

Title

A GOLF BALL WITH AN AERODYNAMIC SURFACE ON A POLYURETHANE
COVER

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Technical Field

The present invention relates to a golf ball with a thermoset polyurethane cover. More specifically, the present invention relates to a dimple pattern for a golf ball with a thermoset polyurethane cover in which the dimple pattern has different sizes of dimples.

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Background Art

Golfers realized perhaps as early as the 1800's that golf balls with indented surfaces flew better than those with smooth surfaces. Hand-hammered gutta-percha golf balls could be purchased at least by the 1860's, and golf balls with brambles (bumps rather than dents) were in style from the late 1800's to 1908. In 1908, an Englishman, William Taylor, received a patent for a golf ball with indentations (dimples) that flew better and more accurately than golf balls with brambles. A.G. Spalding & Bros., purchased the U.S. rights to the patent and introduced the GLORY ball featuring the TAYLOR dimples. Until the 1970s, the GLORY ball, and most other golf balls with dimples had 336 dimples of the same size using the same pattern, the ATTI pattern. The ATTI pattern was an octahedron pattern, split into eight concentric straight line rows, which was named after the main producer of molds for golf balls.

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The only innovation related to the surface of a golf ball during this sixty year period came from Albert Penfold who invented a mesh-pattern golf ball for Dunlop. This pattern was invented in 1912 and was accepted until the 1930's.

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In the 1970's, dimple pattern innovations appeared from the major golf ball manufacturers. In 1973, Titleist introduced an icosahedron pattern which divides the golf ball into twenty triangular regions. An icosahedron pattern was disclosed in British Patent Number 377,354 to John Vernon Pugh, however, this pattern had



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dimples lying on the equator of the golf ball which is typically the parting line of the mold for the golf ball. Nevertheless, the icosahedron pattern has become the dominant pattern on golf balls today.

In the late 1970s and the 1980's the mathematicians of the major golf ball
5 manufacturers focused their intention on increasing the dimpled surface area (the area covered by dimples) of a golf ball. The dimpled surface for the ATTI pattern golf balls was approximately 50%. In the 1970's, the dimpled surface area increased to greater than 60% of the surface of a golf ball. Further breakthroughs increased the dimpled surface area to over 70%. U.S. Patent Number 4,949,976 to William Gobush discloses
10 a golf ball with 78% dimple coverage with up to 422 dimples. The 1990's have seen the dimple surface area break into the 80% coverage.

The number of different dimples on a golf ball surface has also increased with the surface area coverage. The ATTI pattern disclosed a dimple pattern with only one size of dimple. The number of different types of dimples increased, with three different
15 types of dimples becoming the preferred number of different types of dimples. U.S. Patent Number 4,463 to Oka et al., discloses a dimple pattern with four different types of dimples on surface where the non-dimpled surface cannot contain an additional dimple. United Kingdom patent application number 2157959, to Steven Aoyama, discloses dimples with five different diameters. Further, William Gobush invented a
20 cuboctahedron pattern that has dimples with eleven different diameters. See *500 Year of Golf Balls*, Antique Trade Books, page 189. However, inventing dimple patterns with multiple dimples for a golf ball only has value if such a golf ball is commercialized and available for the typical golfer to play.

Additionally, dimple patterns have been based on the sectional shapes, such as
25 octahedron, dodecahedron and icosahedron patterns. U.S. Patent 5,201,522 discloses a golf ball dimple pattern having pentagonal formations with equally number of dimples therein. U.S. Patent Number 4,880,241 discloses a golf ball dimple pattern having a modified icosahedron pattern wherein small triangular sections lie along the equator to

provide a dimple-free equator.

Although there are hundreds of published patents related to golf ball dimple patterns, there still remains a need to improve upon current dimple patterns, particularly for golf balls with thermoset polyurethane covers. Golf balls with
5 thermoset polyurethane covers such as the Maxfli REVOLUTION, the Maxfli HT, the Titleist PROFESSIONAL, the Titleist TOUR PRESTIGE, and the Slazenger RAM 420 all need to compensate for the inherent properties of the polyurethane material which include the increased spin, the higher drag levels, and manufacturing difficulties. There is still a need for a dimple pattern designed to maximize the aerodynamics of a golf ball
10 with a thermoset polyurethane cover.

Brief Disclosure of the Invention

The present invention provides a novel dimple pattern that reduces high speed drag on a golf ball while increasing its low speed lift thereby providing a golf ball that
15 travels greater distances. The present invention is able to accomplish this by providing multiples sets of dimples arranged in a pattern that covers as much as eighty-six percent of the surface of the golf ball.

One aspect of the present invention is a dimple pattern on a golf ball having a thermoset cover with a surface coated with at least a base coat. The preferred thermoset
20 is polyurethane, however, those skilled in the art will recognize that other thermoset materials may be employed in practicing the present invention. The golf ball includes a plurality of different sets of dimples disposed on the surface. Each of the different sets of dimples has a different diameter than any other set of dimples. The depth of each of the dimples of the plurality of different sets of dimples is limited to 0.0060 inches from
25 the chord of each dimple. The depth of each of the dimples of the plurality of different sets of dimples may be between 0.0045 and 0.0060 inches from the chord. Each of the dimples of the plurality of different sets of dimples has an entry angle, and the entry angle of each dimple may be between 14 and 16 degrees. Each of the dimples of the

plurality of different sets of dimples has an edge radius, and the edge radius of each dimple may be between 0.020 and 0.050 inches.

Another aspect of the present invention is a dimple pattern on a golf ball with a thermoset polyurethane cover that provides greater low speed lift and lower high speed drag. The golf ball includes a plurality of different sets of dimples disposed on the surface of the coated thermoset polyurethane cover. Each of the different sets of dimples having a different diameter than any other set of dimples. The plurality of different sets of dimples cover at least eighty-three percent of the surface of the golf ball. The golf ball has a lift coefficient greater than 0.20 at a Reynolds number of 70,000 and 2000 rpm, and a drag coefficient less than 0.232 at a Reynolds number of 180,000 and 3000 rpm.

Brief Description of the Drawings

FIG. 1 is an equatorial view of a preferred embodiment of a golf ball of the present invention.

FIG. 1A is the view of FIG. 1 illustrating the rows of dimples.

FIG. 1B is the view of FIG. 1 illustrating the transition region of dimples.

FIG. 2 is a polar view of the golf ball of FIG. 1.

FIG. 2A is the view of FIG. 2 illustrating the cascading pentagons of dimples.

FIG. 2B is the view of FIG. 2 illustrating the single encompassing pentagon of dimples.

FIG. 3 is a polar view of the golf ball of FIG. 1 illustrating the star configuration.

FIG. 4 is an enlarged cross-sectional view of a dimple of a first set of dimples of the golf ball of the present invention.

FIG. 4A is an isolated cross-sectional view to illustrate the definition of the entry radius.

FIG. 5 is an enlarged cross-sectional view of a dimple of a second set of dimples

of the golf ball of the present invention.

FIG. 6 is an enlarged cross-sectional view of a dimple of a third set of dimples of the golf ball of the present invention.

FIG. 7 is an enlarged cross-sectional view of a dimple of a fourth set of dimples of the golf ball of the present invention.

FIG. 8 is an enlarged cross-sectional view of a dimple of a fifth set of dimples of the golf ball of the present invention.

FIG. 9 is an enlarged cross-sectional view of a dimple of a sixth set of dimples of the golf ball of the present invention.

FIG. 10 is an enlarged cross-sectional view of a dimple of a seventh set of dimples of the golf ball of the present invention.

FIG. 11 is a polar view of an alternative embodiment of the golf ball of the present invention.

FIG. 12 is an equatorial view of yet another alternative embodiment of a golf ball of the present invention.

FIG. 13 is a graph of the lift coefficient versus Reynolds number.

FIG. 14 is graph of the drag coefficient versus Reynolds number.

Best Mode(s) For Carrying Out The Invention

As shown in FIGS. 1-3, a golf ball is generally designated 20. The golf ball may be a one-piece, two-piece, a three piece, or the like golf ball. Further, the three-piece golf ball may have a wound layer, or a solid boundary layer. The cover 21 of the golf ball 20 may be any suitable material. A preferred cover 21 is composed of a thermoset polyurethane material. However, those skilled in the pertinent art will recognize that other cover materials may be utilized without departing from the scope and spirit of the present invention. The golf ball 20 may have a finish of a basecoat and/or top coat.

The golf ball 20 has a surface 22. The golf ball 20 also has an equator 24

dividing the golf ball 20 into a first hemisphere 26 and a second hemisphere 28. A first pole 30 is located ninety degrees along a longitudinal arc from the equator 24 in the first hemisphere 26. A second pole 32 is located ninety degrees along a longitudinal arc from the equator 24 in the second hemisphere 28.

5 On the surface 22, in both hemispheres 26 and 28, are 382 dimples partitioned into seven different sets of dimples. A first set of dimples 34 are the most numerous dimples consisting of two-hundred twenty dimples in the preferred embodiment. A second set of dimples 36 are the next most numerous dimples consisting of one-hundred dimples. A third set of dimples 38 and a fourth set of dimples 40 are the next
10 most numerous with each set 38 and 40 consisting of twenty dimples in the preferred embodiment. A fifth set of dimples 42 and a sixth set of dimples 44 are the next most numerous with each set 42 and 44 consisting of ten dimples in the preferred embodiment. The seventh set of dimples 46 consist of only two dimples. In a preferred embodiment, the 382 dimples account for 86% of the surface 22 of the golf ball.

15 The two dimples of the seventh set of dimples 46 are each disposed on respective poles 30 and 32. Each of the fifth set of dimples 42 is adjacent one of the seventh set of dimples 46. The five dimples of the fifth set of dimples 42 that are disposed within the first hemisphere 26 are each an equal distance from the equator 24 and the first pole 30. The five dimples of the fifth set of dimples 42 that are disposed within the second
20 hemisphere 28 are each an equal distance from the equator 24 and the second pole 32. These polar dimples 42 and 46 account for approximately 2% of the surface 22 of the golf ball 20.

A cross-section of a dimple of the fifth set of dimples 42 is shown in FIG. 8. The radius R_1 of the dimple 42 is approximately 0.0720 inches, the chord depth C_1 is
25 approximately 0.0054 inches, the entry angle θ_1 is approximately 15.7 degrees, and the edge radius ER_1 is approximately 0.0336 inches. A cross-section of a dimple of the seventh set of dimples 46 is shown in FIG.10. The radius R_2 of the dimple 46 is approximately 0.0510 inches, the chord depth C_2 is approximately 0.0049 inches, the

entry angle θ_7 is approximately 13.4 degrees, and the edge radius ER_7 is approximately 0.0336 inches.

The ten dimples of the sixth set of dimples 44 account for approximately 3% of the surface 22 of the golf ball 20. The five dimples of the sixth set of dimples 44 that are disposed within the first hemisphere 26 are each an equal distance from the equator 24 and the first pole 30. The five dimples of the sixth set of dimples 44 that are disposed within the second hemisphere 28 are each an equal distance from the equator 24 and the second pole 32. Also, each of the sixth set of dimples 44 is adjacent to three different sets of dimples 34, 36 and 40.

A cross-section of a dimple of the sixth set of dimples 44 is shown in FIG. 9. The radius R_6 of the dimple 44 is approximately 0.0930 inches, the chord depth C_6 is approximately 0.0051 inches, the entry angle θ_6 is approximately 15.2 degrees, and the edge radius ER_6 is approximately 0.0333 inches. The extraordinarily large diameter of each of the sixth set of dimples 44 allows for the extraordinary surface coverage of the dimple pattern of the present invention. This is contrary to conventional thinking that teaches that dimples with smaller diameters would provide for greater surface coverage.

All of the fourth set of dimples 40 are adjacent to at least one of the sixth set of dimples 44. The twenty dimples of the fourth set of dimples 40 cover approximately 2.7% of the surface 22 of the golf ball 20. The ten dimples of the fourth set of dimples 40 that are disposed within the first hemisphere 26 are each an equal distance from the equator 24 and the first pole 30. The ten dimples of the fourth set of dimples 40 that are disposed within the second hemisphere 28 are each an equal distance from the equator 24 and the second pole 32. Also, each of the fourth set of dimples 40 is adjacent to three different sets of dimples 36, 38 and 44.

A cross-section of a dimple of the fourth set of dimples 40 is shown in FIG. 7. The radius R_4 of the dimple 40 is approximately 0.062 inches, the chord depth C_4 is approximately 0.0052 inches, the entry angle θ_4 is approximately 15.2 degrees, and the edge radius ER_4 is approximately 0.0358 inches.

All of the third set of dimples 38 are adjacent to at least one of the sixth set of dimples 44. The twenty dimples of the third set of dimples 38 cover approximately 3.8% of the surface 22 of the golf ball 20. The ten dimples of the third set of dimples 38 that are disposed within the first hemisphere 26 are each an equal distance from the equator 24 and the first pole 30. The ten dimples of the third set of dimples 38 that are disposed within the second hemisphere 28 are each an equal distance from the equator 24 and the second pole 32. Also, each of the fourth set of dimples 38 is adjacent to three different sets of dimples 34, 36 and 40.

A cross-section of a dimple of the third set of dimples 38 is shown in FIG. 6. The radius R_3 of the dimple 38 is approximately 0.074 inches, the chord depth C_3 is approximately 0.0053 inches, the entry angle θ_3 is approximately 15.3 degrees, and the edge radius ER_3 is approximately 0.0344 inches.

The two-hundred twenty dimples of the first set of dimples 34 are the most influential of the different sets of dimples 34-46 due to their number, size and placement on the surface 22 of the golf ball 20. The two-hundred twenty dimples of the first set of dimples 34 cover approximately 53% of the surface 22 of the golf ball 20. The one-hundred ten dimples of the first set of dimples 34 that are disposed within the first hemisphere 26 are disposed in either a first row 80 and a second row 82 above the equator 24, or a pseudo-star configuration 84 about the first pole 30 that is best illustrated in FIG. 3. Similarly, the one-hundred ten dimples of the first set of dimples 34 that are disposed within the second hemisphere 28 are disposed in either a first row 90 and a second row 92 below the equator 24, or a pseudo-star configuration 94, not shown, about the second pole 32, not shown.

A cross-section of a dimple of the first set of dimples 34 is shown in FIG. 4. The radius R_1 of the dimple 34 is approximately 0.0834 inches, the chord depth C_1 is approximately 0.0053 inches, the entry angle θ_1 is approximately 15.3 degrees, and the edge radius ER_1 is approximately 0.0344 inches. Unlike the use of the term "entry radius" or "edge radius" in the prior art, the edge radius as defined herein is a value

utilized in conjunction with the entry angle to delimit the concave and convex segments of the dimple contour. The first and second derivatives of the two Bézier curves are forced to be equal at this point defined by the edge radius and the entry angle, as shown in FIG. 4A. The one-hundred dimples of the second set of dimples 36 are the next

5 most influential of the different sets of dimples 34-46 due to their number, size and placement on the surface 22 of the golf ball 20. The one-hundred dimples of the second set of dimples 36 cover approximately 22% of the surface 22 of the golf ball 20. Thus, together the first set of dimples 34 and the second set of dimples 36 cover over approximately 75% of the surface 22 of the golf ball 20. The fifty dimples of the

10 second set of dimples 36 that are disposed within the first hemisphere 26 are disposed in either a third row 86 above the equator, a second pentagon 102 about the first pole 30, or along a transition latitudinal region 70. Similarly, the fifty dimples of the second set of dimples 36 that are disposed within the second hemisphere 28 are disposed in either a third row 96 below the equator 24, a second pentagon 102a, not shown, about

15 the second pole 32, or along a transition latitudinal region 72. A cross-section of a dimple of the second set of dimples 36 is shown in FIG. 5. The radius R_2 of the dimple 36 is approximately 0.079 inches, the chord depth C_2 is approximately 0.0053 inches, the entry angle θ_2 is approximately 15.1 degrees, and the edge radius ER_2 is approximately 0.0315 inches.

20 As best illustrated in FIG. 1A, each hemisphere 26 and 28 begins with three rows from the equator 24. The first and second rows 80 and 82 of the first hemisphere 26 and the first and second rows 90 and 92 of the second hemisphere 28 are composed of the first set of dimples 34. The third row 86 of the first hemisphere 26 and the third row 96 of the second hemisphere 28 are composed of the second set of dimples 36. This

25 pattern of rows is utilized to achieve greater surface coverage of dimples on the golf ball 20. However, as mentioned previously, conventional teaching would dictate that additional rows of smaller diameter dimples should be utilized to achieve greater surface area coverage. However, the dimple pattern of the present invention transitions

from rows of equal dimples into a pentagonal region 98. The pentagonal region 98 is best seen in FIG. 2A. A similar pentagonal region 98a, not shown, is disposed about the second pole 32. The pentagonal region 98 has five pentagons 100, 102, 104, 106 and 108 expanding from the first pole 30. Similar pentagons 100a, 102a, 104a, 106a and 108a expand from the second pole 32. The first pentagon 100 consists of the fifth set of dimples 42. The second pentagon 102 consists of the second set of dimples 36. The third pentagon 104 consists of the first set of dimples 34. The fourth pentagon 106 also consists of the first set of dimples 34. The fifth pentagon 108 consists of the first set of dimples 34 and the sixth set of dimples 44. However, the greater fifth pentagon 108' would include the fifth pentagon 108 and all dimples disposed between the third row 86 and the fifth pentagon 108. The pentagonal region 98 allows for the greater surface area of the dimple pattern of the present invention.

FIG. 2B illustrates five triangles 130-138 that compose the pentagonal region 98. Dashed line 140 illustrates the extent of the greater pentagonal region 98' which overlaps with the transition latitudinal region 70.

As best illustrated in FIG. 1B, all of the dimples of the third set of dimples 38, the fourth set of dimples 40 and the sixth set of dimples 44 are disposed within the transition latitudinal regions 70 and 72. The transition latitudinal regions 70 and 72 transition the dimple pattern of the present invention from the rows 80, 82, 86, 90, 92 and 96 to the pentagonal regions 98 and 98a. Each of the transition latitudinal regions 70 and 72 cover a circumferential area between 40 to 60 longitudinal degrees from the equator 24 in their respective hemispheres 26 and 28. The first transition latitudinal region 70 has a polar boundary 120 at approximately 60 longitudinal degrees from the equator 24, and an equatorial boundary 122 at approximately 40 longitudinal degrees from the equator 24. Similarly, the second transition latitudinal region 72 has a polar boundary 120a at approximately 60 longitudinal degrees from the equator 24, and an equatorial boundary 122a at approximately 40 longitudinal degrees from the equator 24.

Alternative embodiments of the dimple pattern of the present invention are illustrated in FIGS. 11 and 12. The dimple pattern on the golf ball 20a of FIG. 11 only has five different sets of dimples 34, 36, 40, 42 and 44. The dimple pattern on the golf ball 20b of FIG. 12 only has six different sets of dimples 34, 36, 38, 40, 42 and 44.

- 5 Both of the dimple patterns of the golf balls 20a and 20b have had the seventh set of dimples 46 that are disposed at the poles 30 and 32 removed, and the dimple pattern of the golf ball 20a has had all of the dimples of the third set of dimples 38 substituted with dimples from the fifth set of dimples 42.

10 The force acting on a golf ball in flight is calculated by the following trajectory equation:

$$F = F_L + F_D + G \quad (A)$$

wherein F is the force acting on the golf ball; F_L is the lift; F_D is the drag; and G is gravity. The lift and the drag in equation A are calculated by the following equations:

$$F_L = 0.5 C_L A \rho v^2 \quad (B)$$

$$15 \quad F_D = 0.5 C_D A \rho v^2 \quad (C)$$

wherein C_L is the lift coefficient; C_D is the drag coefficient; A is the maximum cross-sectional area of the golf ball; ρ is the density of the air; and v is the golf ball airspeed.

The drag coefficient, C_D , and the lift coefficient, C_L , may be calculated using the following equations:

$$20 \quad C_D = 2 F_D / A \rho v^2 \quad (D)$$

$$C_L = 2 F_L / A \rho v^2 \quad (E)$$

The Reynolds number R is a dimensionless parameter that quantifies the ratio of inertial to viscous forces acting on an object moving in a fluid. Turbulent flow for a dimpled golf ball occurs when R is greater than 40000. If R is less than 40000, the flow may be laminar. The turbulent flow of air about a dimpled golf ball in flight allows it to travel farther than a smooth golf ball.

The Reynolds number R is calculated from the following equation:

$$R = vD\rho/\mu \quad (F)$$

wherein v is the average velocity of the golf ball; D is the diameter of the golf ball (usually 1.68 inches); ρ is the density of air (0.00238 slugs/ft³ at standard atmospheric conditions); and μ is the absolute viscosity of air (3.74 x 10⁻⁷ lb*sec/ft² at standard atmospheric conditions). A Reynolds number, R , of 180,000 for a golf ball having a
5 USGA approved diameter of 1.68 inches, at standard atmospheric conditions, approximately corresponds to a golf ball hit from the tee at 200 ft/s or 136 mph, which is the point in time during the flight of a golf ball when the golf ball attains its highest speed. A Reynolds number, R , of 70,000 for a golf ball having a USGA approved
10 diameter of 1.68 inches, at standard atmospheric conditions, approximately corresponds to a golf ball at its apex in its flight, 78 ft/s or 53 mph, which is the point in time during the flight of the golf ball when the travels at its slowest speed. Gravity will increase the speed of a golf ball after its reaches its apex.

FIG. 13 illustrates the lift coefficient of a golf ball 20 with the dimple pattern of
15 the present invention thereon as compared to the Titlelist PROFESSIONAL, the Titlelist TOUR PRESTIGE, the Maxfli REVOLUTION and the Maxfli HT URETHANE. FIG. 14 illustrates the drag coefficient of a golf ball 20 with the dimple pattern of the present invention thereon as compared to the Titlelist PROFESSIONAL, the Titlelist TOUR PRESTIGE, the Maxfli REVOLUTION and the Maxfli HT
20 URETHANE.

All of the golf balls for the comparison test, including the golf ball 20 with the dimple pattern of the present invention, have a thermoset polyurethane cover. The golf ball 20 with the dimple pattern of the present invention was constructed as set forth in U.S. Patent Number 6,117,024, filed on July 27, 1999, for a Golf Ball With A
25 Polyurethane Cover which pertinent parts are hereby incorporated by reference. The aerodynamics of the dimple pattern of the present invention provides a greater lift with a reduced drag thereby translating into a golf ball 20 that travels a greater distance than golf balls of similar constructions.

As compared to other golf balls having polyurethane covers, the golf ball 20 of the present invention is the only one that combines a lower drag coefficient at high speeds, and a greater lift coefficient at low speeds. Specifically, as shown in FIGS. 13 and 14, none of the other golf balls have a lift coefficient, C_L , greater than 0.18 at a Reynolds number of 70,000, and a drag coefficient C_D less than 0.23 at a Reynolds number of 180,000. For example, while the Titliest PROFESSIONAL has a C_L greater than 0.18 at a Reynolds number of 70,000, its C_D is greater than 0.23 at a Reynolds number of 180,000. Also, while the Maxfli REVOLUTION has a drag coefficient C_D greater than 0.23 at a Reynolds number of 180,000, its C_L is less than 0.18 at a Reynolds number of 70,000.

In this regard, the Rules of Golf, approved by the United States Golf Association ("USGA") and The Royal and Ancient Golf Club of Saint Andrews, limits the initial velocity of a golf ball to 250 feet (76.2m) per second (a two percent maximum tolerance allows for an initial velocity of 255 per second) and the overall distance to 280 yards (256m) plus a six percent tolerance for a total distance of 296.8 yards (the six percent tolerance may be lowered to four percent). A complete description of the Rules of Golf are available on the USGA web page at www.usga.org. Thus, the initial velocity and overall distance of a golf ball must not exceed these limits in order to conform to the Rules of Golf. Therefore, the golf ball 20 has a dimple pattern that enables the golf ball 20 to meet, yet not exceed, these limits.

PU1057-WO

14/1

Claims

1. A golf ball having a thermoset polyurethane cover with a surface thereon, the golf ball comprising:

- 5 a plurality of different sets of dimples disposed on the surface, each of the different sets of dimples having a different diameter than any other set of dimples, wherein the chord depth of each of the dimples of the plurality of different sets of dimples is between 0.0045 inch and 0.0060 inch, wherein the chord depth is the depth to the bottom of the dimple from an imaginary horizontal plane extending from an
- 10 inflection point of the curvature of the dimple, and wherein each of the dimples of the plurality of different sets of dimples has an entry angle, and the entry angle of each dimple is between 13 and 16 degrees, the entry angle is defined between the intersection of a tangent extending outward from a first inflection point of the curvature of the dimple and a tangent extending outward from a second inflection point at the
- 15 start of the edge radius of each dimple.

2. The golf ball according to claim 1 wherein the thermoset polyurethane cover has a thickness between 0.030 and 0.038 inches.

PU1057-WO

15/1

3. A golf ball having a surface, the golf ball comprising:
- a first plurality of dimples disposed on the surface, each of the first plurality of dimples having a first diameter of 0.124 inch;
 - a second plurality of dimples disposed on the surface, each of the second plurality of dimples having a second diameter, the second diameter greater than the first diameter;
 - a third plurality of dimples disposed on the surface, each of the third plurality of dimples having a third diameter, the third diameter greater than the second diameter;
 - a fourth plurality of dimples disposed on the surface, each of the fourth plurality of dimples having a fourth diameter, the fourth diameter greater than the third diameter;
 - a fifth plurality of dimples disposed on the surface, each of the fifth plurality of dimples having a fifth diameter, the fifth diameter greater than the fourth diameter; and
 - a sixth plurality of dimples disposed on the surface, each of the sixth plurality of dimples having a sixth diameter, the sixth diameter greater than the fifth diameter and approximately 0.186 inch;
- wherein the first, second, third, fourth, fifth and sixth pluralities of dimples cover at least eighty-three percent of the surface of the golf ball.

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15/2

4. A golf ball having a thermoset polyurethane cover with a surface thereon, the golf ball comprising:

a plurality of different sets of dimples disposed on the surface, each of the different sets of dimples having a different diameter than any other set of dimples,
5 wherein the chord depth of each of the dimples of the plurality of different sets of dimples is between 0.0045 inch and 0.0060 inch, wherein the chord depth is the depth to the bottom of the dimple from an imaginary horizontal plane extending from an inflection point of the curvature of the dimple, wherein each of the dimples of the plurality of different sets of dimples has an edge radius, and the edge radius of each
10 dimple is between 0.020 and 0.050 inches.

5. A golf ball having a surface, the golf ball comprising:

382 dimples, wherein the 382 dimples are partitioned into seven different sets of dimples, each of the seven different sets of dimples having a different
15 diameter than any other set of dimples, and wherein the 382 dimples cover at least 86% of the surface of the golf ball.

PU1057-WO

16/1

6. A golf ball having a thermoset cover with a surface thereon, the golf ball comprising:

a plurality of different sets of dimples disposed on the surface of the thermoset cover, each of the different sets of dimples having a different diameter than any other set of dimples, the plurality of different sets of dimples covering at least
5 eighty percent of the surface of the golf ball;

wherein the golf ball has a lift coefficient greater than 0.18 at a Reynolds number of 70,000 and 2000 rpm, and a drag coefficient less than 0.228 at a Reynolds number of 180,000 and 3000 rpm.

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7. The golf ball according to claim 6 wherein the golf ball has a drag coefficient less than 0.228 at a Reynolds number of 180,000 and 3000 rpm.

8. The golf ball according to claim 6 wherein the golf ball has a lift coefficient
15 greater than 0.24 at a Reynolds number of 70,000 and 2000 rpm.

9. The golf ball according to claim 6 wherein the thermoset cover is a thermoset polyurethane cover and has a thickness between 0.030 and 0.038 inch.

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