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(54) **SOLE CONFIGURATION FOR METAL WOOD GOLF CLUB**

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(57) **ABSTRACT**

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A metal wood type golf club head including a club head body and means for attachment to a golf shaft, the club head body including a frontal ball striking face having a center of percussion thereon, a rear face, a heel, toe, and top crown, and a rigid, non-deformable bottom sole having a forward section and at least one additional rear section. The forward section provides a friction surface and is defined by a bounce angle extending downwardly from said frontal ball striking face to prevent the leading edge of the club head from digging into the turf or ground during the execution of a golf shot. The rear section of the bottom sole is a reduced friction surface and is recessed upwardly into the club head.

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**Related U.S. Application Data**

(63) Continuation-in-part of application No. 11/264,390, filed on Nov. 2, 2005.

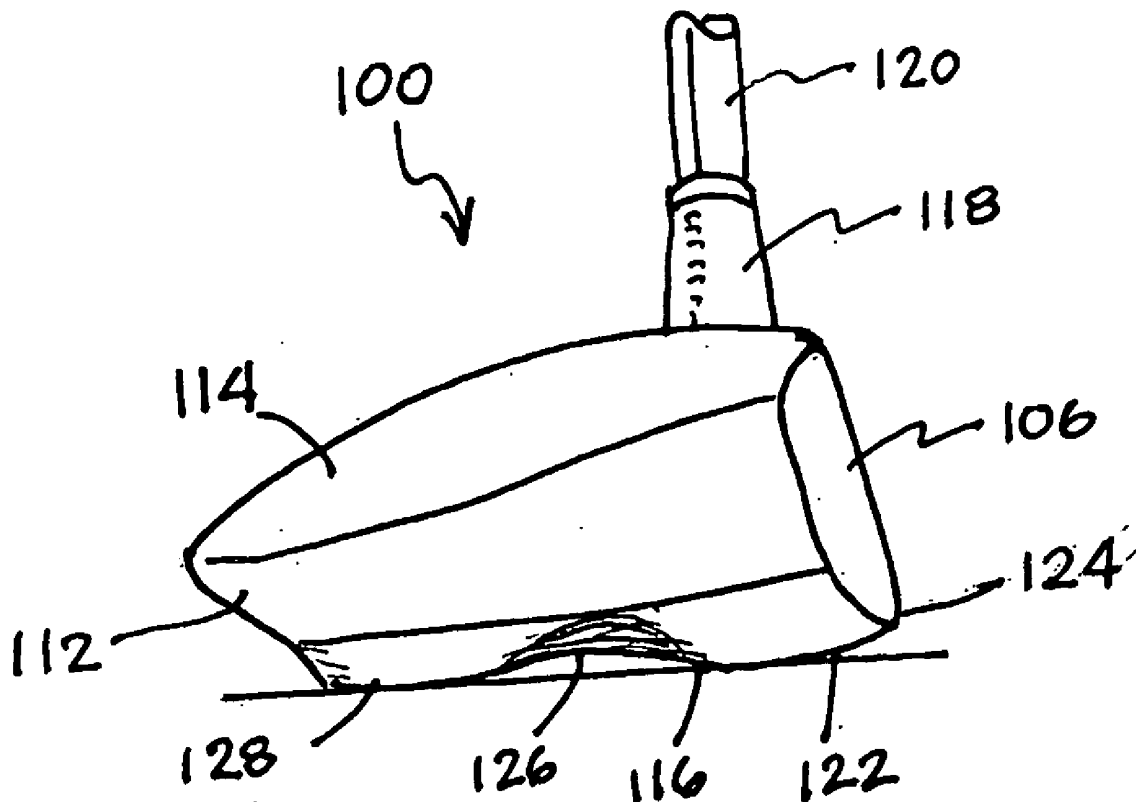


Fig. 1

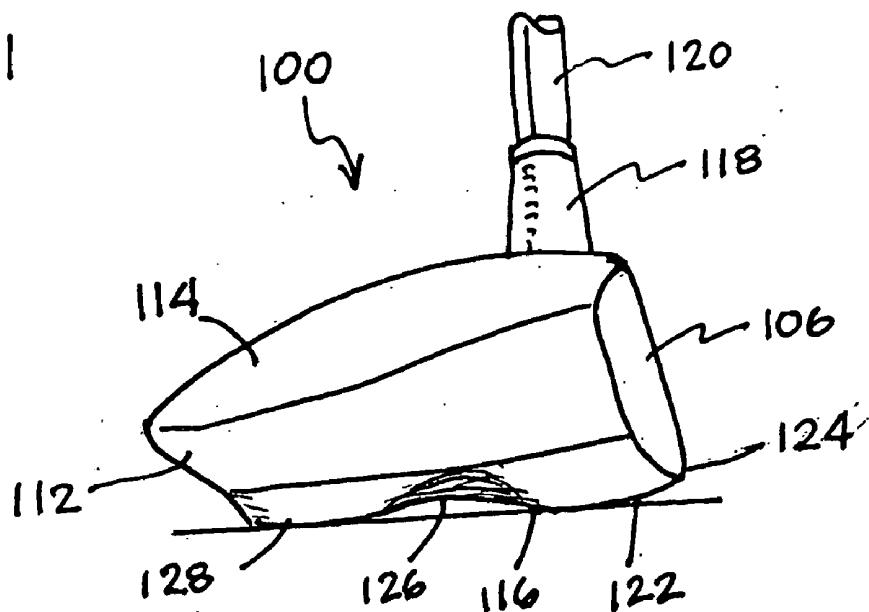


Fig. 2

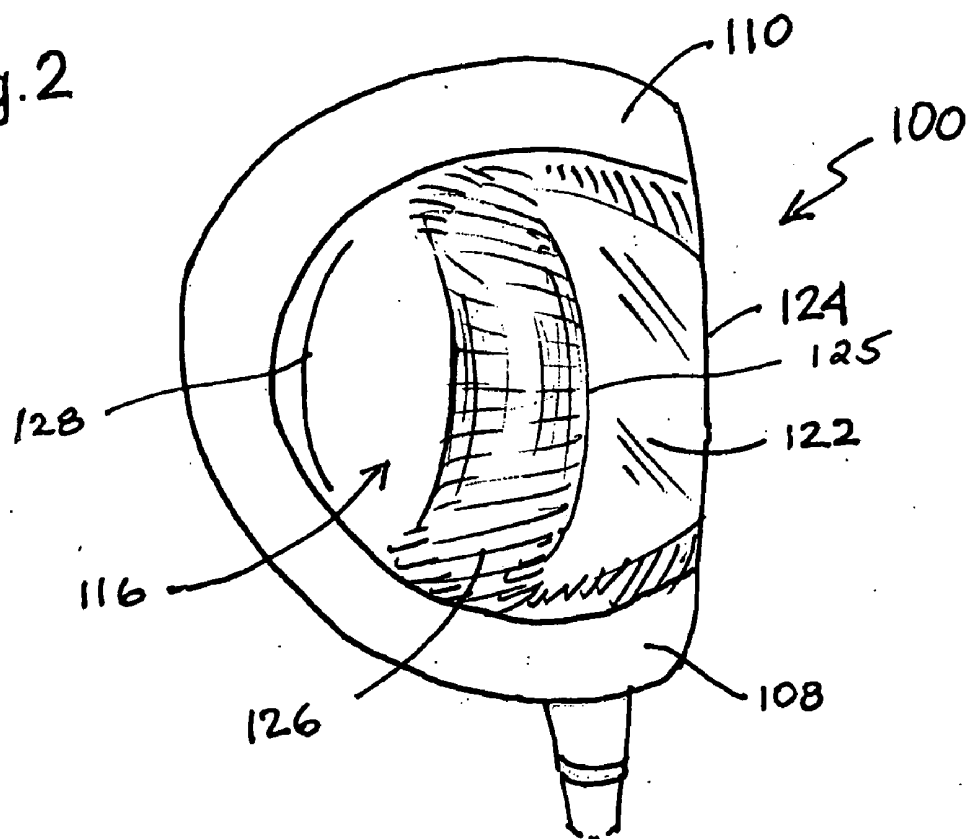


Fig. 3

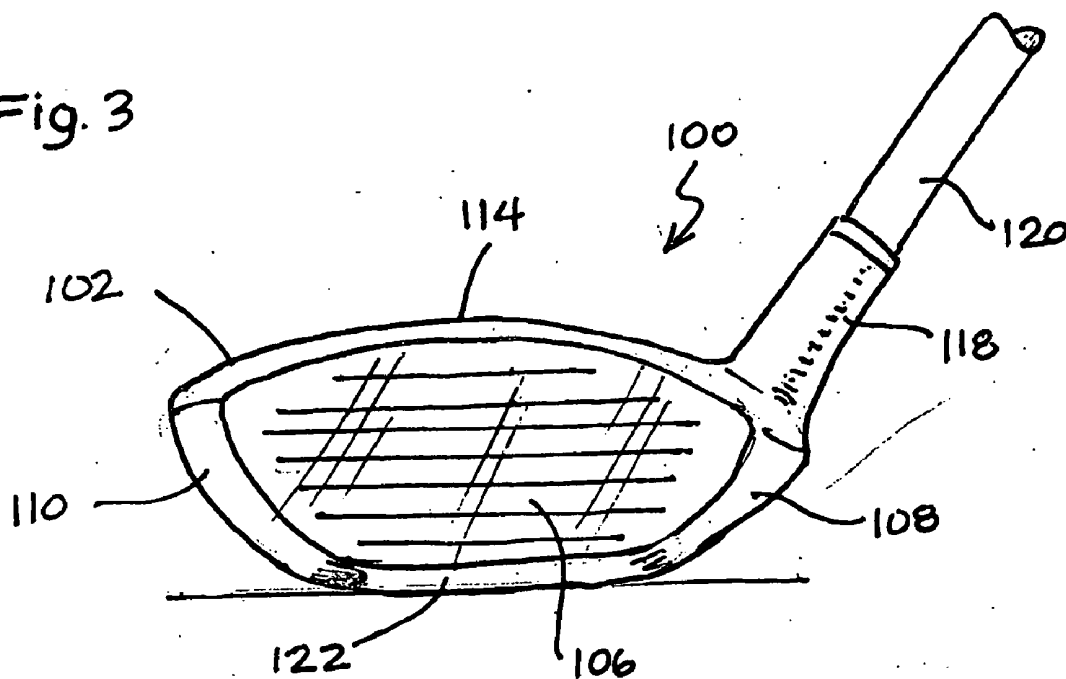


Fig. 4

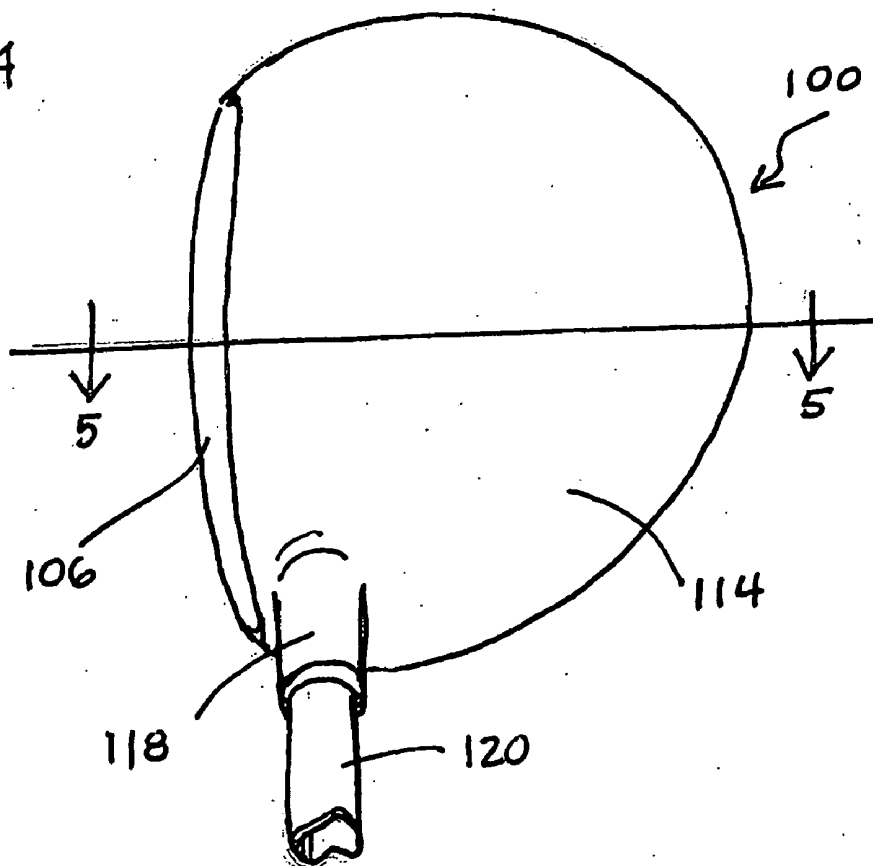


Fig. 5

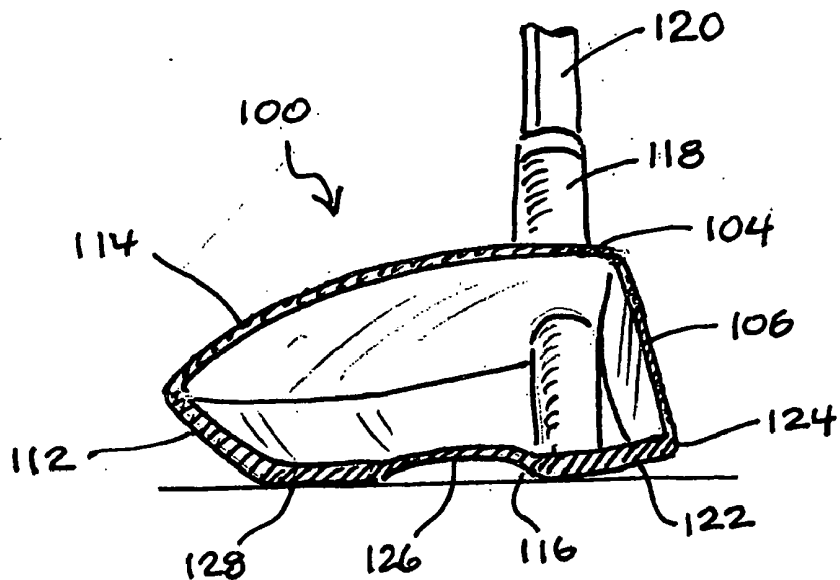


Fig. 6

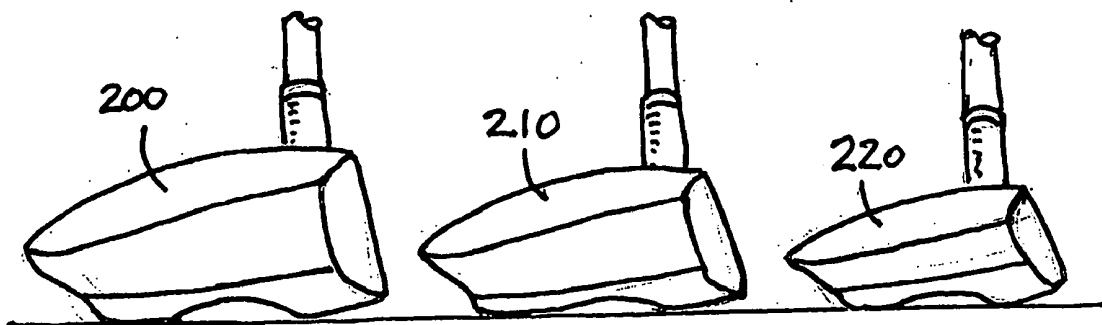


Fig. 7

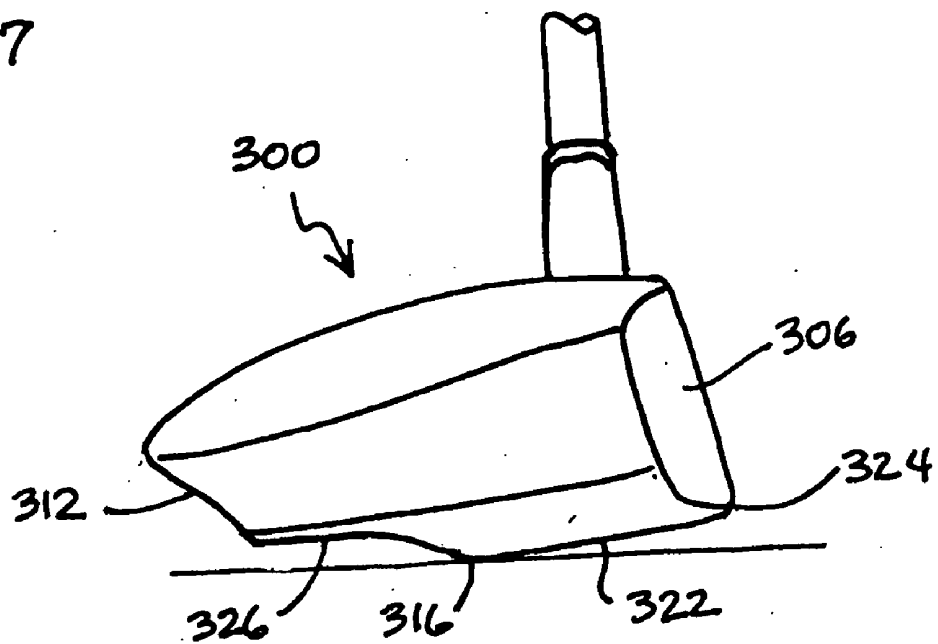


Fig. 8

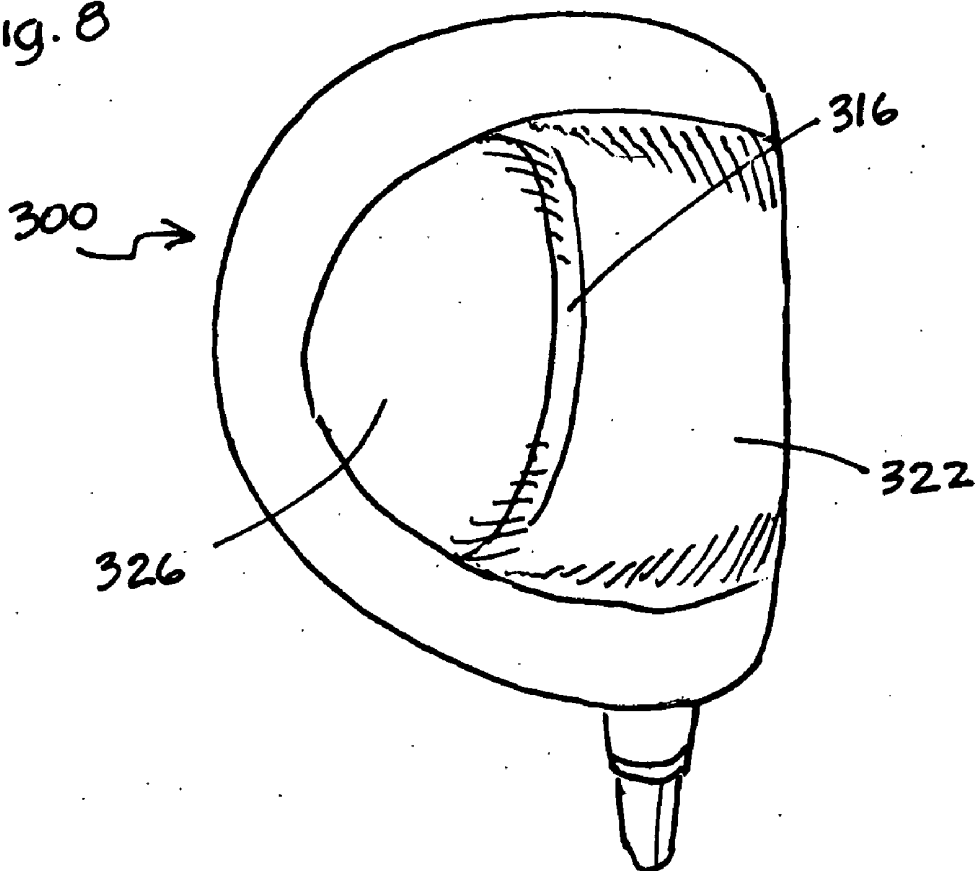


Fig. 9

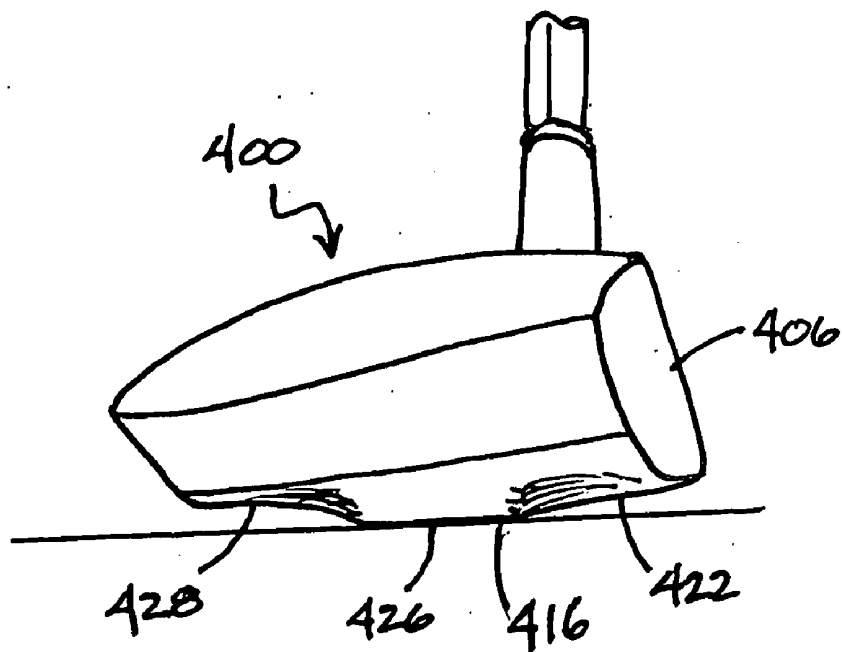


Fig. 10

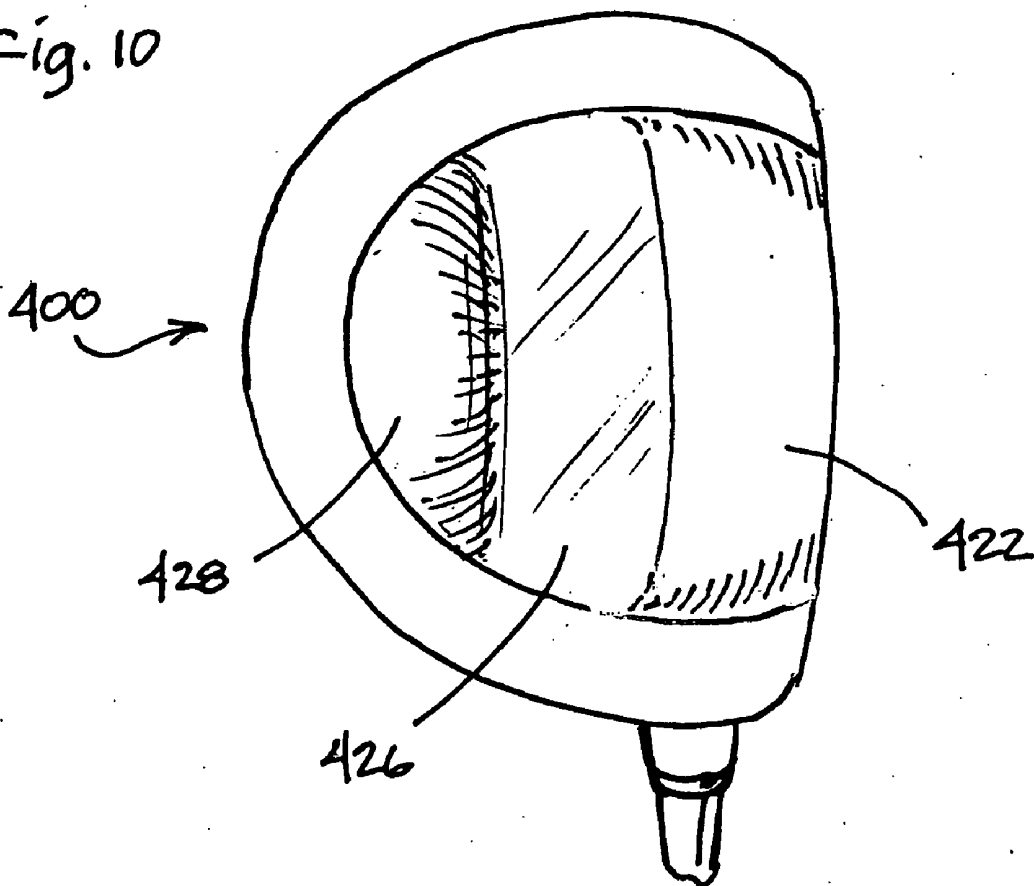


Fig. 11

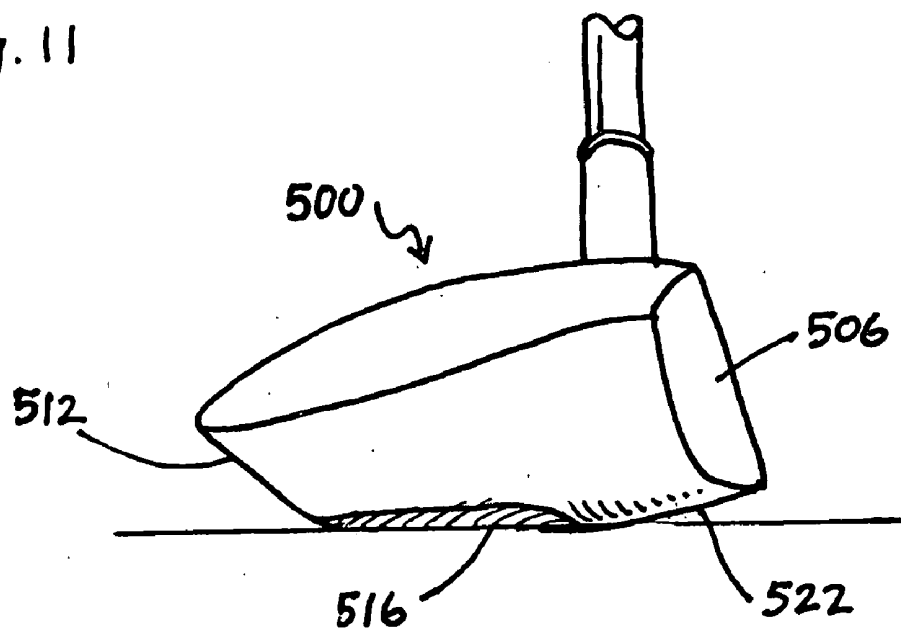
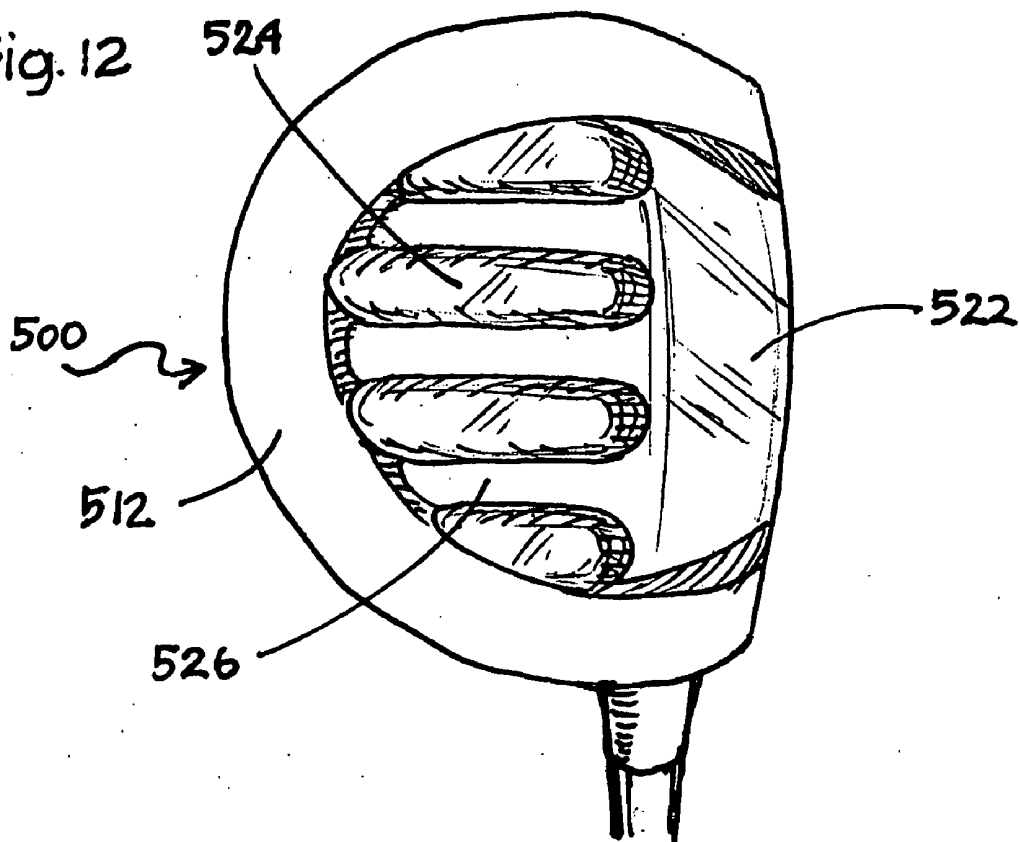


Fig. 12



## SOLE CONFIGURATION FOR METAL WOOD GOLF CLUB

### CROSS REFERENCE TO RELATED APPLICATION

[0001] This application is a continuation-in-part of U.S. patent application Ser. No. 11/264,390, filed Nov. 2, 2005, entitled "SOLE CONFIGURATION FOR METAL WOOD GOLF CLUB", which is currently pending.

### BACKGROUND OF THE INVENTION

[0002] The present invention relates to golf clubs and in particular to wood or metal wood type golf club heads having an improved sole configuration.

[0003] The way the sole of a golf club impacts the ground surface during the execution of a golf shot often determines the ball flight and the overall results of the shot. When the impact of the golf club on the ground surface creates a divot, mis-hits often occur. The leading edge of a golf club head is the edge at the interface of the bottom sole and lower portion of the ball striking face. It is well known in order to prevent the leading edge from digging into the ground at impact with a golf ball, the bottom sole configuration is formed with a downwardly extending, angular surface toward the rear edge of the club head that raises the leading edge above the ground. This is known in the art as the bounce of the club head, the bounce angle being the angle of the bottom sole relative to the horizontal when the club head is in a normal address position prior to the execution of a golf swing. Therefore, golf clubs with different bounce characteristics will react differently with the ground surface as the club head impacts with the ground during a golf shot.

[0004] Typically, a golf club with a higher bounce angle is considered to have more bounce. Typical bounce angles vary between 6 and 12 degrees. However, the effective bounce of a club head may also vary by changing the overall length of the bounce surface that engages the ground. For example, a larger bounce angle combined with a shorter bounce surface will create the same effective bounce as a lesser bounce angle with a wider ground engaging surface, since each structure will raise the leading edge of the club head the same height above the ground support surface. Bounce is particularly useful for golf clubs that are used to hit shots out of sand bunkers to enable the club to be swung down and through the sand without digging too deeply therein.

[0005] Even when a golf ball lies on smoothly cut grass or turf, the bounce and sole configuration will affect the results of the golf shot. This is particularly true when more severe conditions are encountered, such as extremely hard or soft surfaces. For example, when a golf club impacts a hard surface, the club head will tend to bounce resulting in the golf ball being hit thin resulting in a lower golf shot. When a ground surface is soft, a golf club may embed in the ground resulting in the loss of club head speed causing the golf ball to fly short of the intended target. Prior art golf club heads have been made with bottom sole configurations to control the way a golf club head reacts with the ground for the purpose of better controlling a golf shot.

[0006] Bounce angles are well known on iron type golf club heads, particularly on sand wedges. The bounce of these wedges prevents the leading edge of the club from digging into the sand thereby allowing a golfer to hit behind the ball

and still be able to swing through the shot to extract the ball from the sand onto the green putting surface.

[0007] Wood type golf club heads are not provided with the bounce structure. Tsurumaki 2004/021852 discloses a wood type golf club head that is specifically designed to collapse when it strikes a golf ball. Tsurumaki shows a sole with a flat, angled forward section, a recessed mid-section and a rear section capable of testing on the ground. However both the structure and function of this sole configuration does not provide bounce. Rather the sole is designed to collapse change the club face angle when it strikes the ground.

### SUMMARY OF THE INVENTION

[0008] The present invention is a metal wood type golf club head of conventional design with an improved sole configuration to increase the effective bounce of the club head. The bottom sole surface is rigid and non-deformable and formed in separate sections. A first forward sole section is located directly behind the leading edge of the club head and extends partway to the rear of the club head. The forward sole section is formed of a generally flat or planar land area at an angle downward from the horizontal when the club head is in a normal address position just prior to the execution of a golf shot. This angle is the bounce angle and raises the leading edge above the ground surface. The bounce angle allows the club to hit a golf ball off of a ground surface without taking a divot. The forward section provides a non-deformable, frictional surface that impacts the ground as a golf ball is hit with the club head. Because the sole is rigid, the bounce angle of the forward section prevents the club head from digging into the turf or ground and actually causes the club head to bounce. The bottom sole includes at least a second section behind the forward sole bounce section. The second section extends upwardly and inwardly and recesses into the club head body so it is raised above the ground surface with the club head at the address position. There is less friction on the second section surface since it is raised relative to the ground as a golf ball is hit by the club head. The raised second section preferably has an aerodynamic or airfoil shape that traps air between the bottom sole and ground creating lift and increasing club head speed.

[0009] Another feature of the sole structure is increased mass low on the club head because of the increased surface area and thickness of the metal wood shell in the lower areas. The increased thickness adds to the rigidity of the sole structure. This produces a higher trajectory ball flight for a given loft angle of the clubface. This, in turn, allows for a lower loft angle for a given ball flight resulting in increased distance for a given swing force. Because of this combination of bounce, loft angle and lower weight, lower lofted clubs, such as drivers, may be used in the fairway resulting in longer golf shots for a given swing force.

[0010] In various embodiments, the club head may be provided with a rear edge of the bottom sole that rests the club head on the ground for increased stability. The club head may have a flat mid section to stabilize the club at address. Similarly the bottom sole of the club head may have a forward or bounce section of various sizes and bounce angles.

[0011] The present invention is particularly adaptable for metal wood type golf clubs and in particular to fairway woods. The invention is also adapted for driver type golf clubs and allows drivers to hit a golf ball off closely cut fairway grasses without taking a divot.

[0012] Among the objects of the present invention is the provision of a metal wood golf club head with an improved, rigid bottom sole configuration having a reduced frictional surface.

[0013] Another object of the present invention is the provision of a metal wood having an improved sole configuration to facilitate hitting a golf ball from a fairway grass surface.

[0014] Another object of the present invention is the provision of a metal wood golf club head with an improved bottom sole configuration with a bounce angle at the leading edge.

[0015] Still another object of the present invention is the provision of a metal wood golf club head with an improved bottom sole configuration having an aerodynamic lower surface.

[0016] Yet another object of the present invention is the provision of a metal wood golf club head with an improved bottom sole configuration allowing a driver lofted club to be used from the fairway grass.

[0017] Another object of the present invention is the provision of a metal wood type golf club that can be hit off of a ground surface without taking a divot.

[0018] These and other objects will become apparent with reference to the following specification and accompanying drawings.

#### BRIEF DESCRIPTION OF THE DRAWINGS

[0019] FIG. 1 is a toe side elevational view of a metal wood type golf club head in accordance with the present invention.

[0020] FIG. 2 is a bottom view thereof

[0021] FIG. 3 is a front elevational view thereof FIG. 4 is a top plan view thereof.

[0022] FIG. 5 is a sectional view taken along line 5-5 of FIG. 4.

[0023] FIG. 6 is a view of three sizes of metal wood golf clubs of the present invention.

[0024] FIG. 7 is a toe side elevational view of another embodiment of a metal wood golf club head in accordance with the present invention.

[0025] FIG. 8 is a bottom view of the club head of FIG. 7.

[0026] FIG. 9 is a toe side elevational view of another embodiment of a metal wood golf club head in accordance with the present invention.

[0027] FIG. 10 is a bottom view of the club head of FIG. 9.

[0028] FIG. 11 is a toe side elevational view of another embodiment of a metal wood golf club head in accordance with the present invention.

[0029] FIG. 12 is a bottom view of the club head of FIG. 11.

#### DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0030] Detailed embodiments of the present invention are disclosed herein. It should be understood that the disclosed embodiments are merely exemplary of the invention, which may be embodied in various forms. Therefore the details disclosed are not to be interpreted as limiting, but merely form a basis for the claims and as a basis for teaching one of ordinary skill in the art how to make and/or use the invention.

[0031] Referring to the drawings, FIGS. 1 to 5 disclose a metal wood golf club head 100 of the present invention formed with a body portion 102 made of a hard metal material, forming a metal shell 104. The club head 100 includes a ball striking face 106, heel 108, toe 110, rear face 112, top

crown 114, and bottom sole 116. The club head 100 is preferably formed with a hosel 118 connected to a conventional shaft 120 of any suitable length and handle or grip (not shown) on the upper end thereof.

[0032] The bottom sole 116 is formed in separate sections of a rigid and non-deformable metal material. A first forward sole section 122 is located directly behind the leading edge 124 of the club head 100 and extends partway to the rear face 112 of the club head 100. The forward sole section 122 is formed of a flat or planar land area at an angle downward from the horizontal when the club head 100 is in a normal address position just prior to the execution of a golf shot. This angle is the bounce angle and raises the leading edge 124 above the ground surface. The bounce angle extends from the leading edge 124 to the rear edge 125 of the forward sole section 122. The bounce angle may be as little as three degrees and as much as 12-15 degrees depending upon the overall front to rear width of the forward sole bounce section 122, the loft and size of the club head 100. The forward section 122 provides a frictional surface that impacts the ground when a golf ball is struck by the club head 100. Because the forward section 122 of the sole 116 is rigid and non-deformable, the bounce angle of the forward section 122 prevents the leading edge 124 of the club head 100 from digging into the turf or ground surface and actually causes the club head 100 to bounce slightly, thereby maintaining the club head on plane without interference with the ground.

[0033] The bottom sole 116 includes a mid-section 126 behind or rearward of the forward sole bounce section 122. The mid-section 126 extends upwardly and inwardly and recesses into the club head body 102 to the extent that it is raised above the ground surface with the club head 100 at the address position. The bottom sole 116 preferably may be provided with a rear edge 128 having at least a portion that rests the club head 100 on the ground for increased stability. Raising the mid-section 126 above the ground provides less friction on the surface of the mid-section 126 since it is raised higher than the forward sole bounce section 122 that, in turn, reduces the overall friction across the bottom sole surface 116 of the club head 100 as the club head 100 is swung. The raised mid-section 126 preferably has an aerodynamic or airfoil shape that traps air between the bottom sole 116 and ground creating lift and increasing club head speed.

[0034] As seen in the sectional view of FIG. 5, the thickness of the bottom sole 116 of the club head 100 is greater than the upper portions of the club head 100 resulting in increased weight at the lower areas of the club head 100, that, in turn, facilitates hitting a golf ball higher into the air. The bounce configuration of the forward sole section 122 allows a golfer to hit a golf ball from a flat surface, such as closely mown fairway grass or even a dirt surface, without the leading edge 124 of the club head 100 digging into the surface. Therefore a golfer may hit a driver type club, typically with a face loft angle between 8 to 12 degrees, from a flat surface without a tee. This enables a shot to be hit from a fairway lie where greater distance is needed in order to reach the green and reduces the likelihood of taking a divot that would reduce club head speed and promote a miss hit.

[0035] In the present embodiment, the club head 100 includes a third rear section 128 on the bottom sole 116 that touches the ground to stabilize the club head 100.

[0036] FIG. 6 illustrates a series of golf club heads **200**, **210** and **220**, representing a driver, three wood and five wood respectively. It will be appreciated that the structure of the present invention is equally applicable to any size, shape and loft metal wood. The above illustrations are illustrative only and are deemed limiting to specific shapes, sizes and lofts.

[0037] FIGS. 7 and 8 illustrate a golf club head **300** that is essentially the same as the club head of FIGS. 1 to 5 except for the bottom sole **316**. In this embodiment, a forward section **322** of the bottom sole **316** extends approximately half way between the leading edge **324** and the rear face **312**. The forward section **322** includes a bounce angle of a lesser degree than the bounce angle of the previous embodiment, the extended length of the forward section being sufficient to raise the ball striking face **306** of the club head **300** above the ground surface. A rear section **326** of the bottom sole **316** extends upwardly into the club head **300** so as to be raised above the ground surface to reduce friction and provide an aerodynamic airflow surface.

[0038] FIGS. 9 and 10 illustrate a golf club head **400** that is essentially the same as the club head of FIGS. 1 to 5 except for the bottom sole **416**. In this embodiment, the bottom sole **416** includes a forward section **422** that includes a bounce angle sufficient to raise the ball striking face **406** of the club head **400** above the ground surface. A center portion **426** of the bottom sole **416** is flat and is used to support the club head on the grass or other ground support surface prior to the execution of a golf shot. A rear section **428** of the bottom sole **416** extends upwardly into the club head **400** and is raised above the ground surface to reduce friction and provide an aerodynamic flow surface.

[0039] FIGS. 11 and 12 illustrate still another golf club head **500** that is also essentially the same as the club head of FIG. 1 to 5 except for the bottom sole **516**. In this embodiment, the bottom sole **516** includes a forward section **522** with a bounce angle as described herein above. A plurality of slots or channels **524** are provided between the forward section **522** and the rear face **512**. The slots **524** are oriented in a front to rear direction on the bottom sole **516**. The slots reduce friction and provide an aerodynamic flow surface for the club head **500** as it is swung during the execution of a golf shot.

[0040] While various embodiments have been shown and described, it will be understood there is no intent to limit the invention by such disclosure. All modifications and alternate constructions of woods and metal woods having a bottom sole with a bounce section are included within the spirit and scope of the invention as defined by the following claims.

1. A metal wood type golf club head including a club head body and means for attachment to a golf shaft, said club head body including a frontal ball striking face having a center of percussion thereon, a rear face, a heel, toe, and top crown, wherein the improvement comprises:

a bottom sole characterized as being rigid and non-deformable;

said bottom sole having a forward bounce angle section and at least one additional rear section;

said bottom sole said forward section being defined by a generally flat friction surface with a bounce angle extending downwardly from said frontal ball striking face to a rear edge of said forward bounce angle section; and,

said rear section being raised upwardly relative to said forward section and recessed into said club head body providing an area of reduced friction relative to said forward bounce angle section.

2. The metal wood type golf club head of claim 1, wherein said rear section of said bottom sole is formed in two parts between said forward section and said rear face; a mid section and a rear ground engaging section.

3. The metal wood type golf club head of claim 2, wherein said mid section is recessed into said club head body.

4. The metal wood type golf club head of claim 2, wherein said rear section includes at least a portion designed to rest on a ground surface.

5. The metal wood type golf club head of claim 2, wherein said mid section is flat to provide a support area for said club head that rests on a ground surface.

6. The metal wood type golf club head of claim 5, wherein said rear section is recessed into said club head body.

7. The metal wood type golf club head of claim 1, wherein said forward section with the bounce angle formed thereon extends approximately midway between said frontal ball striking face and said rear face.

8. The metal wood type golf club head of claim 7, wherein said rear section is recessed upwardly into said club head body.

9. The metal wood type golf club head of claim 1, wherein said bounce angle is formed in a range of three to 15 degrees.

10. The metal wood golf club head of claim 1, wherein said rear section includes at least one slot extending in a front to rear direction said rear face and said bottom sole.

11. The metal wood golf club head of claim 10 being further defined by a plurality of generally parallel slots extending in a front to rear direction on said bottom sole.

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