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(54) **Improved golf club driver and method for making**

(57) An oversized metal wood golf club head having a ball striking face 28, a bottom sole portion 14 and a upper portion or crown 12. The club head is molded or formed in substantially one piece, the crown having an opening which is sealed by securing a crown plate 22 in the opening. The metal wood has a nonmetallic insert 19 secured to a cavity 18 formed in the ball striking face and reinforced by ribs 34 on the interior of the face and the walls of a cavity formed in the club striking face. The insert is secured in the cavity by adhesion which is enhanced by channels 48 formed in the insert cavity and hollow columns formed in the insert. The channels may be of curved or square cross section.

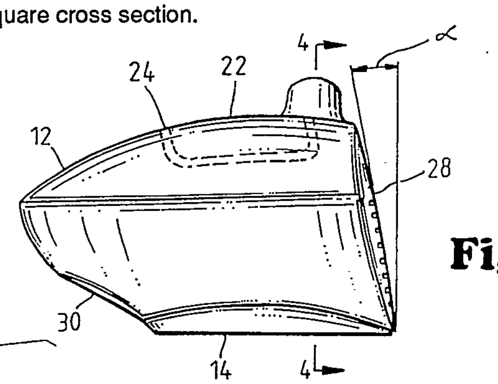
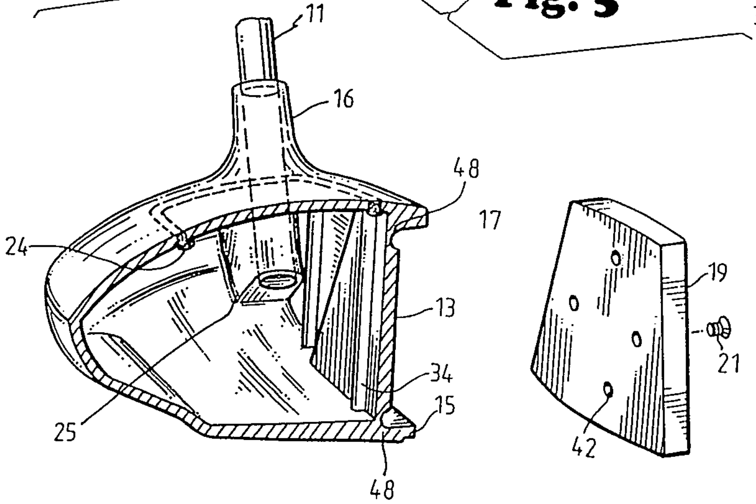


Fig. 2

Fig. 5



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At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

Fig. 1A

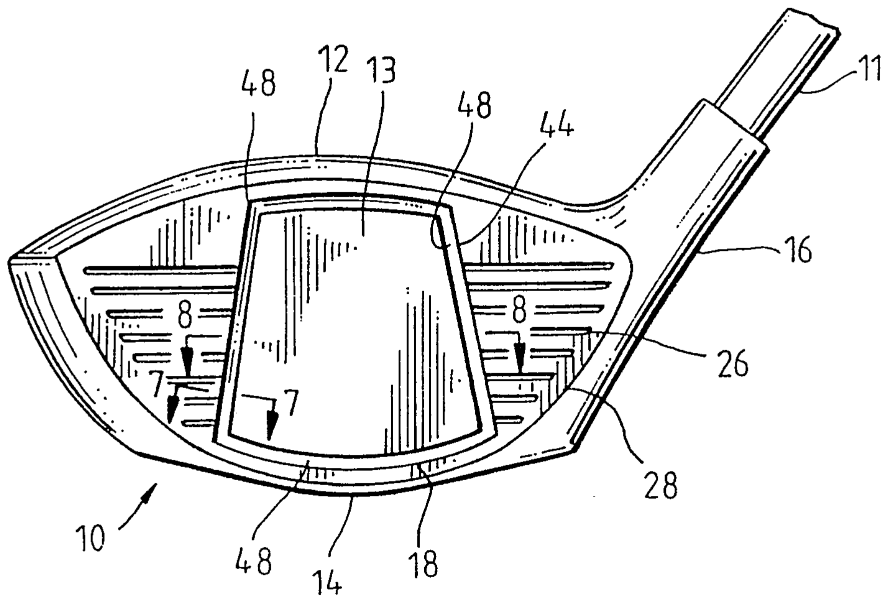
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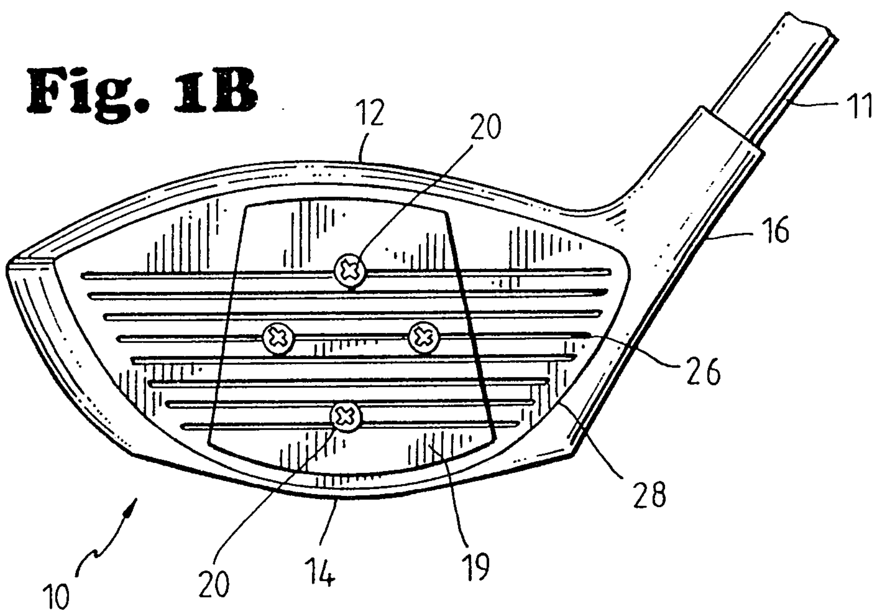
Fig. 1B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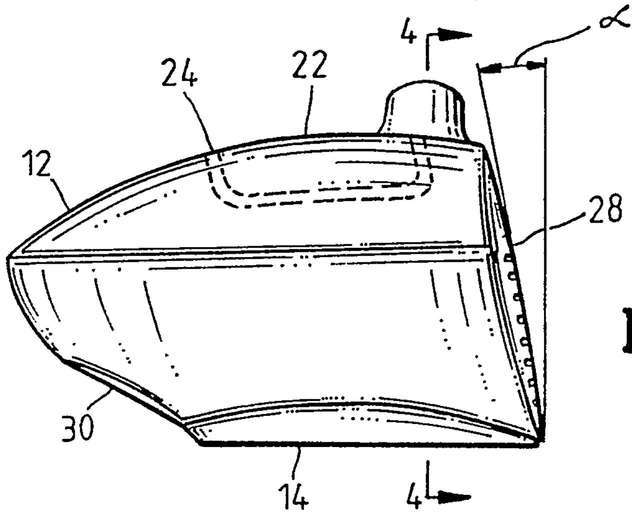
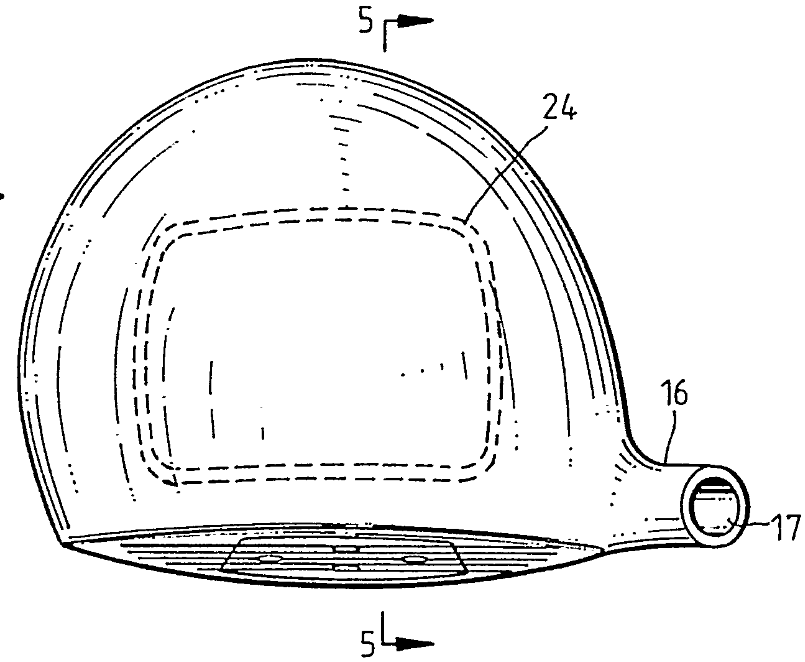


Fig. 2

Fig. 3A



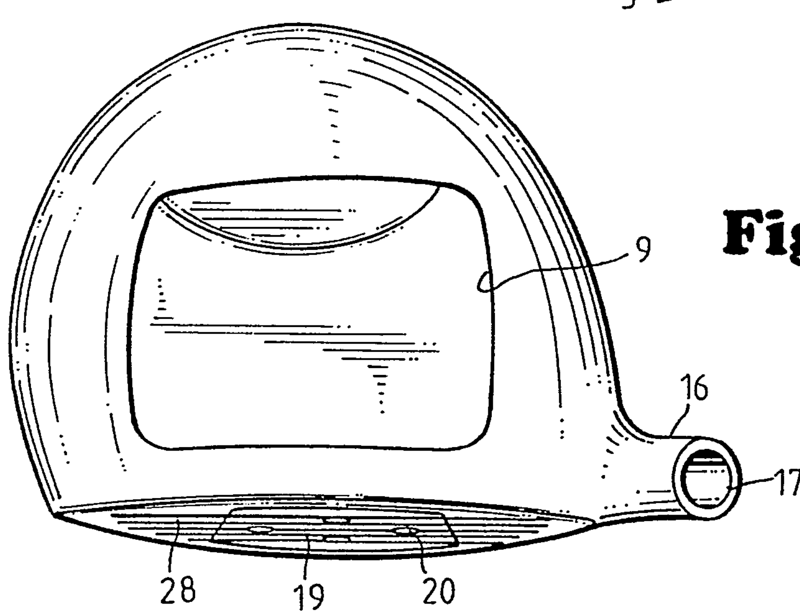


Fig. 3B

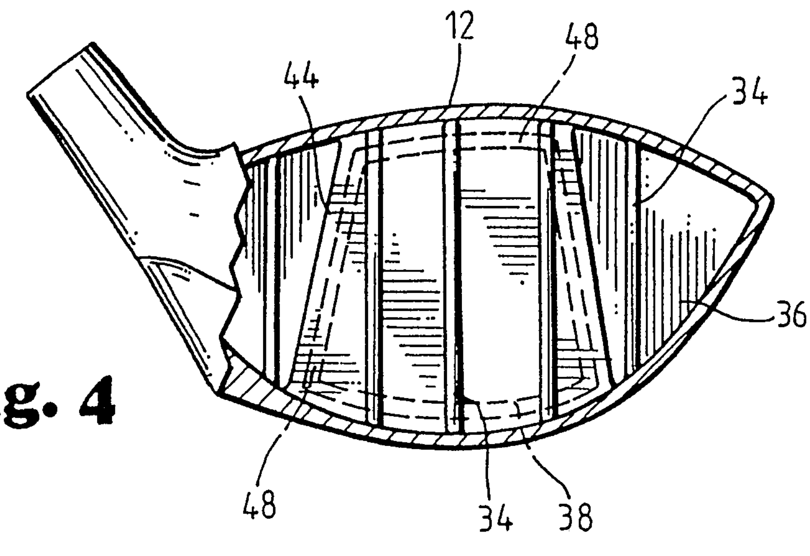


Fig. 4

Fig. 5

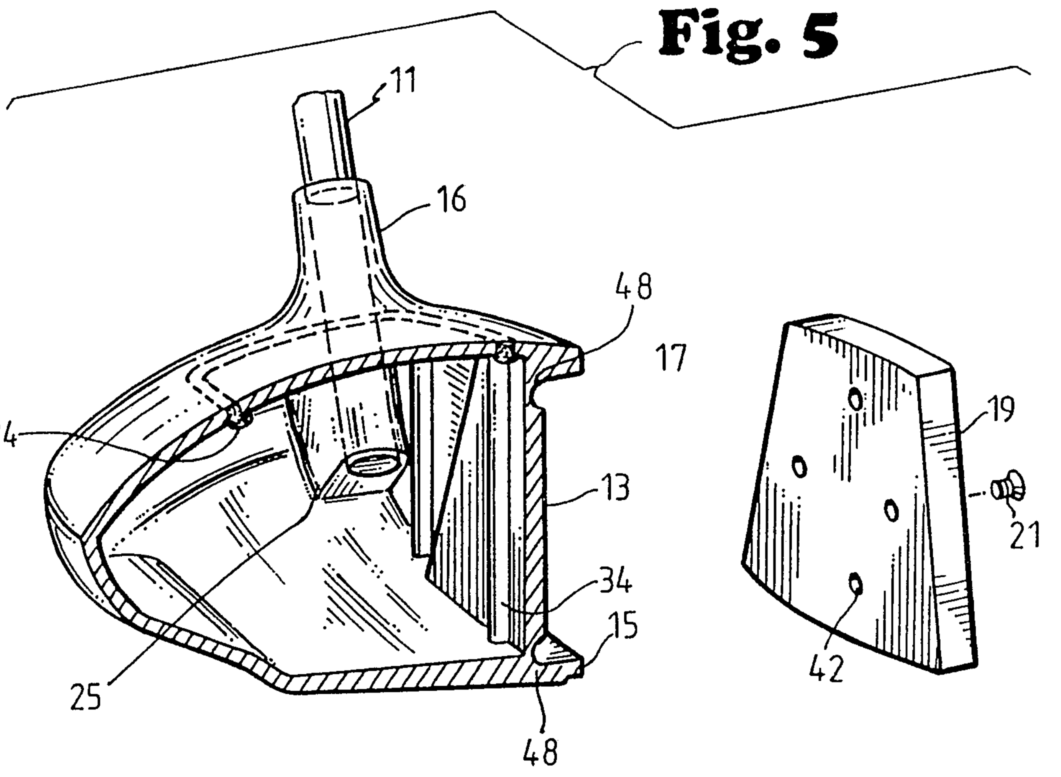
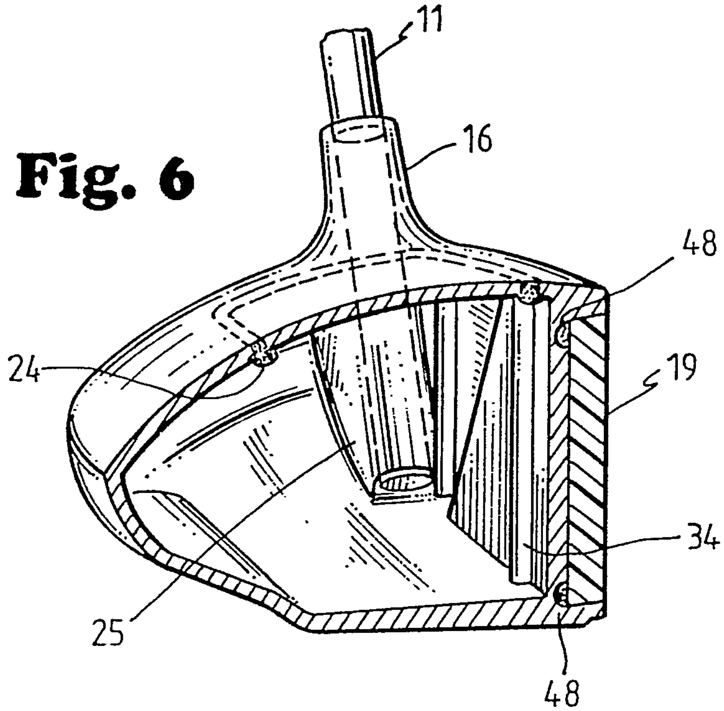


Fig. 6



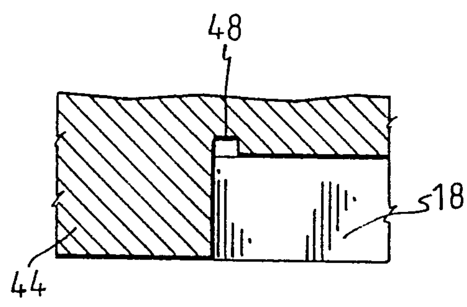


Fig. 7A

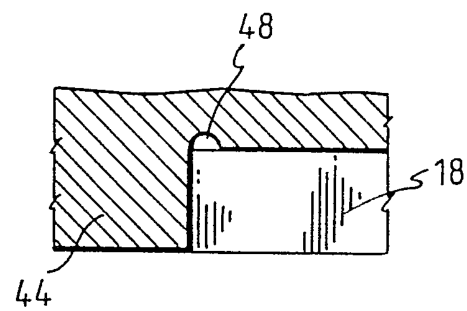


Fig. 7B

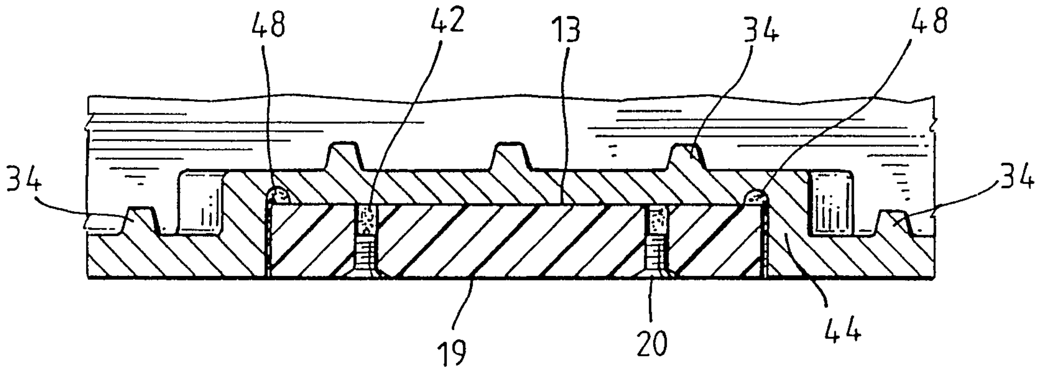


Fig. 8

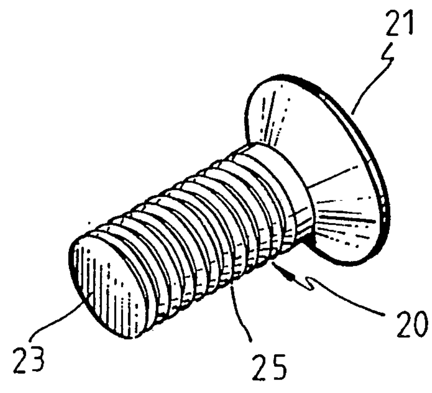


Fig. 9

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IMPROVED GOLF CLUB DRIVER AND METHOD FOR MAKING

This invention relates to the field of golf clubs. More specifically, it relates to a metal wood club with an improved club head.

The desire to improve one's golf game and increasing the player's competitive advantage have led to many improvements in the design of golf clubs over the years. A relatively recent development is that of the "metal wood". Traditionally, woods (clubs usually used for tee shots and longer fairway shots) have had heads made of hard wood, the preferred wood being persimmon. The tendency of wood to warp or split, however, coupled with increasing cost of material and labor, has led to the development of metal heads for the woods. Such metal woods typically comprise a hollow cast metal shell filled with a synthetic plastic foam material.

The metal wood has achieved a large measure of success in terms of acceptance in use by skilled golfers. Nevertheless, many golfers still prefer traditional, "wooden" woods, because of what they consider to be non-optimal weight distribution in metal wood heads. Specifically, a very important element of the club head design is the concentration of as much of the mass of the head as possible into the face of the club head in the portion of the head behind the face. This puts the mass of the head where it effectively contributes to energy imparted to the ball, rather than being merely "dead weight" that limits the velocity of the club head when it is swung. In other words, such a distribution of the mass in the club head increases the effective mass of the head, without increasing this total mass. Maximizing the effective mass of the head without significantly increasing its total mass results in a little or no loss in the achievable club head velocity. The result is greater shot distance, since the energy imparted to the ball by the club is proportional to the effective mass of the club head times the square of the club head velocity. Preferably the mass in the club head is distributed around the perimeter of the club face. Perimeter weighting gives the club a larger sweet spot. Thus the perimeter weighed club is more forgiving. That is, a golfer need not strike the ball in the center of the club face to project the ball in a straight path. The enlarged sweet spot of a perimeter weighted club face allows the golfer a larger margin of error when striking the ball. A hit off-center still achieves a straight shot.

Recently, metal woods have become larger and oversized metal woods are now very popular. It is desirable to maximize the size of the oversize club head without increasing the weight of the club head to achieve maximum distance and velocity. In producing an larger oversized metal club head, therefore, the walls of the club head are thinner than a normal size club to avoid increasing the weight of the larger club and reducing the swing velocity. The enlarged or oversized metal wood heads are therefore thinner than conventional clubs and thus more susceptible to failure by cracking or crushing.

The top of the metal club head or crown in some oversized heads, is so thin that a golfer may crush or crack the metal club head by stepping on the crown. Some manufacturers of oversized clubs will not warrant against these types of failures. The metal club head is also subject to failure at the crown by cracking or crushing by allowing the crown to strike the sole of another club when inserting the oversized metal club head into the golf bag.

Another disadvantage of conventional metal woods and oversized metal woods is crystallization of the head packing material causing the club head to rattle. The shaft penetrates the hollow metal club head and transmits vibrational energy to the packing material adjacent the shaft. This vibrational energy can crystallize the packing material. Crystallized packing material hardens and separates, causing a distracting rattle inside the club head.

Another disadvantage of conventional metal wood club heads is that they are molded or cast with an opening in the bottom or sole portion of the club head. A sole plate is welded over the opening to seal the club head. The sole plate welding seam creates a structural discontinuity at the juncture of the front edge of the sole plate and bottom edge of the face plate. This structural discontinuity or weld seam may be subject to failure as the face strikes the ball or the sole strikes the ground. The weld also increases the weight of the bottom portion or sole of the club. The increased weight and metal in the sole means that weight and less metal may be placed in the crown. The crown must, therefore, be thinner and more susceptible to the crushing or cracking by forces acting normal to the crown surface.

Another disadvantage of oversized metal wood club heads is that the ball striking face on these clubs is thinner due to the weight restriction, therefore, susceptible to structural failure by crushing or deformation when striking a ball. Increasing the mass of the club face by increasing the thickness of the face results in a rigid club face and the undesirable effect of a limiting the sweet spot. A thinner face is more flexible. Moreover, a thin club face with perimeter weighting achieves a larger sweet spot. Also there is a weight limit on the amount of metal a design can allocate to the club face without increasing the overall weight of the club head and reducing the club head velocity.

The present invention is a "metal wood" golf club head to which a shaft is attached. More specifically, the golf club head of the present invention comprises an upper metal surface (the crown), a front ball striking surface (the face) which extends from the heel to the toe of the club head and is comprised of a metallic wall (the face wall) containing a centrally located sunken cavity (the insert cavity) into which a non-metal insert (the insert) is secured. The exterior ball-striking face of the club head is comprised of two horizontally-grooved metal surfaces (the metal face) adjacent, flush with and flanking the similarly grooved non-metallic insert. The golf club head is also comprised of a lower metal surface or sole portion comprised of three distinct surfaces or contours: (1) the front portion of the sole which extends from the lower edge of the face backwards along the sole to the convex portion of the sole, (2) the rear portion of the sole which extends forward from the rear junction of the sole and crown to its junction with the convex portion of the sole and (3) a convex surface located between the front and rear portions of the sole surface.

The hosel is located on the crown near the heel end of the club head. The golf club shaft is attached to the club head by penetrating the head through a circular opening in the center of the hosel. The hosel assembly continues into the interior of the club head to depth equal to the shaft's penetration into the club head. The hosel continuation may continue to a variable depth until it almost contacts the interior surface of the sole. Clearance between the hosel continuation and the sole is allowed to facilitate flow of packing material that is injected into the head through the hosel bore.

The continuation of the hosel assembly insulates the shaft so that it does not directly contact the packing material inside the club head. The hosel assembly thus insulates and reduces vibrational energy transmitted from the shaft to the packing material and reduces crystallization of the packing material. This helps overcome one source contributing to the problem of the distracting rattle.

The insert cavity helps to distribute the mass of the club face around the perimeter of the club face. Perimeter weighting helps develop the striking surface face with a larger sweet spot. The insert cavity is formed by walls formed in the club face wall. The walls of the insert cavity may be thicker or thinner than the club face wall. The insert cavity walls project rearwardly and perpendicular to the plane of the club face wall. These walls support the club face as well as adding mass to it. The walls thus allow for a strong club face with a reduced amount of mass or metal, thus achieving increased potential club head swing velocity.

The interior surface of the club face wall is also reinforced with vertical ribs. These ribs are formed on the interior surface of the club face wall. The ribs act to support and strengthen the club face wall. The ribs reinforce the front face allowing it to be thin and flexible yet have the structural strength of a thicker striking surface.

The invention is further characterized by a crown plate. The face, sole and crown portions of the oversize metal wood head are cast in a single piece so that there are no welding or securing seams in the sole or the club face. Instead, an opening is formed in the crown where a crown plate is installed. The seam formed by welding or securing the crown plate in the crown reinforces the crown and overcomes the problems of structural failures or crumpling of the thinner crowns found in oversize club heads that do not contain a crown seam. The welding of the crown plate into the opening in the crown of the club body results in significant strengthening of the crown and the top of the face that adjoins the crown. Moreover, the face wall also has additional strength because the crown plate weld or securing seam functions as a reinforcing rib supporting the crown and therefore top of the face that adjoins the crown.

The crown is effectively divided into three smaller sections by the crown plate seam and is therefore stronger and overall less flexible than a similar crown without a seam. The reinforced crown with a seam is less susceptible to crushing. Moreover, strengthened crown require less metal to support the crown. Metal that would otherwise be employed in thickening and strengthening the crown may be utilized in strengthening and adding mass to the club face or sole of the club head without increasing the overall weight of the club. The club head of the present invention is thus stronger than a club of the same weight, volume and material made without a crown seam.

The club face is also supported by the presence of internal ribs located on the interior surface of the club face. The support ribs are rounded in shape to enhance uniform distribution or flow of the interior packing material injected into the club head. This helps to eliminate or reduce the formation of air pockets near the interior surface of the face adjacent the ribs. Air pockets reduce the support to the face offered by the packing material. Also, the insert cavity walls serve to significantly strengthen the central striking area of the club face. The cavity walls serve to effectively strengthen and thicken the club face at the point of impact. The insert walls protrude at right angles or perpendicular to the striking surface face wall of the face and "in line" with the most probable forces that will act upon the face of the club head upon striking the golf ball. Moreover, the cavity walls also serve to reduce the length of the span between ribs or alternatively the need to increase the number of reinforcing ribs and overall weight of the club head.

The insert cavity employs an nonmetallic insert to form a smooth exterior striking surface on the face wall. In a preferred embodiment the insert is made of Cycolac or Acrylonitrile Batadiene Styrene Terpolymer ("ABS"), but may be any material. The design of the insert and the cavity itself utilize channels and columns enhance adhesion of the insert to the insert cavity surface and thus anchor the insert into the cavity and insure its retention in the face wall. The design of the cavity employs sunken or notched channels or grooves along the perimeter of the insert cavity surface at the conjunction of the insert cavity surface and the insert cavity walls. These channels act as an adhesive anchor into which liquid epoxy or cement, used to affix the insert within the cavity, may flow. These channels enhance securing the insert to the insert cavity surface.

The channels may include a small cross-hatching or irregular patterns to enhance the adhesive effects of the epoxy. The exterior surface of the cavity surface may also be of a non-smooth, roughened nature, enhancing bonding or adhesion of the epoxy to the cavity surface. The back of the insert is similarly roughened or grooved. Cavities or holes may be formed in the back of the insert to enhance bonding or adhesion of the epoxy to the insert in the cavity.

The insert itself is principally composed of non-metallic materials (other than the pins as hereinafter described) and is formed and inserted separately into the insert cavity after completion of construction of the exterior metal portions of the club head and after affixing the crown plate to the body of the club head. The insert is retained in the insert cavity through the application of a liquid epoxy or other bonding agent or substance on the surfaces of the insert, insert cavity surface and insert cavity walls.

The insert includes four (4) hollow metallic pins (the "face pins"), which are knurled, grooved or otherwise constructed along the exterior surfaces of their length so as to provide better bonding and attachment between the exterior of such pins and the insert. The pins are placed at right angles to, and flush with, the exterior surface of the insert and extend from the exterior surface of the front face of the insert, through the insert, to end flush with and recessed from the proposed interior or back surface of the insert. The pins are inserted into the insert at the time that the insert is constructed so that the pins form an integral part of the insert after its construction. The pins are closed at that end (the "head") appearing flush with the exterior or front face of the insert and are hollow or open at the other end of the pins so that, at the time of installing the insert in the insert cavity, epoxy in the cavity may flow into the hollow pins, thus better securing the insert to the insert cavity.

The Pins are positioned in the insert in a spaced vertical diamond pattern centrally located on the face of the insert.

After completion of construction of the club head, the closed end of each face pin is visible from the exterior surface of the insert or face and when so viewed, appears as a smooth rivet head or conventional attachment screw which has been counter-sunk flush to the exterior face surface of the insert.

These hollow pins form open ended air columns that permit the epoxy or bonding agent to flow into these interior of the open ended pin holes or columns. This results in better anchoring of the insert to the insert cavity surface as epoxy flows into the hollow pins. The amount of air left in the open-ended hollow pin column may be controlled by the amount of epoxy placed in the cavity which determines the amount of epoxy flowing into the pin column. The amount of air left in the pin hole column and pin affects the sound and feel of the club. The amount of air in the columns also changes the flexibility of the club face and its feel and effect on the ball.

The face wall, the sole and a posterior portion of the crown are cast and formed ("single unit construction") as one piece (the "club head body"). The casting process employed results in the completion of the construction of all perimeter metal surfaces of the club head with the exception of an opening in the crown which may commence at and along the upper edge of the metal face wall and proceeds backwards to the anterior edge of the partially completed crown. The metal exterior of the club head body is completed and the aforementioned opening is "closed in" by welding a separately cast metal piece (the "crown plate") to the club head body along the top edge of the metal face wall and the edges of the incomplete crown.

The hosel is formed as an integral part of the body wall and extends through the wall of the body as an open-ended metal cylinder into the interior body cavity (the "hosel extension").

Figure 1 is a front elevation view of a metal wood golf club in accordance with a preferred embodiment of the present invention, showing the head and lower portion of the shaft.

Figure 2 is a front elevation view of the golf club shown in Figure 1.

Figure 3 is a top view of the golf club shown in Figure 1.

Figure 4 is a plan view of the interior surface of the front face of the golf club showing the support ribs and cavity walls.

Figure 5 is a front cross-sectional view taken along line 5-5 in Figure 3 showing the extended hosel penetrating the interior of the club head.

Figure 6 is a front cross-sectional view taken along line 5-5 in Figure 3 showing the extended hosel penetrating the interior of the club head with the insert placed in the insert cavity.

Figure 7A is a cross-sectional view of the insert cavity showing a square channel.

Figure 7B is a cross-sectional view of the insert cavity showing a rounded channel.

Figure 8 is a cross-sectional view of the club head face showing the insert secured in the insert cavity.

Figure 9 is a detailed view of a hollow face pin.

Referring to the drawings, a golf club head **10** in accordance with a preferred embodiment of the present is shown in Figure 1. Figure 1A shows the golf club head **10** with a shaft **11** attached to the club head **10** by inserting the shaft **11** into hosel **16** so that the shaft penetrates the interior of the club head **10**. The club head **10** as shown in Figure 1 comprises a hollow metal shell which is filled with a foam or packing crystals. In a preferred embodiment the metal head is filled with expandable crystals which may be weighted precisely to account for variances in the overall weight of the molded head piece **10**. This technique reduces the number of heads that must be rejected due to weight variances. In a preferred embodiment the club head weighs between 195 and 205 grams.

The club head **10** is comprised of a crown **12**, a sole **14** and a club face **28**. The club face **28** is scored, etched or molded to form horizontal face grooves **26**. The club face also includes an insert cavity **18**. The rear exterior surface of the insert cavity **18** contains channels **48** at the perimeter of the straight or semi-vertical edges of the insert cavity **18** walls.

Referring now to Figure 1B an insert **19** is secured to the insert **18** with an epoxy, cement or some other adhesive. The insert **19** may also be secured within insert cavity **18** by pressure or a molding process. Face pins **20** are arranged in a diamond pattern or other pattern in the insert and can be seen on the exterior face of the insert **18**. The face pins **20** are hollow so that epoxy or adhesive may flow into the hollow interior of the face pins **20** through face pin holes **42** shown in Figure 5. The combination of channels **48** and face pin holes **42** and hollow face pins **20** allows conventional epoxy or adhesive to flow into the empty spaces and enhance adhesion of the epoxy or adhesive to the insert cavity surface **13** and to the insert **19**. Enhanced adhesion helps secure the insert **19** to the insert cavity surface 13 exterior.

Referring now to Figure 2, in a preferred embodiment the club head **10** is cast in a single piece forming a club face **28**, a sole **14**, a crown **12** with a opening 9 formed in the crown. This opening is filled by a crown plate **22**. The crown plate **22** is secured to crown **12** by welding, adhesion, pressure, molding or some other process. In a preferred embodiment the crown plate **22** is welded to crown **12** to fill the opening **9** in the crown **12**. This welding or securing by other means forms reinforcing a seam **24** in the crown at the juncture of the crown plate **22** with the crown **12**. In a preferred embodiment the opening **9** formed in the crown **12** may have an angle or lip formed at its edge so that the crown plate **22** fits into the opening and engages the angle or lip of the opening **9** in a complimentary fashion to support the crown plate **22**. The crown plate **22** thus engages the crown opening **11** so that the crown plate **22** does not fall into interior of the club head. The crown plate **22** then stays in place to facilitate welding or securing of the crown plate **22** to the crown opening **9** in the crown **12**. A top view of the crown plate **22** secured in the crown **12** is shown in Figure 3A. The double dashed line 24 in Figure 3A shows the location of the seam. A top view of the crown **12** and opening **9** in the crown is shown in Figure 3B.

The rear portion of the sole **14** at the end opposite the face adjoins a concave surface **30**. This concave aerodynamic surface **30** reduces the turbulence generated by the club head **10** as it passes through the air during the golf swing. The concave surface **30** reduces the aerodynamic drag of the club head **10** as it passes through the air and also reduces the amount of lift generated by air passing swiftly over the convex crown **12** of the club head. The reduction of lift and drag helps maintain the loft angle of the club head shown by the angle alpha in Figure 2. The aerodynamic forces exerted on the club head can cause the club head to deflect. This deflection increases the deflection angle alpha and increases the loft of the club. This increase is an undesirable as it reduces the distance the ball travels because energy is wasted by projecting the ball in a higher trajectory than desired.

In a preferred embodiment a crown plate **22** is located centrally in the crown **12** as shown in Figure 3B. However, the location of the opening **9** in the crown **12** and the location of the crown plate **22** that fills the opening may vary. The location and shape of the opening **9** and crown plate **22** may be adjusted to any configuration or location on the crown **12**.

Referring to Figure 4, the support ribs **34** are shown. Support ribs **34** are formed on the interior surface **36** of the club face **28**. These ribs may be either square, triangular, rounded or any other shape. In a preferred embodiment the ribs are triangular in shape with a rounded edge at the apex of the triangular shape with its base adjacent the interior face wall surface to enhance the flow of packing material while increasing the strength and reducing the with the minimum amount of metal or mass. The walls **44** of the insert cavity are shown in Figure 4. The walls **44** of the insert cavity **18** form a sunken box on the club face **28** to hold the insert **19**. In a preferred embodiment the walls **44** are a uniform thickness on all four sides to enhance quality control during molding process and heat treatment. The thickness of the insert cavity walls also affects the sound and feel of the club when striking a golf ball with the insert **19**. The insert cavity walls also serve to support and strengthen the club face.

In a preferred embodiment the club head shell is formed of a titanium-aluminum alloy preferably 92% aluminum and 8% titanium. This alloy composition may vary. The molded club head is heat treated to enhance the sound and feel of the club when striking a golf ball. Heat also hardens the club head. The ball striking surface face wall [exclusive of the support ribs **34**] and each of the insert cavity walls are generally of uniform thickness. Uniform thickness enhances the sound and feel of the club head when striking a ball. Heat treatment also affects the sound and feel of the golf club when the striking the golf ball. Heat treating gives club a lower, more natural and pleasing sound and feel when striking a golf ball. The club feels and sounds more like a wooden golf club and less like a metal golf club.

In a preferred embodiment the insert is made of Cycolac or ABS resin. These materials are commonly known and used for inserts in the golf industry. Cycolac inserts are available from cell parts. ABS resin is available from scotch weld. Cycolac is the material traditionally used as a face insert in persimmon or wooden golf clubs. Cycolac inserts are available from Cell Parts Mfg. Co., 5220 N. Rose Ave., Rosemont, Il 60018, telephone (708) 678-2590. ABS is available from Scotch Weld, General Electric Plastics Division, 9709 Burleson, Dallas, TX 75243. Therefore, in the present invention the golfer has a striking surface or insert similar to the traditional wooden club with the advantages of the durable oversized head and an enlarged sweet spot offered by a metallic club. The adhesion enhancing channels **48** are shown at the sides of the insert cavity **18**.

Referring to Figure 5, the club head is shown in cross-section. The crown seam **24** is shown protruding from the interior surface of the crown **12**. The hosel **16** is shown in Figure 5. The shaft **11** penetrates the hosel **16** through shaft bore **17**. The hosel **16** extends into the club head to form hosel continuation **25**. The hosel **16** continues through the heel end of the crown **12** and penetrates to a depth equal to the shaft penetration within the interior of the club head. The hosel continuation **25** separates and insulates the shaft from the packing material inside the club head **10**. The hosel continuation **25** reduces vibrational energy from being transmitted from the club shaft to the packing material inside the club. The hosel continuation **25** also prevents the epoxy, glue or cement used to secure the club shaft into the hosel bore **17** from leaking into the club head and adversely reacting with the packing material inside the club head. Vibrational energy or epoxy leaking into the packing material may cause crystallization of the packing material. These crystallized components of the packing material may separate and cause a distracting rattle from inside the club head.

The insert cavity **18** walls form a sunken box on the club face **28**. The front or face edge of the crown **12** forms the top support wall **17** for the insert cavity **18**. The front or face edge of the sole forms the lower support wall **15** for the insert cavity **18**. In a preferred embodiment the upper wall **17** and the lower wall **15** and the insert cavity surface **13** of the insert cavity **18** are molded to a uniform thickness. The insert **19** fits within the insert cavity **18**. In a preferred embodiment the hollow face pins **20** are molded into the insert **19**. Alternatively, the hollow face pins **20** may fit within face pin holes **42**. The face pins **20** are hollow so that an open ended cavity opening at the back of the insert formed by the internal hollow portion of the face pin **20** as shown in Figure 5. The head of the pin is closed. In a preferred embodiment, the face pins extend substantially the entire width of the insert. The pin may be recessed slightly so that the pin does not contact the insert cavity face surface. The pin heads may resemble a screw head or a smooth rivet or other pattern. As shown in Figure 9, the face pins **20** have a closed end or head **21** and an open end **23** which is hollow. The sides **25** of the pin may be knurled or grooved to enhance adhesion. The epoxy, glue or cement placed in the insert cavity **18** and into the hollow portion of face pin **20**. In an alternative embodiment having pin holes **42** the epoxy, glue or cement flows into the pin holes **42** and into the hollow face pins **20**. In still another alternative embodiment the face pins may be solid and may be variable length so that they are long enough to penetrate substantially the entire width of the insert, or may be shorter so that they are recessed away from the insert's rear surface and the insert cavity surface. This design enhances the flow of the epoxy into the insert **19** and into the hollow face pins **20** thus enhancing the adhesion of the insert to the insert cavity. The epoxy, glue or cement also flows into the channels **48** formed at the perimeter of the side walls **44** of the insert cavity **18**. In a preferred embodiment, the insert cavity side walls **44** project perpendicularly from the club face wall **28**. These side insert support walls **44** form a perpendicular support for the insert **19** and serve to support the face wall **28** when striking a bell. These insert cavity walls are a uniform thickness in a preferred embodiment. The side walls **44** are the same thickness as the insert cavity surface **13** of the insert cavity **18**. The uniform thickness supports the insert evenly, enhances the sound and feel of the club head when striking a golf ball and facilitates heat treatment hardening of the club head by reducing the likelihood of cracking or deformation due to uneven contraction or expansion during the heat treatment process.

Referring now to Figure 6, the insert **19** is secured to insert cavity **18**. The hosel extension **25** is shown covering substantially all of the shaft **11** portion that penetrates the interior of the club head **10**.

Referring to Figure 7**A**, a cross-sectional view of the insert cavity **18** in a preferred embodiment is shown with a square channel **48** formed at the perimeter or edge of the insert cavity **18** exterior face. The channels may be any shape but are round in a preferred embodiment. Figure 7B shows a rounded channel **48** formed at the perimeter of the insert cavity **18**.

Referring now to Figure 8, a portion of the club face **28** is shown in cross section with the insert **19** secured to the insert cavity **18**. In a preferred embodiment the hollow face pins penetrate substantially the entire thickness of the insert and thus permitting the interior of the pins to be filled or partially filled with epoxy. The face pins **20** may be any length however and may be shorter than the width of the insert. An alternative embodiment may utilize pin holes found in the insert and pins shorter than the thickness of the insert. In such an alternative embodiment the pins are shorter than the width of the insert and the pin holes **42** and the hollow pins **20** will receive excess epoxy or glue as the epoxy or glue is displaced by the insert and flows from the cavity. The hollow face pins **20** and pin holes **42** are filled with epoxy. The channels **48** are also shown filled with epoxy. The amount of epoxy filling the pin holes **42** and hollow pins **20** and thus the amount of air left in the face pins **20** and pin holes **42** may be varied and controlled by the amount of epoxy or adhesive placed in the insert cavity **18**. If the hollow face pins **20** and pin holes **42** are partially filled with epoxy or adhesive, this will affect the sound and feel of the club as it hits a golf club. The amount of epoxy or adhesive in these cavities can be controlled by the amount of epoxy inserted into the insert cavity. The amount of epoxy in the channels **48** also affects the sound and feel of the club when striking a golf ball. The amount of the epoxy in the channels can be controlled by the amount of epoxy placed in the insert cavity **18**. This amount of air left in the channels **48** face pins **20** and pin holes **42** also affects the flexibility of the insert and thus the sweet spot on the club face.

In a preferred embodiment the weight of the head is 195-205 grams. The distance from the face to the back of the head or the head width is 92.5 millimeters, the radius of the face is 11", the volume of the head is 275 cubic centimeters, the height of the face is 49.5 millimeters, the length of the face is 95 millimeters, the cavity height is 44.5 millimeters, the cavity length at the top is 30 millimeters, and the cavity length at the bottom 47 millimeters. The angle formed by the semi-vertical cavity walls is 12° off vertical. The trace lines horizontally marked in the face of the club are the following dimensions; the top trace line length is 53 millimeters and the bottom trace line length is 33 millimeters. The distance between the top and the bottom trace line is 36 millimeters. The total number of trace lines or grooves in the face is nine. The depth of the cavity is 6 millimeters and the wall thickness of the face is 4 millimeters. The radius of curvature for the concave portion at the rear of the sole is 2" radius. The loft angle of the face of the club or the angle the face makes with a vertical line is 10.5°, the height of the crown or head is 52.5 millimeters, the loft angle is 10.5°, the head width is 92 millimeters, the sole width is 53 millimeters, the vertical trace radius is 12" radius.

The foregoing description is that of a preferred embodiment. It will be appreciated that modifications of the disclosed embodiment will suggest themselves to one skilled in the pertinent arts. Each modification should be considered within the spirit and scope of the invention, as defined in the claims.

CLAIMS:

1. A metal wood golf club head comprising:

an upper crown;

a ball-striking face;

a heel;

a toe;

a sole;

said face extending from said heel to said toe and connecting the sole and the upper crown;

a sunken insert cavity in said face;

an insert secured in said insert cavity; and

a channel formed in said insert cavity.

2. The club head of claim 1 further comprising:

a hosel located on said crown near said heel of said face.

3. The club head of claim 2 wherein said hosel continues through said crown and penetrates said club head to a depth substantially equal to at least one third of the distance between the sole and the upper crown.

4. The club head of claim 1 wherein said crown further comprises:

an opening formed in said crown; and

a crown plate secured in said opening in said crown.

5. The club head of claim 1 wherein said sunken insert cavity further comprises cavity walls projecting rearwardly and away from said club face.

6. The club head of claim 1 wherein said insert further comprises a pin hole formed perpendicular to the face of said insert and passing through the face of said insert; and a hollow face pin inserted into said pin hole.

7. The club head in claim 1 wherein the club head, except for the insert, is made of an aluminum titanium alloy.

8. The club head of claim 5 wherein said cavity walls are the same thickness as said club face.

9. The club head of claim 8 wherein said thickness is 2 millimeters.

10. The club head of claim 6 wherein said hollow face pin is closed at one end forming a pin head.

11. The club head of claim 10 wherein said pin head is formed to look like a conventional screw head.

12. The club head of claim 10 wherein said pin head is formed to look like a conventional rivet head.

13. The club head of claim 7 wherein said alloy is ninety eight (98) per cent aluminum and eight (8) per cent titanium.

14. The club head of claim 1 wherein said channel is formed at the perimeter of said sunken insert cavity.

15. The club head of claim 14 wherein said channel is formed around the entire perimeter of said insert cavity.

16. The club head of claim 14 wherein said sunken cavity comprises a cavity surface and side walls, said channel formed in cavity surface of said insert cavity.

17. The club head of claim 14 wherein said sunken cavity comprises a cavity surface and side walls, said channel formed in side wall of said insert cavity.

18. A metal wood golf club head comprising:

an upper crown;

a ball-striking face;

a heel;

a toe;

a sole;

said face extending from said heel to said toe and connecting the sole and the upper crown;

a sunken insert cavity in said face;

a non-metallic insert secured in said insert cavity;

a channel formed in the insert cavity; and

a hosel located on said crown near said heel of said face,

said hosel continuing through said crown and penetrating said club head to a depth substantially equal to at least one third of the distance between the sole and the upper crown;

said crown further comprising an opening formed in said crown and a crown plate secured to said opening in said crown;

said insert cavity further comprising cavity walls projecting rearwardly from said club face; and

said insert further comprising a hollow face pin inserted into said insert;

said club head, except for the insert, being made of an aluminum titanium alloy said cavity walls formed to the same thickness as said club face; and

said hollow face pin being closed at one end forming a pin head.

19. A method for manufacturing a hollow metallic golf club head of the driver type comprising the steps of:

molding a single hollow piece to define a ball-striking face, a lower sole, and an upper crown having an opening formed therein;

and securing a crown plate to said crown to close said opening.

20. The method of claim 8 and including the step of forming a hosel in said single hollow piece, said hosel extending a predetermined distance into the head.

21. The method of claim 9 further comprising the step of inserting a shaft end into said hosel so that said shaft end is coextensive with the penetrating end of said hosel.

22. The club head of claim 1 wherein said insert is non-metallic.

23. The club head of claim 1 wherein said sole has a concave contour formed at the rear end of the sole and opposite said ball striking face.

24. A metal wood golf club head as hereinbefore described with reference to and as shown in the accompanying drawings.

25. A method for manufacturing a hollow metallic golf club head as hereinbefore described with reference to the accompanying drawings.

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Relevant Technical fields (i) UK Cl (Edition K) A6D (D23B) (ii) Int Cl (Edition 5) A63B 53/04	**Search Examiner** D WHITFIELD
Databases (see over) (i) UK Patent Office (ii) ONLINE DATABASE: WPI	**Date of Search** 2 DECEMBER 1992

Documents considered relevant following a search in respect of claims 1-18, 20-25

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
Y	GB 2173407 A (TILLEY) see figure 2	1-3,5
Y	US 4681322 (STRAZA) see figure 6	1-3,5

Category	Identity of document and relevant passages	Relevant to claim(s)

Categories of documents

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