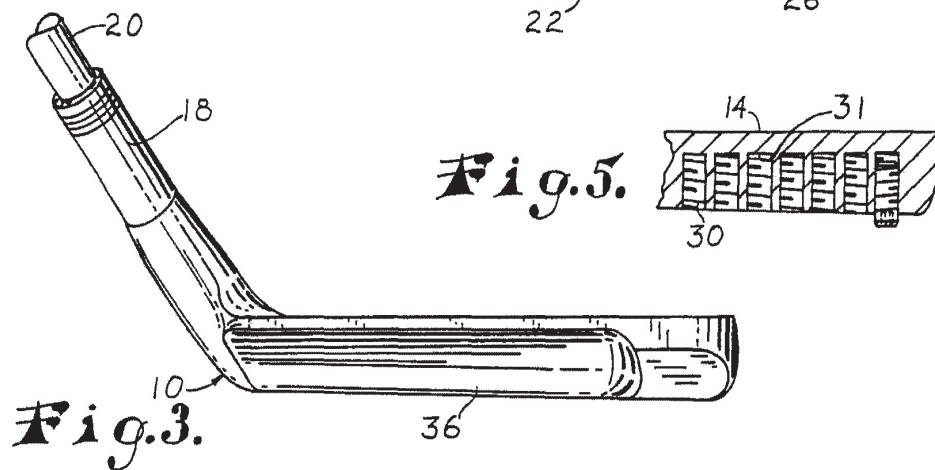
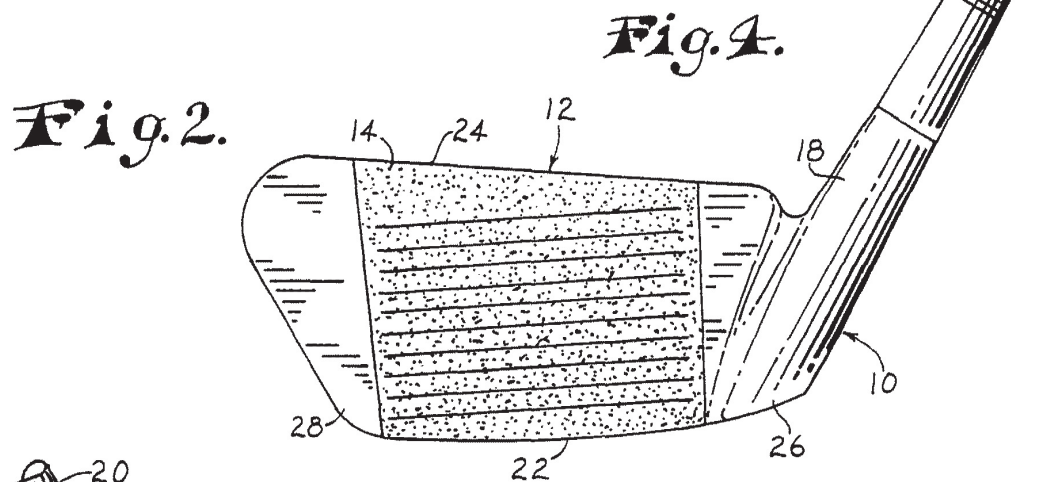
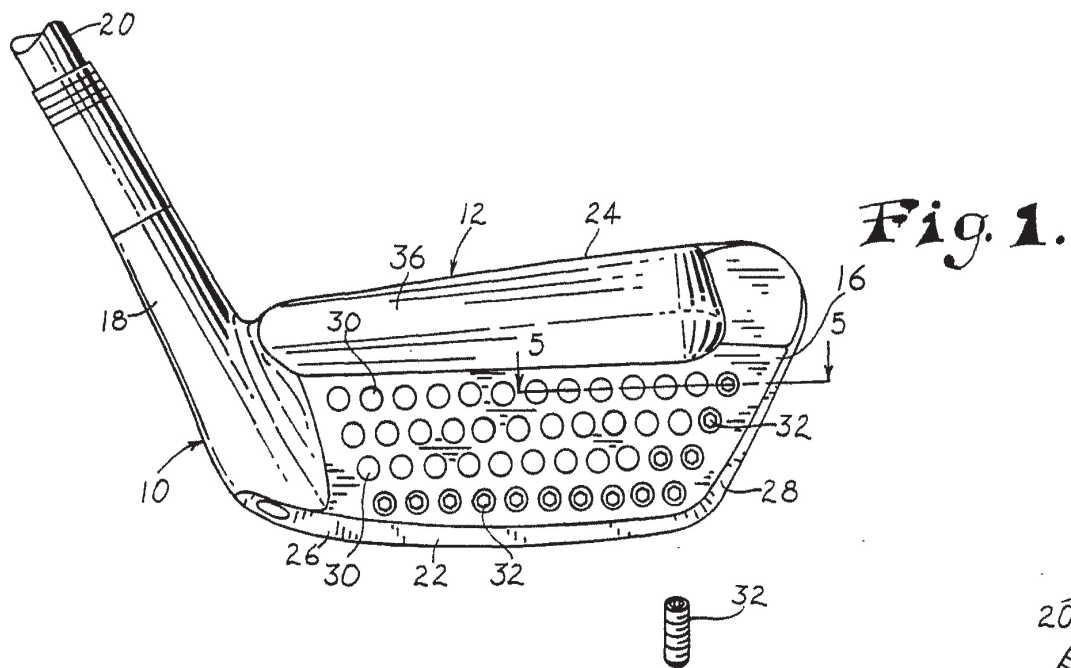
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6. A system as recited in Claim 1, wherein the club head is constructed of a weight less than a predetermined desired playing weight, and the second plurality of weights together define a mass sufficient to increase the weight of the club head to the predetermined desired playing weight when the second plurality of weights are secured on the club head, the first plurality of cavities outnumbering the second plurality of weights so that after the weights have been secured to the club head a number of empty cavities remain.

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7. A system as recited in Claim 1, wherein there are a minimum of nine cavities provided on the back face of the body.

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INTERNATIONAL SEARCH REPORT

International Application No PCT/US92/01896

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ³		
According to International Patent Classification (IPC) or to both National Classification and IPC IPC(5): A63B 53/04, A63B 53/08 US CL.: 273/171,173		
II. FIELDS SEARCHED		
Minimum Documentation Searched ⁴		
Classification System	Classification Symbols	
US	273/167-175, 193R, 194R, 194B, 77R	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁵		
III. DOCUMENTS CONSIDERED TO BE RELEVANT ¹⁴		
Category *	Citation of Document, ¹⁶ with indication, where appropriate, of the relevant passages ¹⁷	Relevant to Claim No. ¹⁸
X	US,A 1,133,129 (GOVAN) 23 MARCH 1915. SEE THE ENTIRE DOCUMENT.	1-7
Y	US,A, 4,730,830 (TILLEY) 15 MARCH 1988. SEE FIGURES 4 AND 5 AND COLUMN 2, LINES 36-42.	1,6,7
Y	GB,A 439,187 (NASH) 02 DECEMBER 1935. SEE FIGURES 1 AND 2 AND PAGE 2, LINES 55-91.	1,6,7
A	US,A 4,754,977 (SAHM) 05 JULY 1988. SEE FIGURE 1 AND COLUMN 3, LINES 9-15 AND COLUMN 4, LINES 52-56.	
A	US,A 925,389 (ROYCE) 15 JUNE 1909. SEE FIGURE 2 AND PAGE 1, LINES 31-63.	
A	GB,A 1,387,955 (WILSON) SPORTING GOODS) 03 MARCH 1975. SEE FIGURES 1 AND 3 AND PAGE 1, LINES 85-96.	
<div style="display: flex; justify-content: space-between;"> <div style="width: 48%;"> <p>* Special categories of cited documents: ¹⁹</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"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)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </div> <div style="width: 48%;"> <p>"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</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"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.</p> <p>"&" document member of the same patent family</p> </div> </div>		
IV. CERTIFICATION		
Date of the Actual Completion of the International Search ²		Date of Mailing of this International Search Report ²
01 MAY 1992		11 JUN 1992
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