



(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
24.06.2015 Bulletin 2015/26

(51) Int Cl.:
A63B 37/14 (2006.01) A63B 37/00 (2006.01)

(21) Application number: **13830670.9**

(86) International application number:
PCT/KR2013/002507

(22) Date of filing: **26.03.2013**

(87) International publication number:
WO 2014/030817 (27.02.2014 Gazette 2014/09)

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

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(30) Priority: **21.08.2012 KR 20120091385**

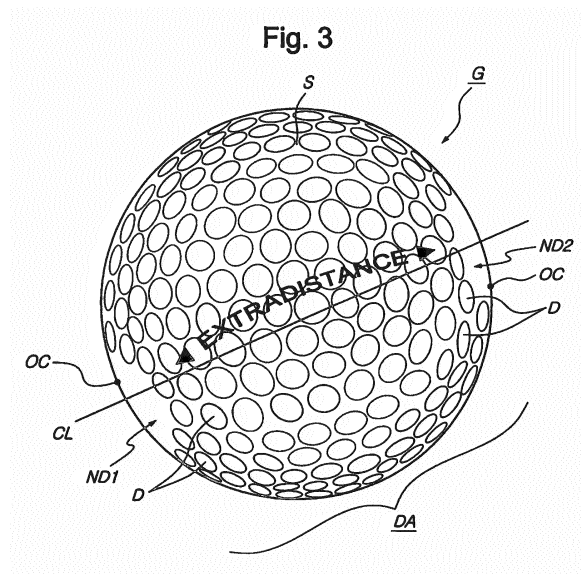
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(54) **GOLF BALL**

(57) The present invention relates to a golf ball, in which one or more non-dimple areas that do not have the dimples are provided relative to a dimple area having a plurality of dimples arranged on the entire outer surface of the golf ball, wherein: the non-dimple areas are two non-dimple areas which are positioned by facing each other on an axial central line that passes an axial center of the golf ball, and which are surrounded by other dimples; recessed circular arcs of the dimples in the dimple area are distributed with variable diameter sizes so as to compensate for the whole volume of the golf ball which is reduced by the provision of the non-dimple areas; the pair of non-dimple areas are respectively positioned in pole portions which are vertical to a seam line formed by bonding an outer cover within a mold during the manufacturing of the golf ball; and the dimples in the dimple area are arranged in order to be symmetric to a straight line that is vertical to the axial central line that passes the axial center of the golf ball by connecting the non-dimple areas.



Description

Technical Field

[0001] The present invention relates to a golf ball, and more particularly, to a golf ball in which a geometric configuration and function of the golf ball is improved to enhance rectilinearity and to obtain various effects such as accuracy in direction and a self-direction control function of a hit ball when putting or hitting the golf ball.

Background Art

[0002] The present invention relates to a golf ball and one of a series of the former inventions of the applicant, Korea patent application No. 10-2011-0104750 titled "Golf ball". Various improvements and researches have been made on golf balls based on psychological and aerodynamic views and improvements of materials.

[0003] In particular, many researches have been made in terms of, for example, arrangement, shape and size of dimples which are recesses formed on the surfaces of golf balls together with improvements in, for example, material quality, inner elastic material and multi-layer configuration in the golf balls.

[0004] Dimples are provided on a golf ball to aerodynamically increase a lift force generated on the golf ball when the golf ball flies, thereby increasing a driving distance of the golf ball. Most of conventional golf ball dimples are provided as a plurality of recesses of various shapes, in particular, as semi-spherical recesses to occupy most of the entire outer peripheral surface of a golf ball. In golf balls which are practically used based on data obtained through researches, dimples occupy about 72% of the area of the entire outer peripheral surface of the golf balls.

[0005] Based on the theory and practice described above, dimples have been recognized as essentially and naturally provided elements. However, problems caused by providing the dimples have also been found.

[0006] Typically, there is a problem in directivity of a hit ball when hitting a golf ball, for example, in putting in which an effect of sending a golf ball in a direction intended by a golfer, for example, a rectilinear direction of a hit ball, is important.

[0007] More specifically, for example, as previously illustrated in FIG. 1a of a previous patent application, when a face surface of a putter head hits an undimpled patch P where no dimple D exists on a golf ball B, that is, in a tangential direction, the golf ball travels in a direction desired by the golfer. However, the chances of successes in this manner are very low. In most cases, the face surface of the head putter hits a dimpled patch, i.e. in a direction of a tangent line c1 that intersects the circumferential edge line of a dimple D of the golf ball B. In such a case, as illustrated in FIGS. 1b or 1c, the face surface hits a corner portion d11 which is very small and is usually an edge of the semi-spherical recess of the dimple D of

the golf ball B as illustrated in FIG. 1b or 1c so that various unintended hitting angles will be formed. As a result, the golf ball travels in a direction unintended by the golfer.

[0008] The following results was obtained through testing performed using a robot hit tester. As illustrated in FIG. 2 included in the previous application of the inventors, when hitting angles were α (in the case of FIG. 1b) and β (in the case of FIG. 1c) in a fine length of time when hitting a golf ball B located at a hitting position where the golf ball was laid to arrive at a target point towards a hole cup C of a hole H, the courses of the golf ball B after hitting deviated from the hole cup C serving as the target point by distances a and b, respectively. As the results of the test, when the putter head (not illustrated) hit the corner d1 of the dimple D, angular deviations of about 1 to 3 degrees (2 degrees on average) were caused. As a result, it was found that when the putting distance is 2 m and the angular deviation is 2 degrees, the golf ball deviates from the hole cup C by about 10.48 cm, when the putting distance is 5 m and the angular deviation is 2 degrees, the golf ball deviates from the hole cup C by about 17.46 cm, and when the putting distance is 5 m and the angular deviation is 3 degrees, the golf ball deviates from the hole cup C by about 26.20 cm.

[0009] In consideration of this problem, various researches have also been made in the past, and, for example, a configuration that enhances the accuracy of a golf ball while sacrificing the driving distance to the minimum by changing the shape of dimples or forming various shapes of grid patterns which may be used in place of the dimples has been conceived.

[0010] A U.S. patent widely known on the market discloses a golf ball in which band-shaped areas, which are arranged diametrically, are formed on the golf ball, and dimples with a very small diameter are formed in the band-shaped area to enhance rectilinearity when the golf ball is hit. However, since the area where dimples do not exist is too broad, the driving distance may be considerably reduced and the rectilinearity improving effect is minimal, and therefore the practicability is very low.

[0011] In consideration of this, the present applicant has proposed a golf ball having an area where no dimple is formed in Korean Patent Application No. 10-2011-0104750 entitled "Golf Ball with Reduced Putting Error". The techniques forming a non-dimple region on a golf ball are recognized as well-known and publicly used technologies of other prior patent applications and patents of which the durations have expired. Representative prior arts are described in prior patent applications as follows.

[0012] Japanese Patent Laid-Open Publication No. Hei 9-117531 discloses a configuration in which small holes with a small diameter are formed in dimpled patches to improve directivity at the time of putting.

[0013] Japanese Patent Laid Open Publication No. 2001-321461 discloses a configuration in which undimpled patches where no dimple exists are selectively provided symmetrically in, for example, a circular arc shape

or a grid shape.

[0014] Korean Patent No. 10-0897625 arranges small dimples in a band-shaped area according to an equator line of a golf ball to improve putting directivity.

[0015] U.S. Patent No. 4,258,921, of which the duration expired, discloses a configuration in which a band-shaped area and a quadrilateral undimpled patch cooperating with the band-shaped area are formed together with a dimpled patch to provide a smooth putter contact surface, thereby improving directivity.

[0016] U.S. Patent No. 5,662,530 discloses only a configuration in which circles having a diameter larger than the diameter of dimples provided on a golf ball are arranged in vertical and horizontal directions or in a circular arc shape.

[0017] In the above-described golf ball, which has been used in the U.S.A. since 1972, the size of dimples arranged on the equator area of the golf ball is reduced so as to intentionally generate resistance so that the golf ball hardly rotates about an axis perpendicular to the equator area. Thus, the golf ball is driven rectilinearly without slicing laterally. Recently, however, it has been found that since a band is formed along the equator area, the driving distance is considerably reduced, and the same effect cannot be obtained at various ball striking angles so that the use of the golf ball has been reduced recently.

[0018] The technical idea of providing a non-dimple area in a dimple area of the outer surface of a golf ball has been already known in the art from the techniques disclosed in the above-described previous patent applications and patents, of which the durations expired.

Detailed Description of the Invention

Technical Problem

[0019] From the previously filed patent applications, the technical idea of forming undimpled patches in which no dimple exists, in various shapes is recognized as a well-known and publicly used technique in the related art.

[0020] The previously filed patent applications disclose a configuration in which undimpled patches are provided in various shapes and arrangements on the surface of golf ball. However, according to tests using golf balls to which the technical ideas are applied, the following problems are found.

[0021] When non-dimple areas of various shapes and arrangements are merely provided on a dimpled golf ball, an effect of improving accuracy may be obtained in theory. However, since an ordinary arrangement pattern of other dimples and merely undimpled patches are provided, air resistance increases, and as a result, the driving distance is considerably reduced. As a result, the originally intended purpose cannot be achieved. Further, when the undimpled areas, in which no dimple is provided, are provided in various shapes, the entire volume of the golf ball increases. As a result, it has been found that

due to the increase of air resistance, besides the problems of the reduced driving distance and directivity which is hard to control, there are problems in that a golfer's hitting sense may be varied while playing golf, a game in which a psychological factor is an important parameter. The golf ball is also unsuitable for international standards.

[0022] The present invention is intended to provide a novel and improved configuration by specifying a limited technical configuration based on well-known and publicly used techniques in the prior art and further improving the configuration to solve the various problems in the techniques in the prior art the prior arts.

[0023] The present invention has been made in consideration of the problems of the golf balls in the previously filed patent applications and an object of the present invention is to provide a golf ball in which according to a self directivity control effect of the golf ball itself, putting accuracy can be improved, and the driving distance of the golf ball can be increased and a golfer's psychological effect can be enhanced by defining a position of an undimpled position, thereby enabling stable ball-hitting.

Technical Solution

[0024] The present invention has been made in order to solve the problems described above. In order to provide usefulness of improving putting accuracy by minimizing a distortion of a putting angle which is caused by dimples when putting the golf ball, the golf ball includes one or more non-dimple areas that do not have dimples and are provided in relation to a dimple area having a plurality of dimples arranged on the entire outer surface of the golf ball.

[0025] As a basic feature, there are two non-dimple areas which are positioned to face opposite directions from each other on an axial central line that passes through an axial center of the golf ball, and which are surrounded by other dimples, and recessed circular arcs of the dimples in the dimple area are distributed with variable diameter sizes so as to compensate for the whole volume of the golf ball which is reduced by the provision of the non-dimple areas.

[0026] As a restricted configuration that forms the entire invention, the pair of non-dimple areas are positioned on an equator line formed by a seam line which is formed when outer covers are bonded to each other within a mold when manufacturing the golf ball, and pole parts which face opposite directions from each other on an axial center line passing through the axial center of the golf ball and which are perpendicular to the axial center line. The dimples of the dimple area are arranged symmetrically with reference to the equator line which is a center line of an outer surface of the golf ball which is perpendicular to the axial center line which connects the non-dimple areas and passes through the axial center of the golf ball. In order to compensate for the entire volume of the golf ball which is reduced by providing the non-

dimple area, the diameter sizes of the dimples are variably and symmetrically distributed to be symmetrical with reference to the equator line which is the center line of the outer surface of the golf ball and is perpendicular to the axial center line passing through the axial center of the golf ball while connecting the non-dimple areas.

Advantageous Effects

[0027] The inventive golf ball is characterized by the fact that the rectilinearity of the golf ball is improved, and the driving distance is increased, in addition to the technical idea of providing non-dimple areas on the dimple areas of the golf ball.

(1) As described above, it is possible to solve the direction control problem in which direction control is difficult when the corner portion of a dimple is hit when putting and thus the rectilinearity is degraded.

(2) Due to the existence of the visible logos formed on the non-dimple areas ND1 and ND2 and the ball striking direction indication mark connecting the non-dimple areas ND1 and ND2, the striking direction of the golf ball G can be easily set at the time of putting, and the non-dimple areas are covered by the visible logo or the like, and thus, the user such as a golfer may be psychologically stable, thereby solving the problem of yps.

(3) According to testing, it has been found that the visible logos on the non-dimple areas ND1 and ND2 guide correct ball striking when teeing off, and the non-dimple areas on the pole parts (described later) of the golf ball aerodynamically allows the driving distance to be increased.

(4) Due to the existence of the non-dimple areas ND1 and ND2, as described above, a self-direction control function to recover and maintain the rectilinearity when the golf ball flies is improved and even when wind is severe, the effect of the wind can be minimized.

Brief Description of the Drawings

[0028]

FIGS. 1a, 1b and 1c are explanatory views for describing problems of a dimple configuration of a conventional golf ball in which the figures are included in a patent application previously filed by the present applicant;

FIG. 2 is an explanatory view for describing the problems of the dimple configuration of the conventional golf ball, which are related to FIGS. 1b and 1c included in the patent application previously filed by the present applicant;

FIG. 3 is a perspective view illustrating a basic configuration of a golf ball according to an embodiment of the present disclosure;

FIG. 4 is a perspective view illustrating a basic configuration of a golf ball according to a modified embodiment of the present invention;

FIGS. 5a and 5b are explanatory views for describing a self-direction control function of a golf ball of the present invention;

FIGS. 6a and 6b are explanatory views for describing a reason why the driving distance increases when the inventive golf ball is hit;

FIG. 7a is a cross-sectional view illustrating a golf ball within a mold when manufacturing the golf ball in order to describe a principle applied to the golf ball; FIG. 7b is a perspective view illustrating a shape of the golf ball after the golf ball is injection-molded, in which the golf ball is manufactured by being injection-molded in a mold;

FIG. 8 is a plan view of an exemplary golf ball illustrating an example of an arrangement of dimples of the inventive golf ball;

FIG. 9 is a front view of a golf ball according to another embodiment illustrating an arrangement of dimple areas of the inventive golf ball;

FIG. 10 is a perspective front view of another embodiment illustrating an arrangement of dimple areas of the inventive golf ball;

FIG. 11 is a front view of an embodiment illustrating an undesired arrangement of dimple areas of the inventive golf ball;

FIG. 12 is an explanatory view for explaining a reference direction of a ball striking method for proving the effects of the inventive golf ball in connection with the descriptions of FIG. 6;

FIG. 13 is testing table of driving distances measured by testing golf balls configured according to the present invention and other makers' golf balls;

FIG. 14 is a graph representing the driving distance by testing golf balls configured according to the present invention and other makers' golf balls;

FIG. 15 is testing table that proves the improvement of directional rectilinearity confirmed by testing golf balls configured according to the present invention and other makers' golf balls;

FIG. 16 is a graph that proves the improvement of directional rectilinearity confirmed by testing golf balls configured according to the present invention and other makers' golf balls; and

FIG. 17 is a perspective view illustrating packaging of a golf ball which is configured according to the present invention.

The best Mode for Carrying Out the Invention

[0029] Hereinafter, configurations and functions of the inventive golf ball for achieving the above-described purpose will be described with reference to the accompanying drawings.

[0030] FIG. 3 is a perspective view illustrating a basic configuration of a golf ball according to an embodiment

of the present disclosure. FIG. 4 is a perspective view illustrating a basic configuration of a golf ball according to a modified embodiment of the present invention. FIGS. 5a and 5b are explanatory views for describing a self-direction control function of a golf ball of the present invention. FIGS. 6a and 6b are explanatory views for describing a reason why the driving distance increases when the inventive golf ball is hit. FIG. 7 is a cross-sectional view illustrating a golf ball within a mold when manufacturing the golf ball in order to describe a principle applied to the golf ball. FIG. 7b is a perspective view illustrating a shape of the golf ball after the golf ball is injection-molded, in which the golf ball is manufactured by being injection-molded in a mold. FIG. 8 is a plan view of an exemplary golf ball illustrating an example of an arrangement of dimples of the inventive golf ball. FIG. 9 is a front view of a golf ball according to another embodiment illustrating an arrangement of dimple areas of the inventive golf ball. FIG. 10 is a perspective front view of another embodiment illustrating an arrangement of dimple areas of the inventive golf ball. FIG. 11 is a front view of an embodiment illustrating an undesired arrangement of dimple areas of the inventive golf ball. FIG. 12 is an explanatory view for explaining a reference direction of a ball striking method for proving the effects of the inventive golf ball in connection with the descriptions of FIG. 6. FIG. 13 is testing table of driving distances measured by testing golf balls configured according to the present invention and other makers' golf balls. FIG. 14 is a graph representing the driving distance by testing golf balls configured according to the present invention and other makers' golf balls. FIG. 15 is testing table that proves the improvement of directional rectilinearity confirmed by testing golf balls configured according to the present invention and other makers' golf balls. FIG. 16 is a graph that proves the improvement of directional rectilinearity confirmed by testing golf balls configured according to the present invention and other makers' golf balls. FIG. 17 is a perspective view illustrating a packaging of a golf ball which is configured according to the present invention. These drawings will be described together or sequentially.

[0031] The inventive golf ball G is intended to solve the problems of conventional configurations by restrictedly providing an aerodynamic technical configuration based on well-known technical ideas that provide non-dimple areas randomly or atypically between dimple areas well-known from the previously filed patent applications described above.

[0032] FIG. 3 illustrates a basic embodiment to which a basic configuration of the inventive golf ball is applied.

[0033] The golf ball G has a plurality of dimples D on the outer surface S thereof and is provided with only two non-dimple areas ND1 and ND2 on the outer surface S of the golf ball G, in which the two non-dimple areas are positioned along an axial center line CL extending across the diameter of an entire dimple area DA to face opposite directions from each other and to be symmetrical with

each other.

[0034] The non-dimple areas ND1 and ND2 refer to areas which do not have dimples formed in the dimple area DA and in which the spherical surface is exposed as it is along circular arcs OC formed by the outer peripheral edges of the dimple area DA. The non-dimple areas ND1 and ND2 are naturally formed by being surrounded by the dimples DA of the dimple area DA. According to testing, it was found that the diameters of the non-dimple areas are preferably in a range of 7 mm to 20 mm.

[0035] For example, each non-dimple area has an approximately circular shape surrounded by nine dimples d1, d2, ..., d9 of the dimple area DA as illustrated in FIG. 8.

[0036] According to the testing, of course, the non-dimple areas ND1 and ND2 are not limited to the areas which do not have dimples and are surrounded only by nine dimples d1, d2, ..., d9. The non-dimple area ND1 and ND2 may be areas which do not have the dimples formed in the dimple area DA and arranged symmetrically with respect to the axial center line CL, which is the axial diametrical line, on the outer surface S.

[0037] In the present invention, the non-dimple areas ND1 and ND2 are limited to only two areas positioned to face opposite directions from each other in the diametric direction due to the reasons to be described below. When three or more non-dimple areas are formed, it has been found through testing that rather negative effects may be caused in driving distance and directivity for a geometric reason.

[0038] When the non-dimple areas ND1 and ND2 are formed on the surface of the golf ball G, the volume of the golf ball G itself inevitably decreases.

[0039] Typically, officially approved golf balls G have a volume in the range of 600 mm³ to 800 mm³ and golfers are familiar to volumetric feelings of such golf balls G. Thus, a minor volumetric increase may cause the golfers to feel stress and this is a very important factor in view of the fact that the records in golf extremely depend on psychological factors.

[0040] In the present invention, besides the provision of the non-dimple areas ND1 and ND2 of the golf ball G, as an essential constituent element, the diameters of the dimples D are differentiated to have different sizes and the dimples D of the dimple area DA, which have the differentiated sizes, are arranged in a geometrically symmetric shape.

[0041] This is to solve the problems in which, when the non-dimple areas ND1 and ND2 are formed on the outer surface S of the golf ball G and inevitably increases the entire volume of the golf ball G, the volumetric increase provides an unfamiliar hitting feeling to the golfers, which reduces the driving distance, and occasionally causes the golf ball G not to meet the standards as an officially approved golf ball.

[0042] Although diametric sizes and arrangement shapes of the dimples D in the dimple area DA may be very variously designed, the arrangement of the dimples

in the dimple area DA surrounding non-dimple areas ND1 and ND2 may be made as exemplified in FIG. 8 in the following manner. The dimples in the dimple area DA are configured to have five kinds of dimples da, db, dc, dd and de are configured to have different dimple diameter sizes while forming the non-dimple areas ND1 and ND2, and areas formed by the kinds of dimples are configured in predetermined polygonal shapes, respectively. The areas of the predetermined polygonal shapes may be symmetrically arranged on the left and right sides with reference to a center line on the outer surface which is perpendicular to the axial center line CL formed by connecting the non-dimple areas ND1 and ND2.

[0043] For example, as illustrated in FIG. 8 which is a plan view of the golf ball and the differentiated dimple areas are indicated by straight lines for description, the dimples are arranged to be geometrically symmetric with respect to the equator line Q which is the center line perpendicular to the axial center C of the axial center line CL formed by connecting the non-dimple areas ND1 and ND2 in the following form: the diameter of the dimples da (d1, d2, ..., and d9) surrounding and forming the non-dimple areas ND1 and ND2 is set to 4.1 mm, the diameter of the dimples db of the dimple area surrounding again the dimples da (d1, d2, ..., and d9) surrounding the non-dimple areas ND1 and ND2 is set to 4.0 mm, the diameter of the dimples dc of the corners at the points where the polygonal areas formed by the dimples da (d1, d2, ..., and d9) surrounding and forming the non-dimple areas ND1 and ND2 meet each other, is set to 3.8 mm, the diameter of the dimples dd, which fill the dimples db of the dimple area DA is set to 4.5mm, the diameter of the dimples de is set to 4.5 mm, and the diameter of the dimples de, which fill the polygonal areas, is set to 4.4 mm.

[0044] When the dimples are arranged in this manner, the dimples may be configured to be geometrically symmetric with respect to the vertical axis such that the entire volume of the golf ball G may satisfy the officially approved standards, for example, 800 mm³.

[0045] A drastic embodiment of the arrangement of the dimples of the dimple areas DA that form the non-dimple areas ND1 and ND2 is illustrated in FIG. 9. When the dimple areas DA on the left and right of the equator line Q of the outer surface of the golf ball which is perpendicular to the axial center line CL formed by connecting the non-dimple areas ND1 and ND2 are arranged to be symmetric to each other while maintaining the entire volume of the golf ball G, the sizes of the diameters of the dimples DA, DB, and DC may configured to sequentially increase or decreases while approaching to the non-dimple areas ND1 and ND2.

[0046] As another embodiment, the symmetric areas divided as illustrated in FIG. 10, which is a front view shown in a slightly inclined direction (i.e., the polygonal dimple areas formed by dimples (not illustrated) having different sizes: D-1, D-1'; D-2, D-2'; and D-3, D-3'), may be configured between the non-dimple areas ND1 and

ND2.

[0047] FIG. 11 illustratively illustrates a shape obtained by dividing an area formed by dimples when the dimples are merely arranged on a golf ball in the conventional dimple arrangement method configuration by separation lines (which do not really exist on the golf ball but illustratively indicate area lines formed by gathered dimples: 11, 12, 13) without considering the foregoing. The shape does not have any symmetric property and cannot be employed in the present invention.

[0048] Of course, the configuration of the dimples da, db, dc, dd, and de described above are illustrative, and when the dimples are formed geometrically symmetrically on both sides with respect to the vertical axis formed by the non-dimple areas ND1 and ND2, they may be applied in any arrangement.

Mode for Carrying Out the Invention

[0049] Descriptions will be made on main technical ideas that differentiate the inventive golf ball G from conventional golf balls provided with non-dimple areas as described in the previously filed patent applications.

[0050] Depending on the number of layers between a core and a cover, golf balls are classified into a two-piece, three-piece, four-piece, and five-piece golf balls (the illustrated configuration corresponds to two-piece golf ball), and as the number of pieces is increases, the spin effect and striking feeling of the golf ball are improved.

[0051] As illustrated in the schematic explanatory view of FIG. 7a, the golf ball G herein has a core CR which may be formed in various configurations and an outer cover CV formed outside the core CR through injection-molding. The core CR is seated in the central portion between a pair of half molds F1 and F2, and the outer cover CV is injection-molded thereon.

[0052] Accordingly, a seam line SL is formed on the outer cover OC along adhesion surfaces on a boundary surface M where the half molds F1 and F2 are separated/bonded for compressing. The density of a cross-sectional area along the seam line SL and the density of pole parts PP perpendicular to the seam line SL form different density distributions. Typically, the seam line SL side which is the bonded part is formed to have a low density as compared to the pole part PP perpendicular to the seam line SL.

[0053] The reason is described in FIG. 7b which illustrates a half-finished product which is released from the molds F1 and F2 after the injection molding.

[0054] In order to mold a plurality of golf balls G within molds F1 and F2 at once, branched stems TT are formed from a stem ST which is a branch to an introduction part of the molds F1 and F2, and the seam lines SL are formed on the surfaces of the golf balls on the bonded surfaces M where the molds F1 and F2 meet the branched stems TT.

[0055] When injection-molding the outer cover CV, molten resins are simultaneously poured into the molds

from a plurality of branch steps TT to simultaneously flow into the outer surface forming area as indicated by arrows and meet along the position which connects the south and north poles (hereinafter, referred to as "pole parts") of the golf ball and to be compressed at the position. Thus, the density of the pole parts is relatively high.

[0056] Accordingly, when the pole parts are hit, the weight property increases compared to other portions and the action is exhibited as the increase of the driving distance as described below.

[0057] To be adequate for the purpose of the present invention, the non-dimple areas ND1 and ND2 are preferably positioned on the seam line SL or the pole parts PP. When the non-dimple areas ND1 and ND2 exist on areas other than the seam line SL or the pole parts PP, that is, when the axial center line L which is a straight line connecting the non-dimple areas ND1 and ND2 exists at an inclined angle which is not perpendicular, due to the weight distribution difference over the entire golf ball, the golf ball G wobbles while being rotated about the axis thereof, like a spinning top. Thus, the rectilinearity which may be obtained by the non-dimple areas ND1 and ND2 is reduced.

[0058] The inventive golf ball G is characterized in that the two non-dimple areas ND1 and ND2 are formed at the pole parts PP which are perpendicular to the seam line SL. As verified in the testing results to be described below, this is because forming the non-dimple areas ND1 and ND2 at the pole parts PP is more preferable than forming them on the seam line SL.

[0059] However, if necessary, when the seam line SL is formed as in the testing to be described below, the trajectory of the golf ball G is formed high and it may be employed for that purpose.

[0060] Thus, one of main view points of the inventive golf ball G is that in forming the non-dimple areas ND1 and ND2 at two locations, the non-dimple areas ND1 and ND2 are preferably formed at the pole parts PP and optionally, may also be formed on the seam line SL.

[0061] According to the testing performed by a robot ball hitting tester using two-piece and three-piece golf balls G manufactured according to the present invention and having non-dimple areas ND1 and ND2 on the seam line SL and pole parts PP, as described below, as illustrated in FIG. 12 (the golf balls G, to which the present invention is applied, will be referred to as "Kisskey" according to the brand name of the products of the inventors), both the two-piece and three-piece golf balls G having the non-dimple areas ND1 and ND2 formed at the pole parts PP had a longer driving distance, which is the sum of a carry which is a practical flight distance of a golf ball and a roll run which is a rolling distance, as compared to the golf balls having the non-dimple areas ND1 and ND2 formed along the seam line SL.

[0062] Accordingly, it is a very important technical idea of the present invention that two non-dimple areas ND1 and ND2 are respectively disposed on the pole parts P on the golf ball G which are perpendicular to the seam

line SL.

[0063] The technical idea providing non-dimple areas ND1 and ND2 in the dimple area DA which is the basic configuration has already been known in the art. However, the technical idea of the present invention provides a more developed and novel technical limitation and an improvement according to it.

[0064] Descriptions will be made on acting effects of the inventive golf ball G having the non-dimple areas ND1 and ND2 as compared to the golf ball having the previous well-known non-dimple areas with reference to FIGS. 5a and 5b.

[0065] As illustrated in FIG. 5a, when the golf ball G is struck and sent flying, the total lift force which is the fine lift forces generated by the dimples of the golf ball G is increased, and when the golf ball flies while being rotated with respect to a ball striking direction X, air flux from the front side of the golf ball meets any one of the non-dimple areas (for example, ND1). Since any one of the met non-dimple areas ND1 does not have dimples, anti-resistant force F_r is generated so that the golf ball G rotates in the direction Rx. Thus, rotation is performed to maintain the golf ball G to be perpendicular to the driving direction of which the ball was struck.

[0066] At this time, if further rotation is desired, the other non-dimple area ND2 meets the air flux to generate anti-resistant force F_1 to play the role of preventing further rotation. Thus, an automatic posture correction (self-direction correction operation) to maintain the axial center line CL connecting the non-dimple areas ND1 and ND2 of the golf ball G at right angles in relation to the ball striking direction X is made continuously and microscopically so that only repeated and constant resistant forces R_{f1} and R_{f2} are applied.

[0067] Accordingly, the rectilinearity of the golf ball G in the ball striking direction is maintained constantly without causing the problem of reducing the direction control capability as in the prior art so that the rectilinearity of the golf ball G is further improved and the effect of wind is minimized at the time of a slice or a hook.

[0068] FIG. 4 illustrates a further improved configuration of the inventive golf ball G.

[0069] When visible marks K which are configured by the user's logo, the manufacturer's logo or the like, are provided on both non-dimple areas ND1 and ND2 of the golf ball G of FIG. 4, it is easy to cause the golf ball G to be visually aligned to the ball striking direction when placing the golf ball G at a ball striking point. Thus, the visible marks are useful obtaining psychological stability and the aerodynamic effect described above early.

[0070] More preferably, when a striking direction indication mark SK visually connecting the non-dimple areas ND1 and ND2 is formed to be elongated, the striking direction indication mark SK will be more useful in visual alignment and striking direction setting. The visibility improvement effect was mentioned many times by the present applicant in the previously filed patent applications and is an important factor together with formation

of the two non-dimple areas ND1 and ND2 which are constituent elements restrictedly applicable to the inventive golf ball G and are included in the main principal idea of the present invention.

[0071] The acting effects thereof will be described with reference to FIGS. 6a and 6b.

[0072] Comparison will be made between FIG. 6b in which a golfer hits the inventive golf ball G located at a ball striking point (a golf tee) oriented in an optional direction and FIG. 6a in which the golfer hits the inventive golf ball G located on the golf tee (not illustrated) in the ball striking direction SD along the visible mark K or the ball striking direction indication mark SK.

[0073] As in FIG. 6b in which the golfer hits the golf ball G located at the striking point (golf tee) in an optional direction, when the golf ball G is hit in the ball striking direction SD, air flux AF collides with the front side of the golf ball G while it flies. In such a case, the dimples of the dimple area DA meet the air flux first and thus, fine vortex Vt is generated on the dimples as in the principle of the conventional golf ball. Due to the formation of the vortex, the entire air flux forms a contact angle α of about 120 degrees with respect to the golf ball G travelling direction. Then, the air flux flows to the rear side of the golf ball G to form a vacuum area V behind the golf ball G so that the air flux acts as a drag force Df pulling the golf ball behind the golf ball.

[0074] Whereas, when the golfer hits the golf ball seated on the golf tee such that the ball striking direction is aligned to the visible mark K or the striking direction indication mark SK as in FIG. 6a, the air flux meets first the non-dimple areas ND1 and ND2 and the contact angle β is dispersed at an angle of about 80 degrees, so that no drag force is generated and the driving distance can be increased.

[0075] Due to this, when the visible mark K is formed on the non-dimple areas ND1 and ND2 or the striking direction indication mark SK which is an indication line in the form of a straight line connecting the non-dimple areas ND1 and ND2 is formed, in addition to the non-dimple areas ND1 and ND2 on the inventive golf ball G, the visibility is improved so that the golfer can easily hit the golf ball G and align the golf ball G in the ball striking direction.

[0076] In order to verify the acting effects of the golf balls G manufactured according to the present invention, testing was performed by a robot ball striking tester using a plurality of golf balls, the test results are illustrated in FIGS. 12 to 16.

[0077] The inventive golf balls G, which are referred to as Kisskey which is a brand name of the present applicant, are configured as two-piece and three-piece golf balls. As in the explanatory view of FIG. 12, four kinds of golf balls which are formed with non-dimple areas ND1 and ND2 on the pole parts PP and the seam line SL were tested using the robot ball striking tester, and golf balls manufactured by other makers, i.e., Bridgestone, Nike, Callaway, TalorMade, and Titleist were tested under the

same condition. The test results were compared with each other.

[0078] The test results are represented in the table of FIG. 13 and the graph of FIG. 14.

[0079] It was found that they are balls having non-dimple areas ND1 and ND2 formed on pole parts PP of two-piece Kisskey golf balls which are the golf balls G configured according to the present invention.

[0080] That is, the golf balls G have the entire distance after the golf balls are hit (a carry distance in which a golf ball flies + a rolling distance in which a golf ball falls on the ground and rolls) of 206.1 yards which is a high rank value, and shows a summit-X axis of 114.3 yards which is the minimum value. Here, the submit-X axis is the distance to the apex on the driving distance. Thus, it was found that the loss of the driving distance according to moving-up and moving-down is the smallest. Accordingly, it has been verified that the configuration of the inventive golf ball G has an effect of increasing the driving distance.

[0081] Under the same condition, the golf balls in which the non-dimple areas ND1 and ND2 are formed on the pole parts PP has a reduced summit X-axis as compared to the golf balls in which the non-dimple areas ND1 and ND2 are formed on the seam line SL. From this, it is believed that the elasticity of the high density region along the seam line SL is high which causes the trajectory to be high and thus, the horizontal distance is reduced.

[0082] This is also found that, as illustrated in the graph of FIG. 14, the golf balls having the non-dimple areas ND1 and ND2 formed on the seam line SL fly higher.

[0083] In addition, Kisskey three-piece golf balls manufactured by the inventors and golf balls manufactured other makers such as Bridgestone, Nike, Callaway, TaylorMade, and Titleist were comparatively tested by intentionally performing slice shot (striking is applied with an angle in relation to a tangential line of a hit face of a golf ball) on the golf balls using the robot ball striking tester.

[0084] As illustrated in FIGS. 15 and 16, the products according to the present invention exhibited the smallest side value deviated from the hitting line, i.e. 7.8 yards, which proves that the rectilinearity by the self-direction controllability was improved.

[0085] The configuration of the inventive golf ball G described above is obtained by providing non-dimple areas ND1 and ND2 on a dimple area DA as in the well-known technique. As described above, the present invention can solve a problem of degrading rectilinearity caused when hitting is applied to a corner portion of a dimple at the time of putting, thereby making the direction control difficult.

[0086] Due to the existence of visible logos formed on the non-dimple areas ND1 and ND2 and the striking direction indication mark connecting the non-dimple areas ND1 and ND2, at time of putting, the ball striking direction of the golf ball G can be easily set and psychological stability is improved, the golfer's psychological withdrawal called "yps" can be improved, and when teeing off, the

most preferable position can be easily set on the golf tee according to the visible logos on the non-dimple areas ND1 and ND2 which guides correct ball striking to increase the driving distance. Even when the ball is sliced, due to the self-direction controllability, the rectilinearity of the golf ball can be ensured as much as possible.

Industrial Applicability

[0087] Although it is intended to practically manufacture and sell the inventive golf balls, it is difficult to make consumers such as golfers to recognize the characteristics of the golf balls G. Thus, a package PC suitable for the inventive golf ball G is illustrated in FIG. 17.

[0088] The present package PC is formed in an envelope shape formed as a packing body formed by paper and vinyl to accommodate the inventive golf ball G and a ball window 101 is formed in the package PC so that the golf ball is partly exposed. In such a case, when any one of the non-dimple areas ND1 and ND2 of the golf ball G is exposed when the golf ball G is packed, the users such as golfers may easily grasp the usefulness of the golf ball G through the real golf ball G and the descriptions thereof provided on the package PC on a selling table or the like, and the sale of the inventive golf ball G can be promoted.

Claims

1. A golf ball including one or more non-dimple areas that do not have dimples are provided in relation to a dimple area having a plurality of dimples arranged on the entire outer surface of the golf ball, wherein the non-dimple areas are two non-dimple areas which are positioned to face opposite directions from each other on an axial central line that passes through an axial center of the golf ball, and which are surrounded by other dimples, and recessed circular arcs of dimples in the dimple area are distributed with variable diameter sizes so as to compensate for the whole volume of the golf ball which is reduced by the provision of the non-dimple areas.
2. The golf ball of claim 1, wherein the pair of non-dimple areas are positioned on: an equator line formed by a seam line which is formed when outer covers are bonded to each other within a mold when manufacturing the golf ball; and pole parts which face opposite directions from each other on an axial center line passing through the axial center of the golf ball and which are perpendicular to the axial center line.
3. The golf ball of claim 1, wherein the dimples of the dimple area are arranged symmetrically with reference to the equator line which is a center line of an outer surface of the golf ball which is perpendicular to the axial center line which connects the non-dimple areas and passes through the axial center of the golf ball.
4. The golf ball of claim 1, wherein in order to compensate for the entire volume of the golf ball which is reduced by providing the non-dimple area, the diameter sizes of the dimples are variably and symmetrically distributed to be symmetrical with reference to the equator line which is the center line of the outer surface of the golf ball and is perpendicular to the axial center line passing through the axial center of the golf ball while connecting the non-dimple areas.
5. The golf ball of claim 1, wherein the diameter of the non-dimple areas formed by being surrounded by the dimple area is in a range of 7 mm to 20 mm.
6. The golf ball of any one of claims 1 to 5, further comprising a visible mark having high visibility such as a maker's logo, sign, or symbol which is printed on the non-dimple areas.
7. The golf ball of any one of claims 1 to 5, further comprising a striking direction indication mark printed on the outer surface of the golf ball so as to allow a user to recognize a striking direction, such as a symbol or a straight line on the straight line visually connecting the non-dimple areas.
8. The golf ball of claim 6, further comprising a striking direction indication mark printed on the outer surface of the golf ball so as to allow a user to recognize a striking direction, such as a symbol or a straight line on the straight line visually connecting the non-dimple areas.

Fig. 1a

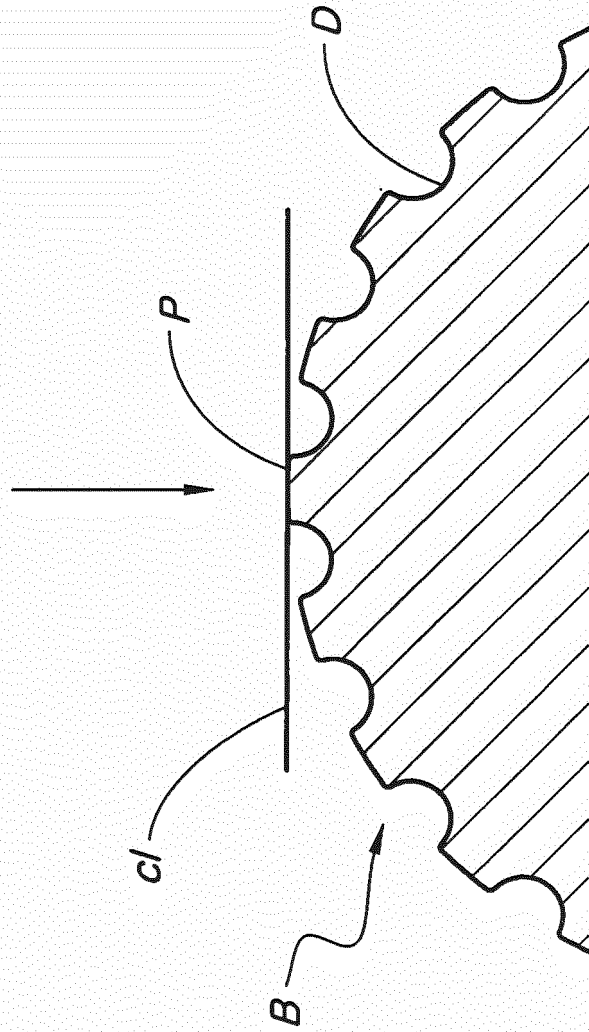


Fig. 1b

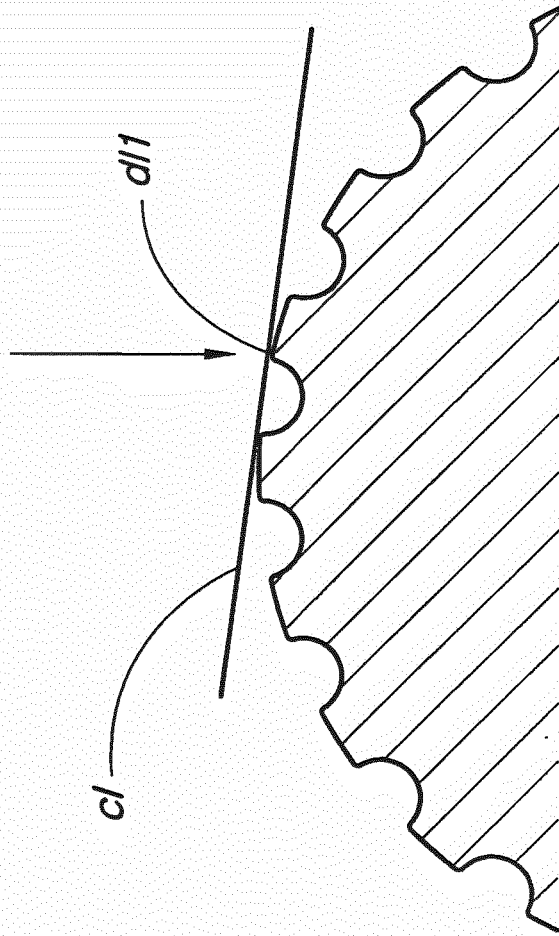


Fig. 1c

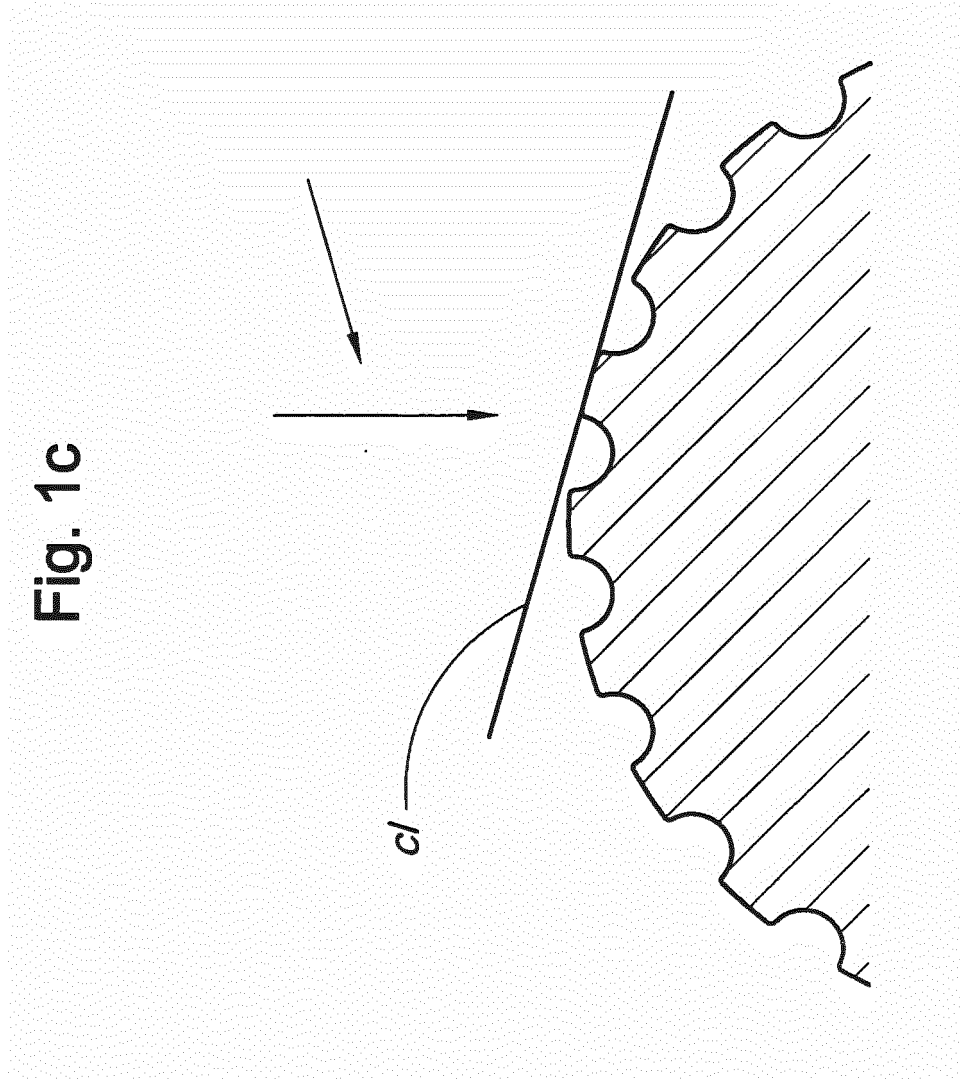


Fig. 2

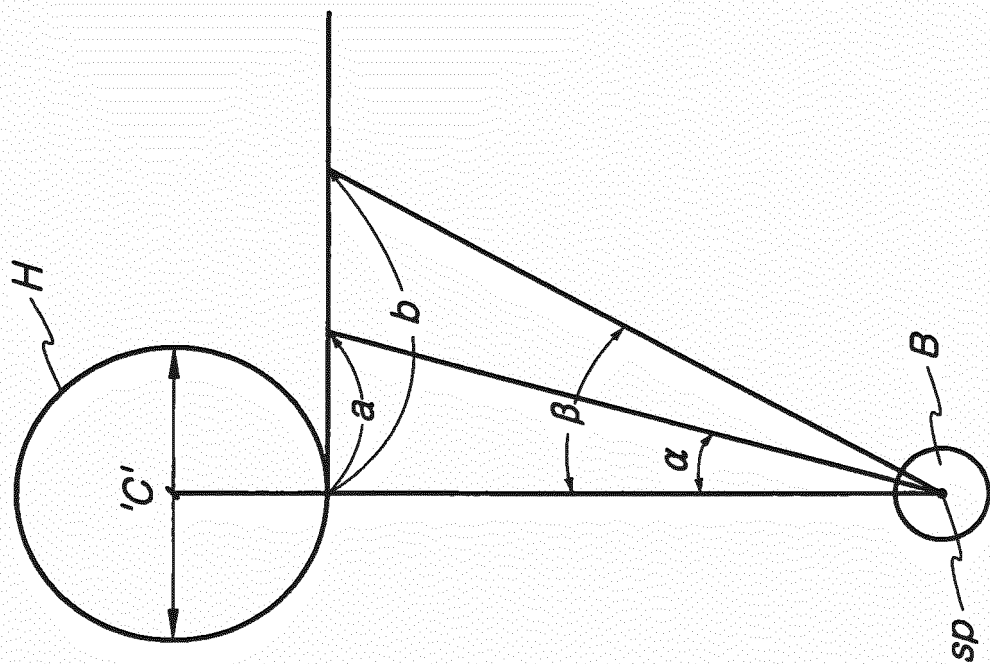
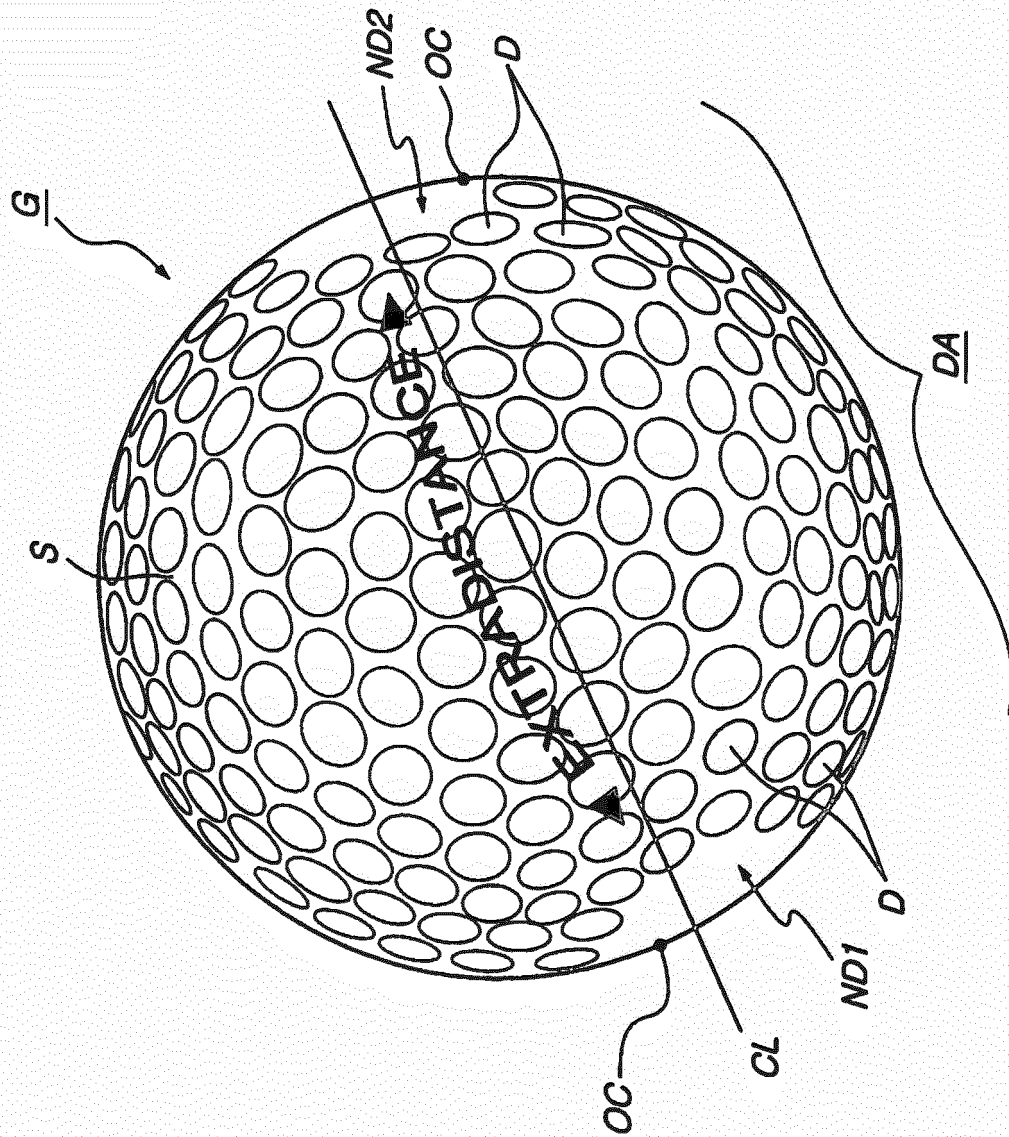


Fig. 3



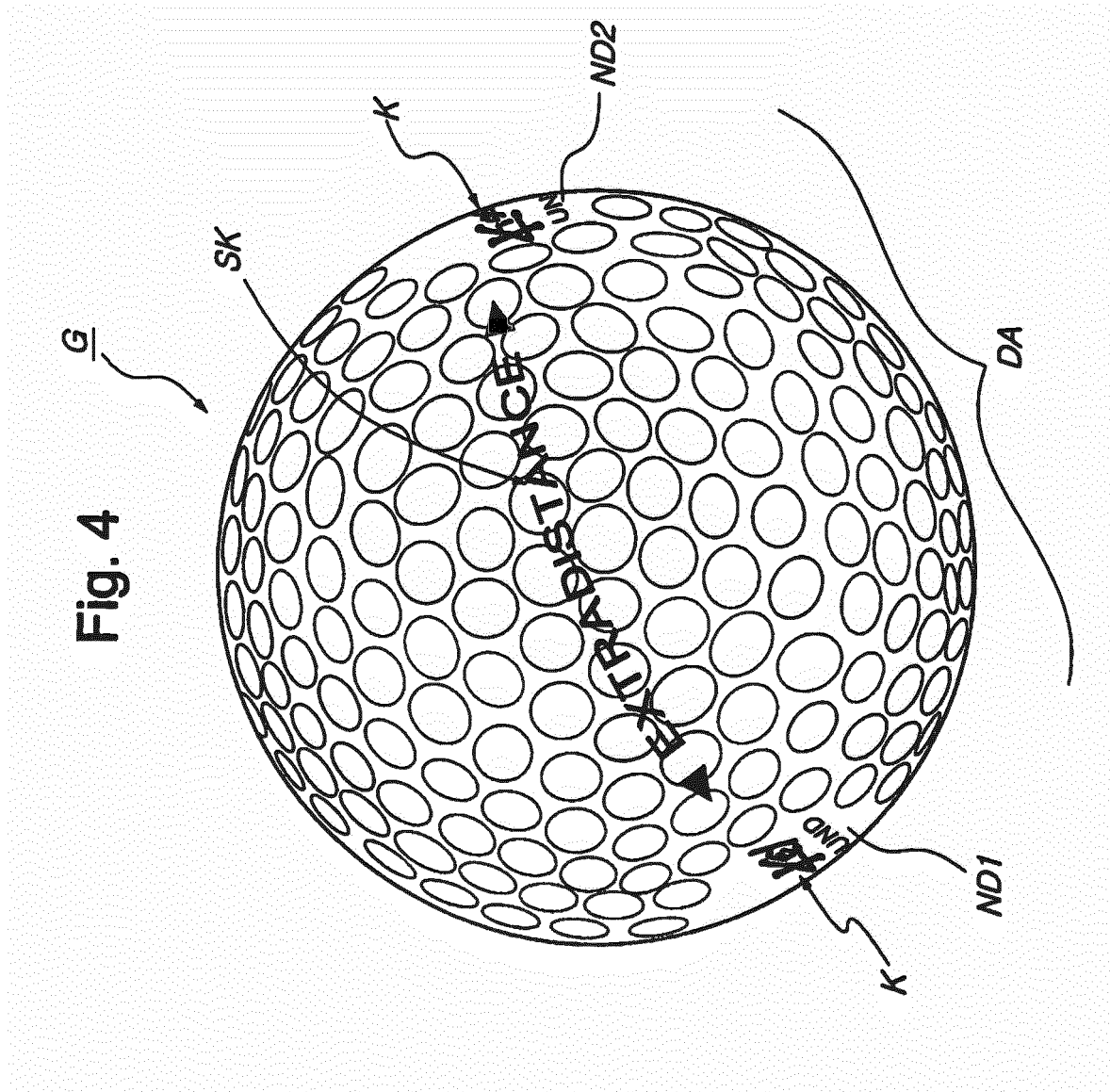


Fig. 5a

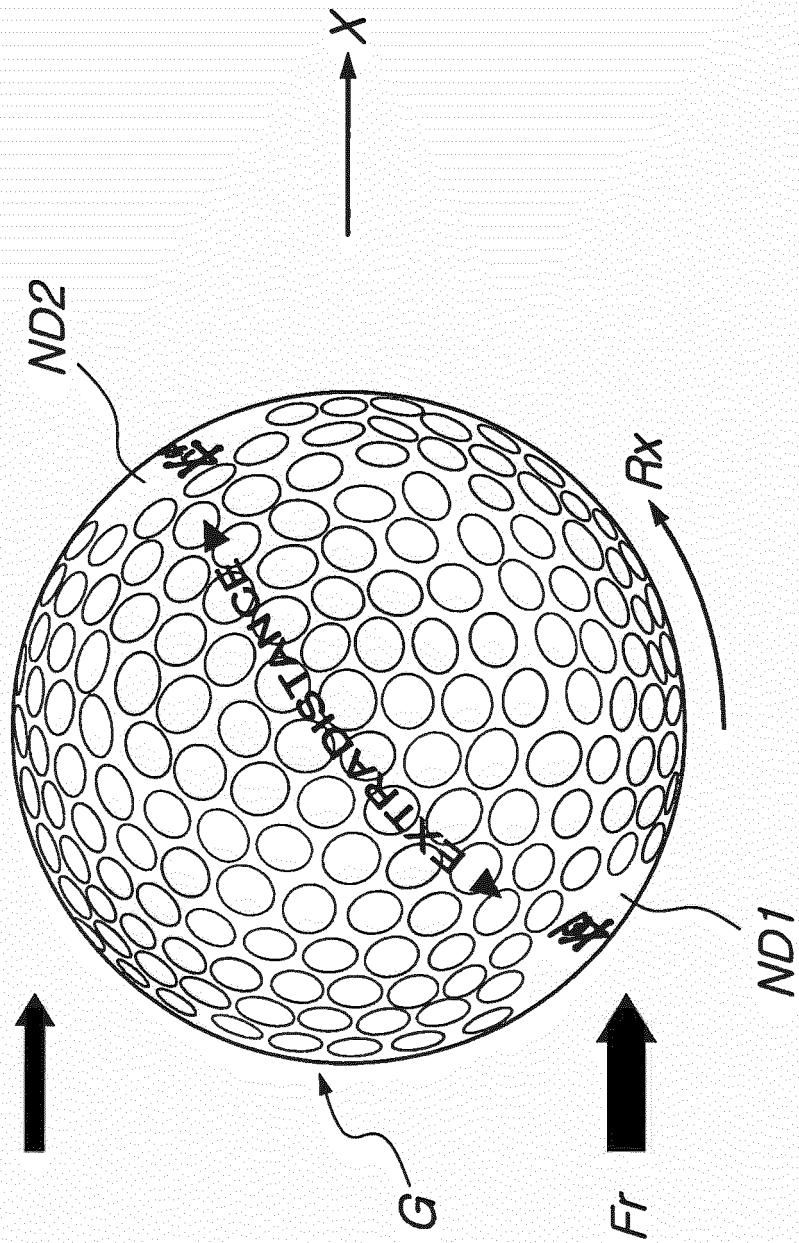


Fig. 5b

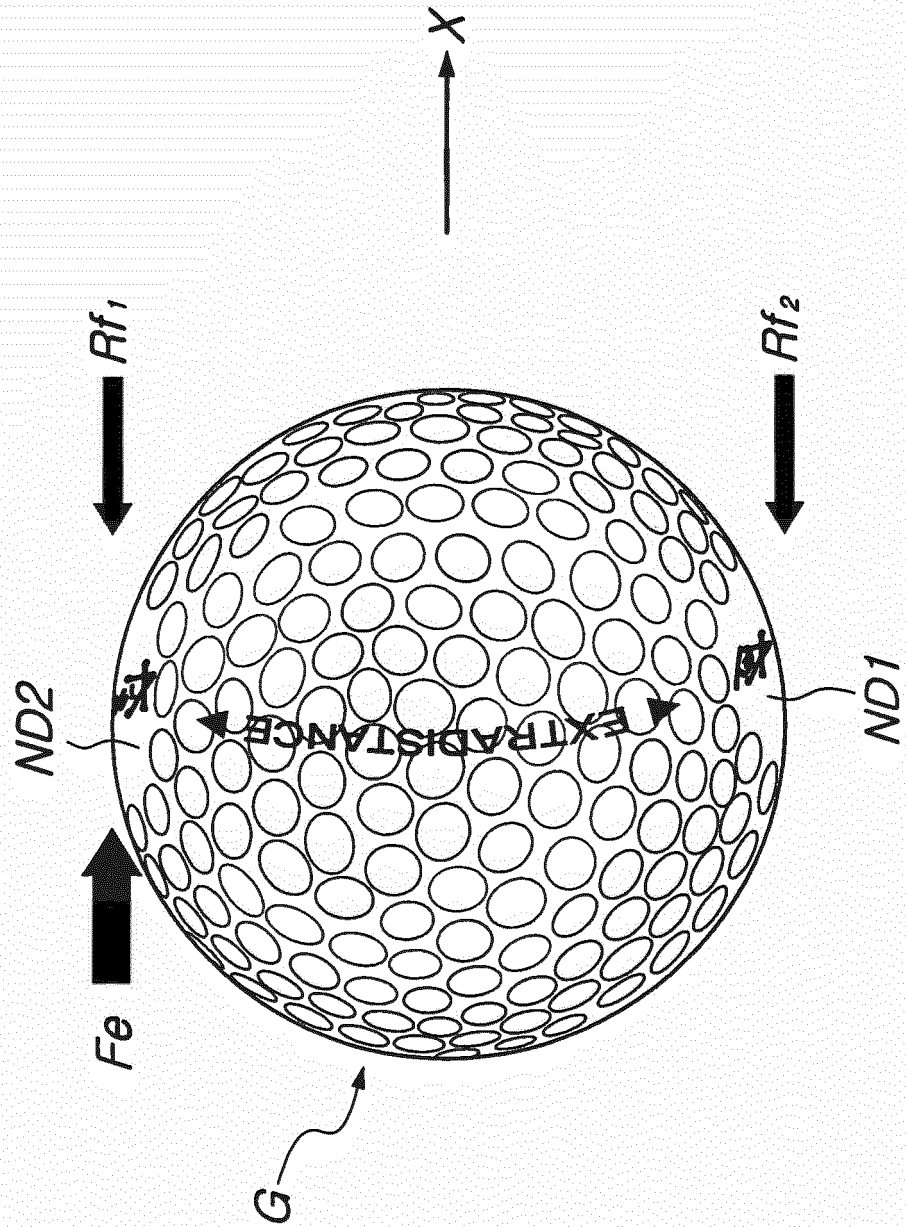


Fig. 6a

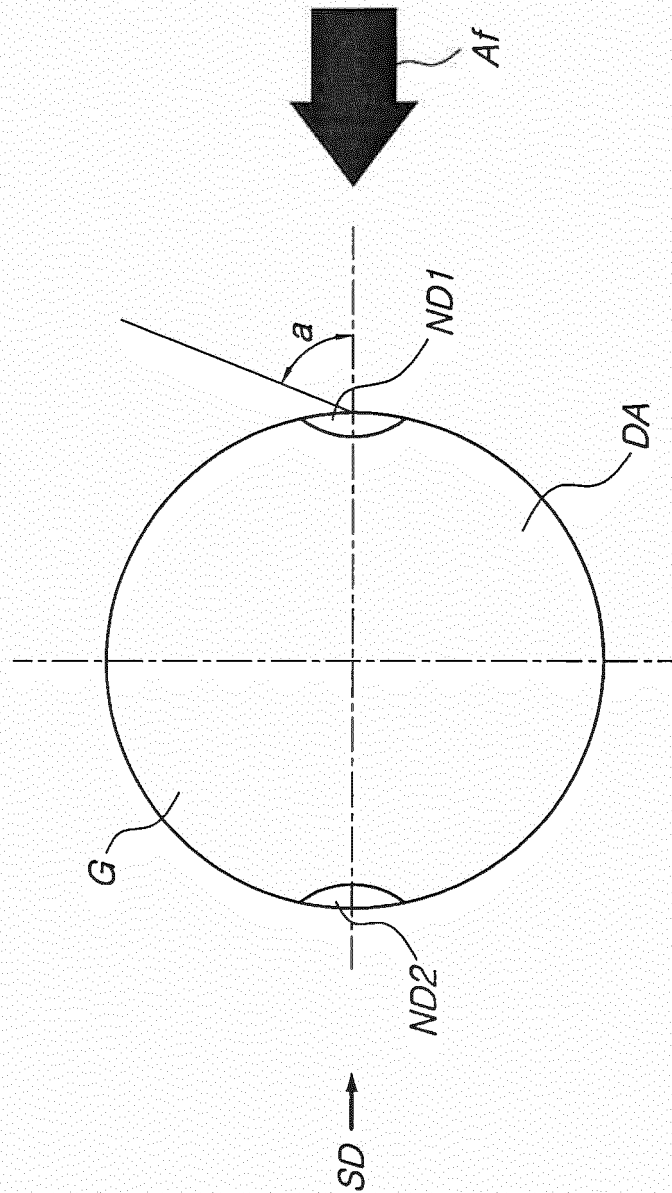


Fig. 6b

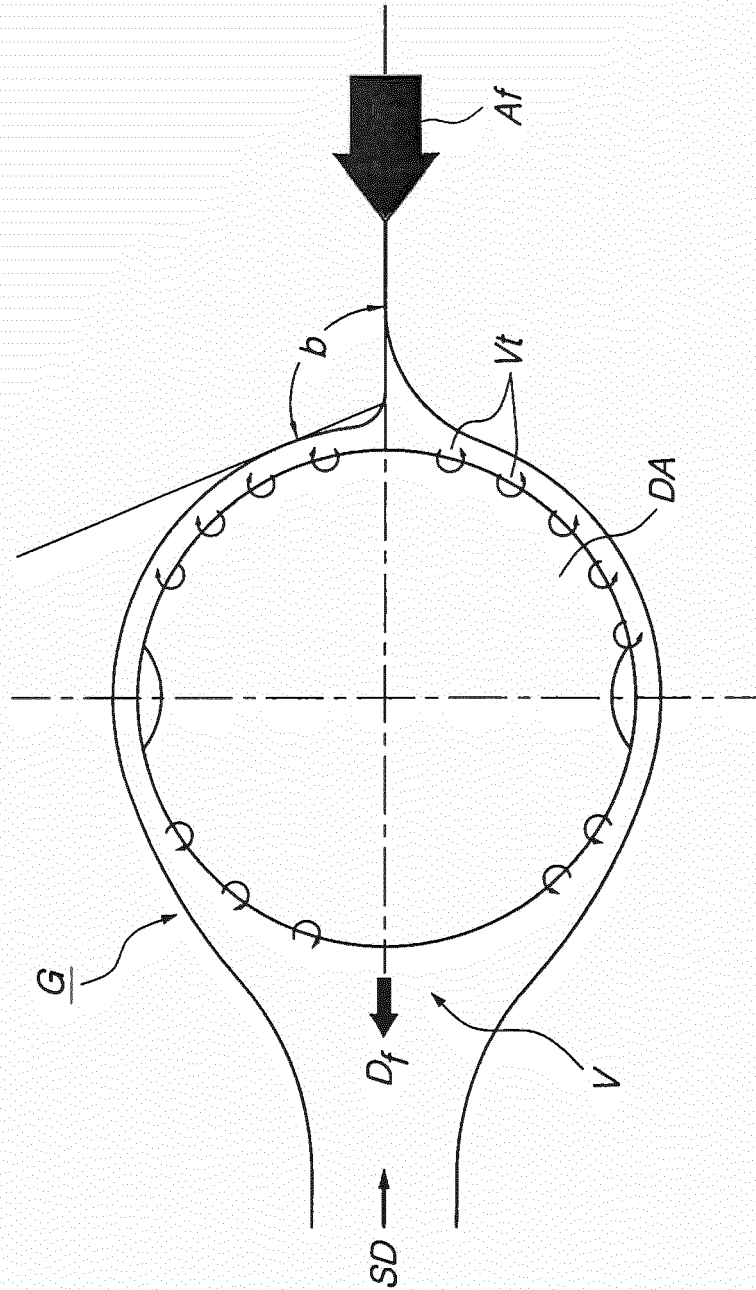


Fig. 7a

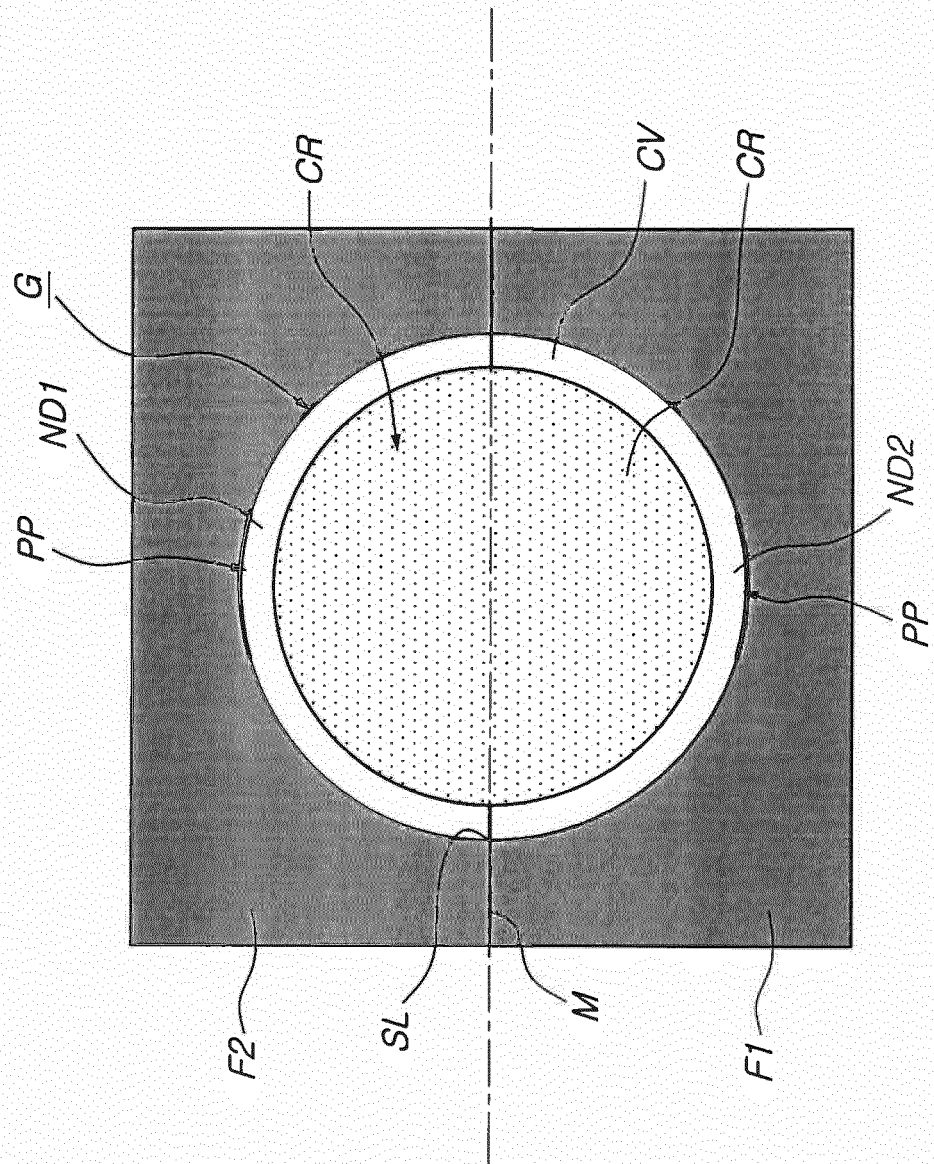


Fig. 7b

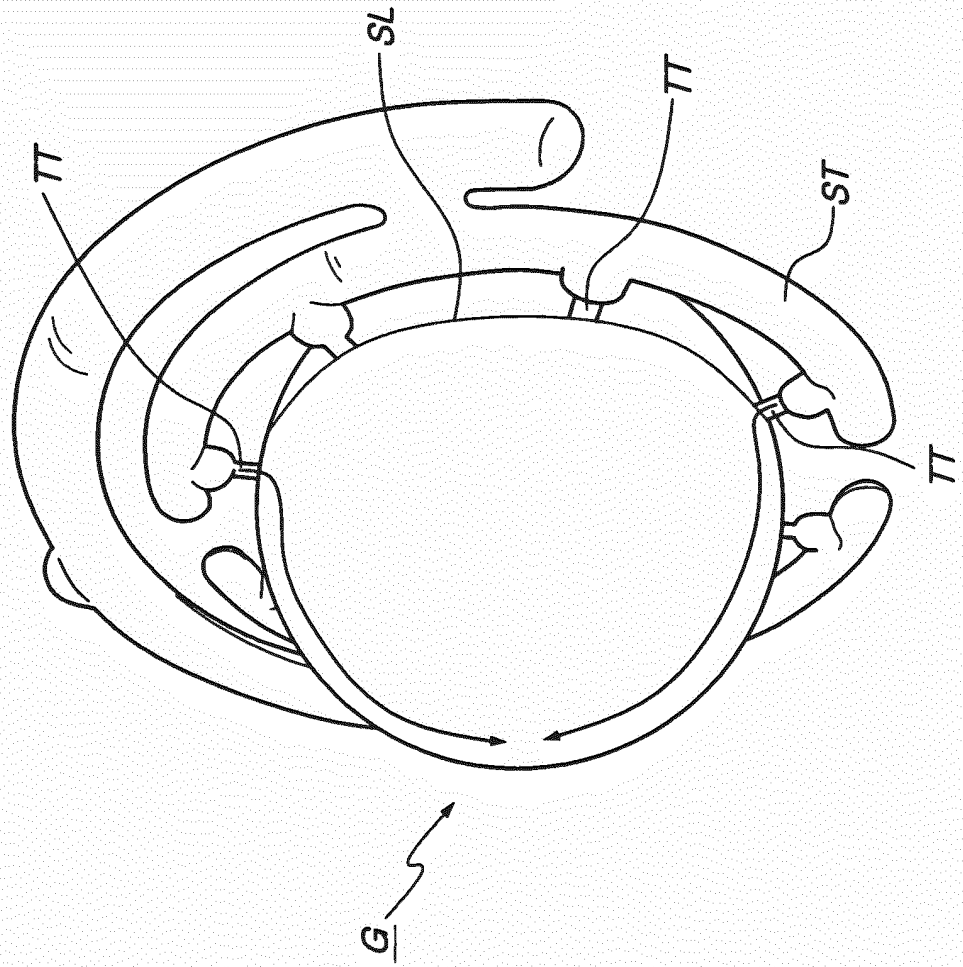


Fig. 8

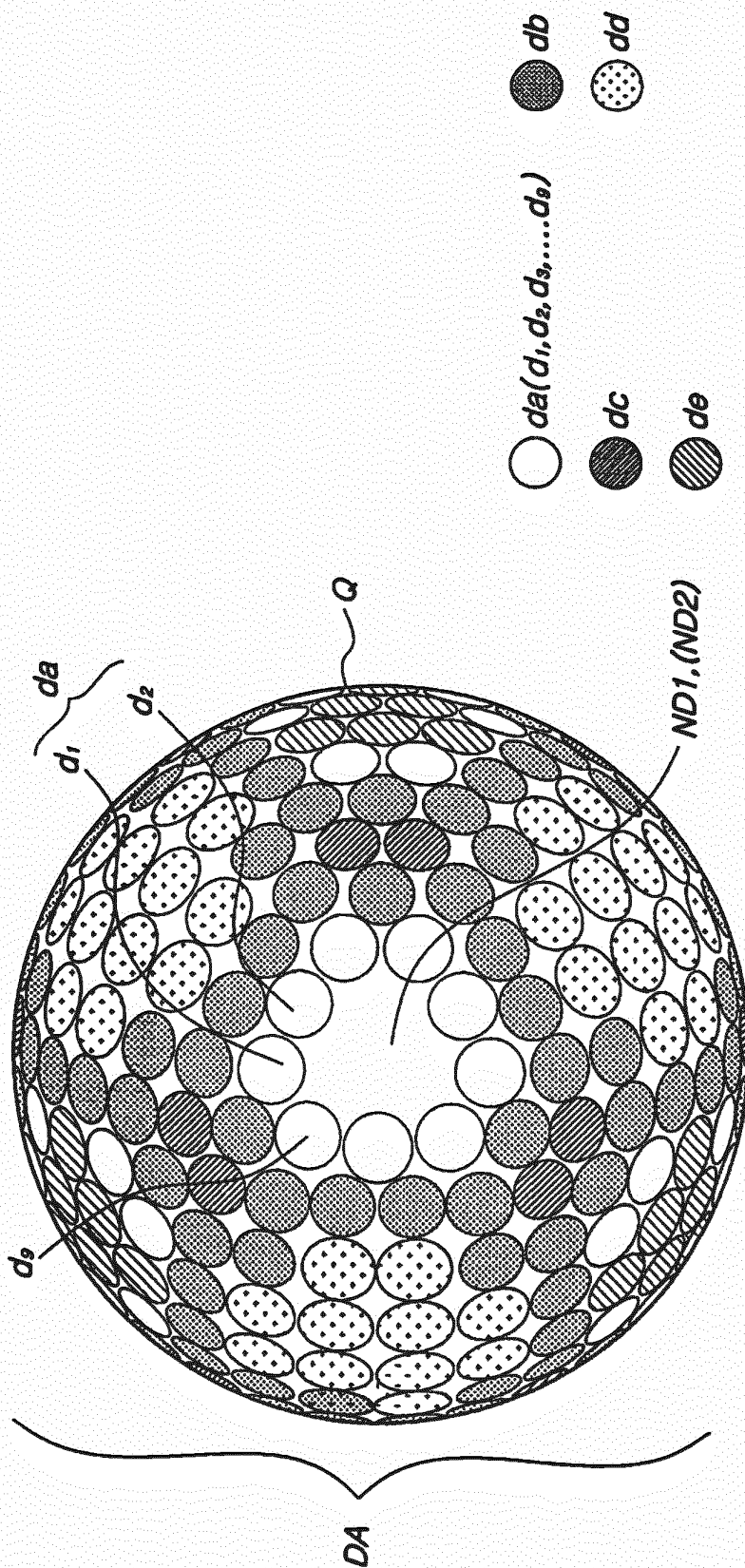


Fig. 9

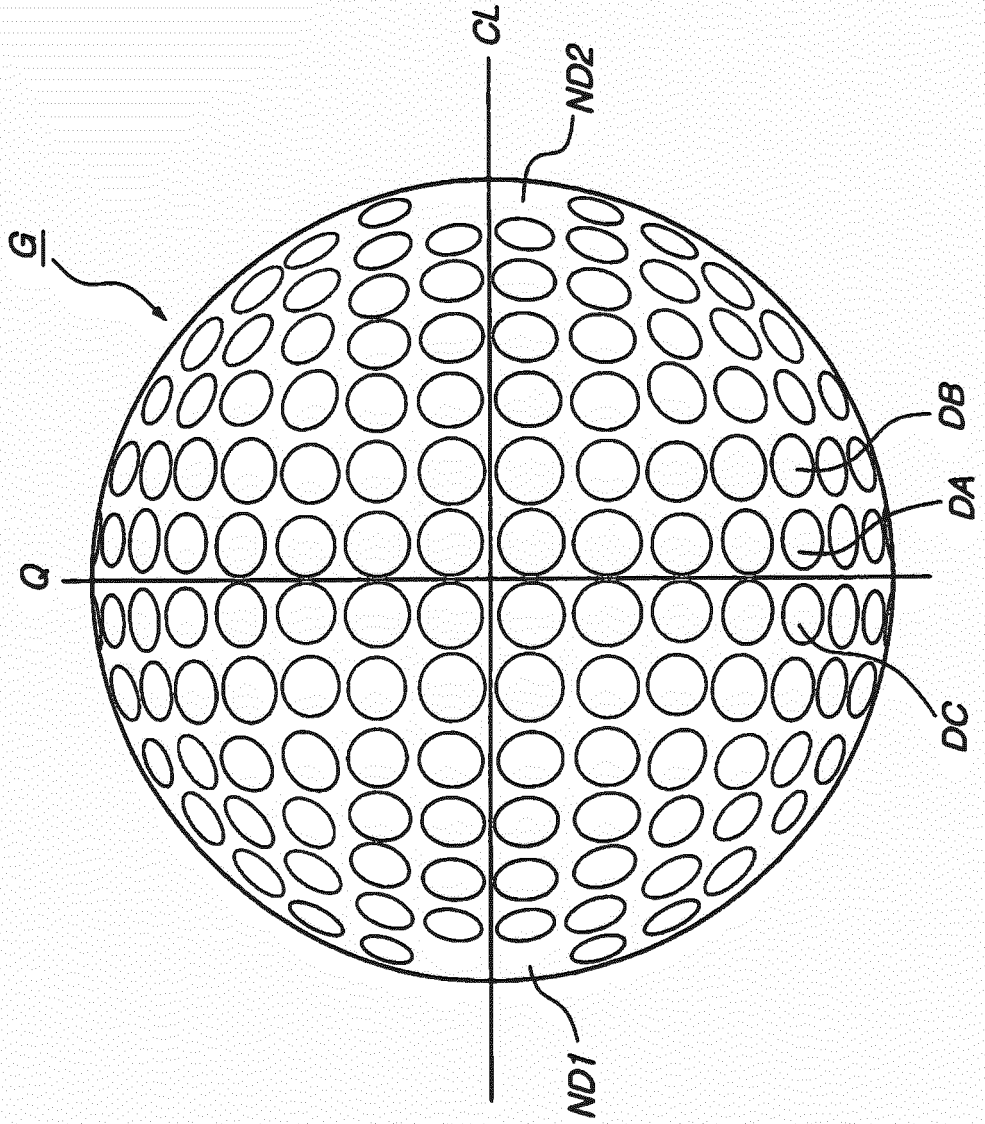


Fig. 10

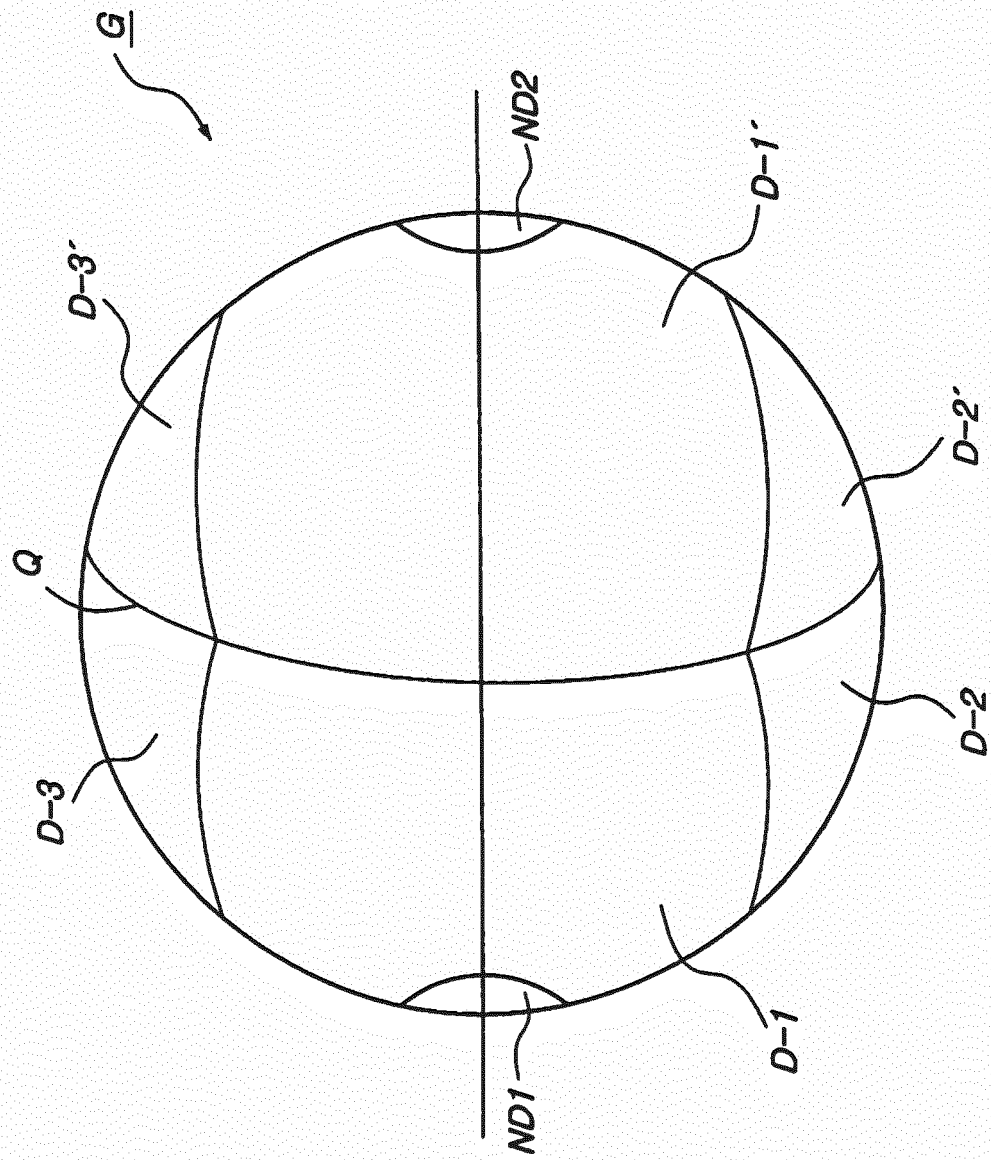


Fig. 11

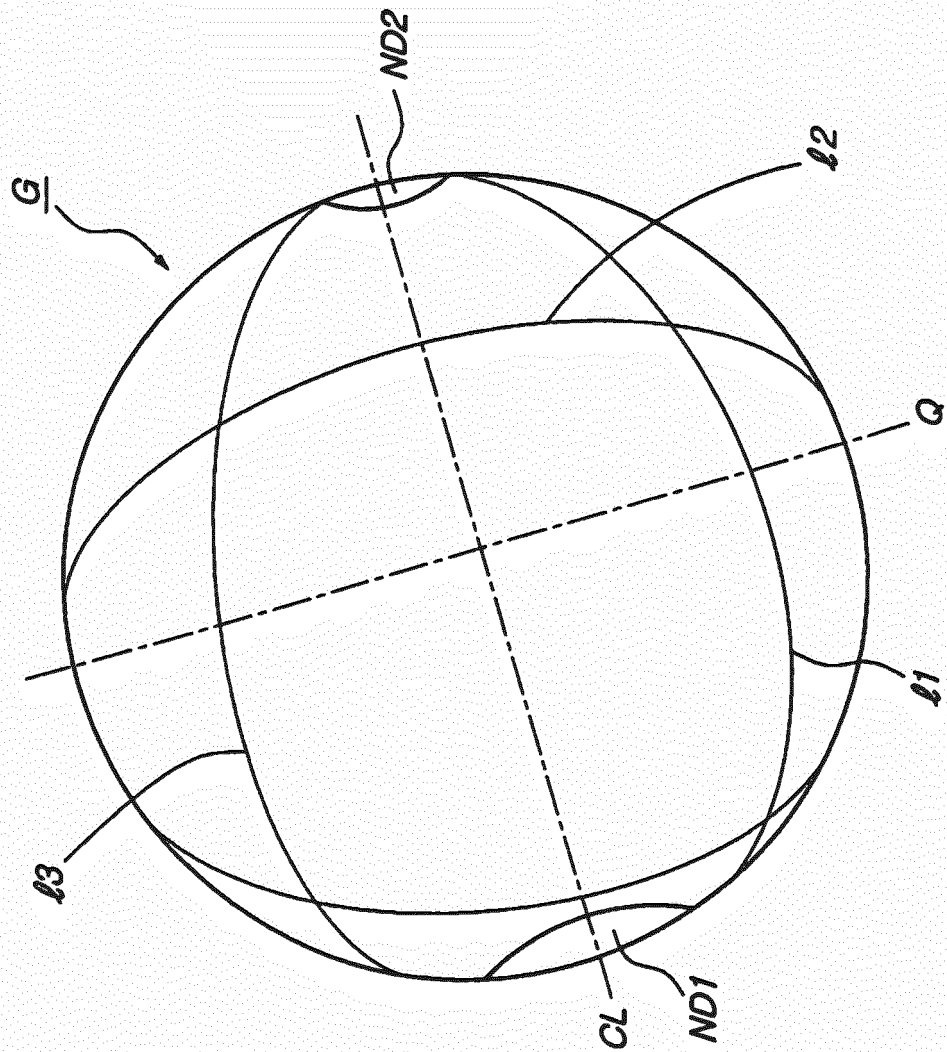


Fig. 12

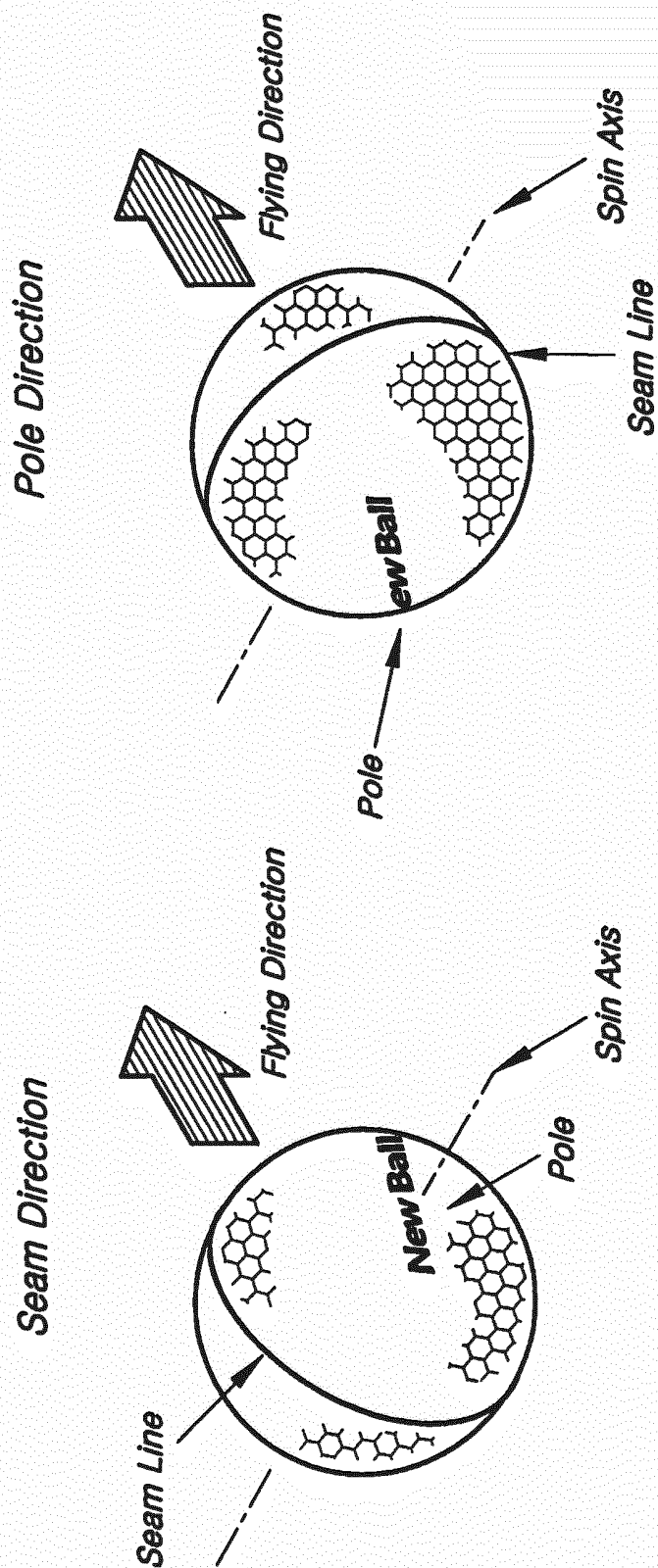


Fig. 13

	Club Speed (mph)	Ball Speed (mph)	L/A	Spin Rate (rpm)	Summit X axis(yd)	Height (yd)	Carry (yd)	Flight time	Total (yd)
kisskey 2PC-POLE	90.2	128.5	11.3	2411.4	114.3	18.4	179.4	5.0	206.1
Kisskey 2PC-SEAM	89.8	128.9	10.8	2537.6	118.8	20.5	174.8	5.3	191.6
kisskey 3PC-POLE	90.2	129.3	11.4	2337.8	114.7	18.8	180.0	5.1	204.6
Kisskey 3PC-SEAM	90.9	129.9	11.1	2482.7	116.5	19.6	175.5	5.1	197.3
Bridgestone e6+	90.9	127.2	11.3	2437.2	118.5	18.6	179.2	5.3	202.6
Nike Vapor BLACK	89.9	128.2	11.1	2521.1	121.0	19.6	181.0	5.4	202.3
Callaway Big BLD	91.0	128.8	11.1	2479.4	121.4	20.0	185.0	5.4	207.0
TaylorMade ROCKETBALLZ	90.7	128.8	11.2	2560.5	125.8	21.3	180.2	5.7	198.5
Titleist NXT Tour	90.6	129.1	10.9	2552.0	122.3	20.8	181.4	5.4	199.7

Fig. 14

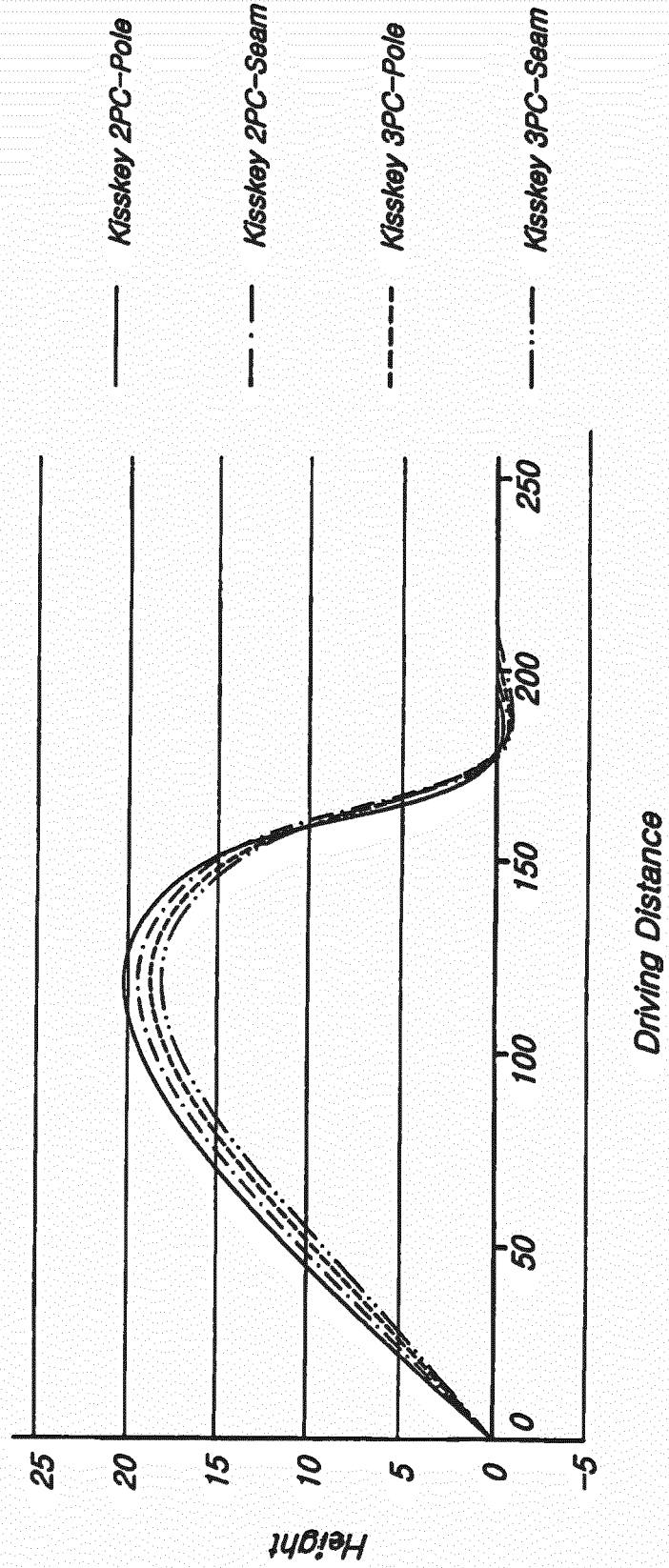


Fig. 15

	Club Speed (mph)	Ball Speed (mph)	Launch Angle (deg)	Spin Rate (rpm)	Spin Axis (deg)	Summit X axis (yd)	Height (yd)	Carry (yd)	Side (yd)	Landing Angle (deg)	Flight time	Total (yd)
Kisskey 3PC Ball	89.7	126.0	12.3	2893.9	-7.3	117.6	19.5	185.8	7.8	-31.3	4.9	213.9
Bridgestone e6+	90.0	124.0	12.1	2851.9	-4.8	117.6	19.7	182.8	11.1	-34.1	5.1	211.2
Nike Vapor BLACK	90.4	124.7	11.9	2889.2	-4.7	117.9	19.5	186.2	11.1	-33.9	5.1	212.5
Callaway Big BLD	90.7	125.5	11.8	2961.2	-6.6	121.3	20.4	188.5	8.4	-35.5	5.2	212.7
TaylorMade ROCKETBALLZ	90.3	124.9	12.0	2954.9	-4.5	120.0	21.5	185.2	10.9	-36.9	5.1	209.5
Titleist NXT Tour	90.8	125.5	11.9	3006.5	-5.8	120.2	20.8	185.1	10.4	-36.0	5.1	210.3

Fig. 16

Slice Chart

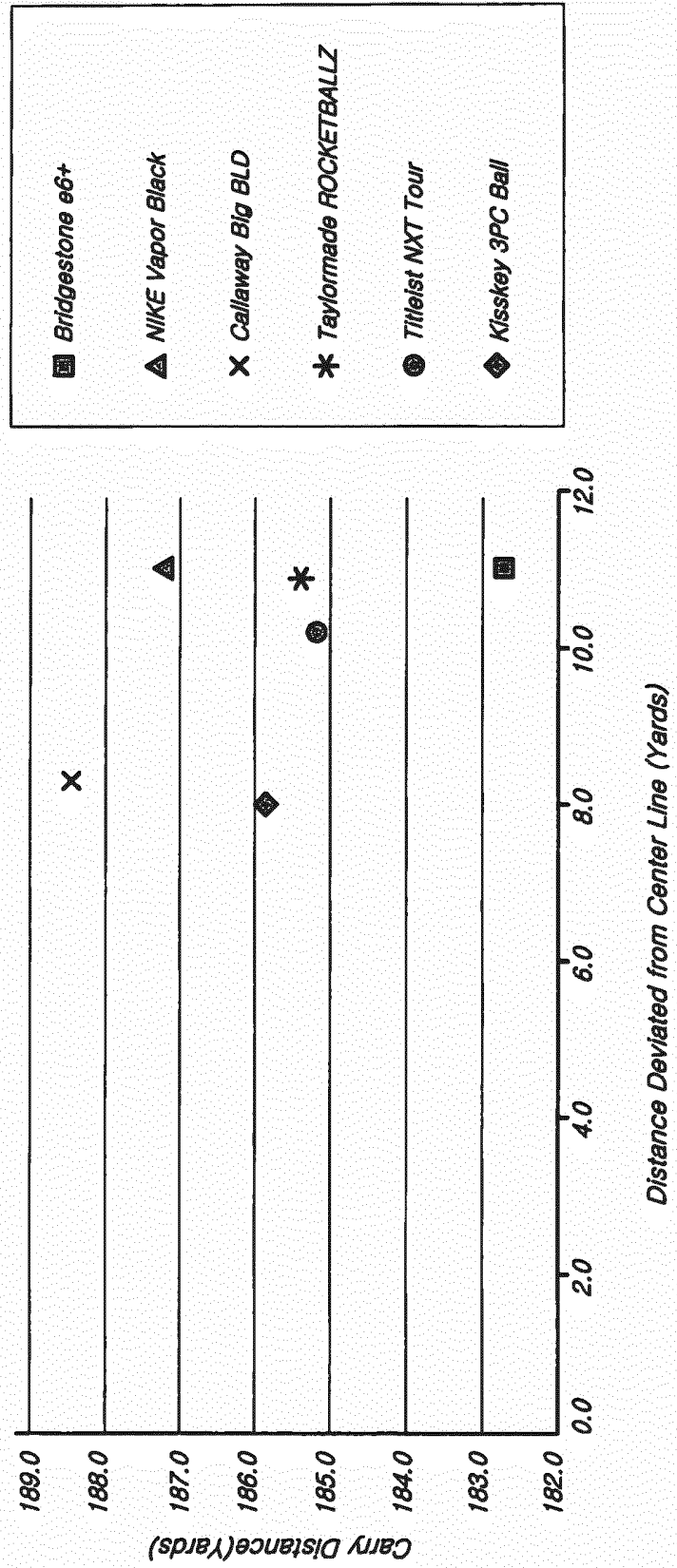
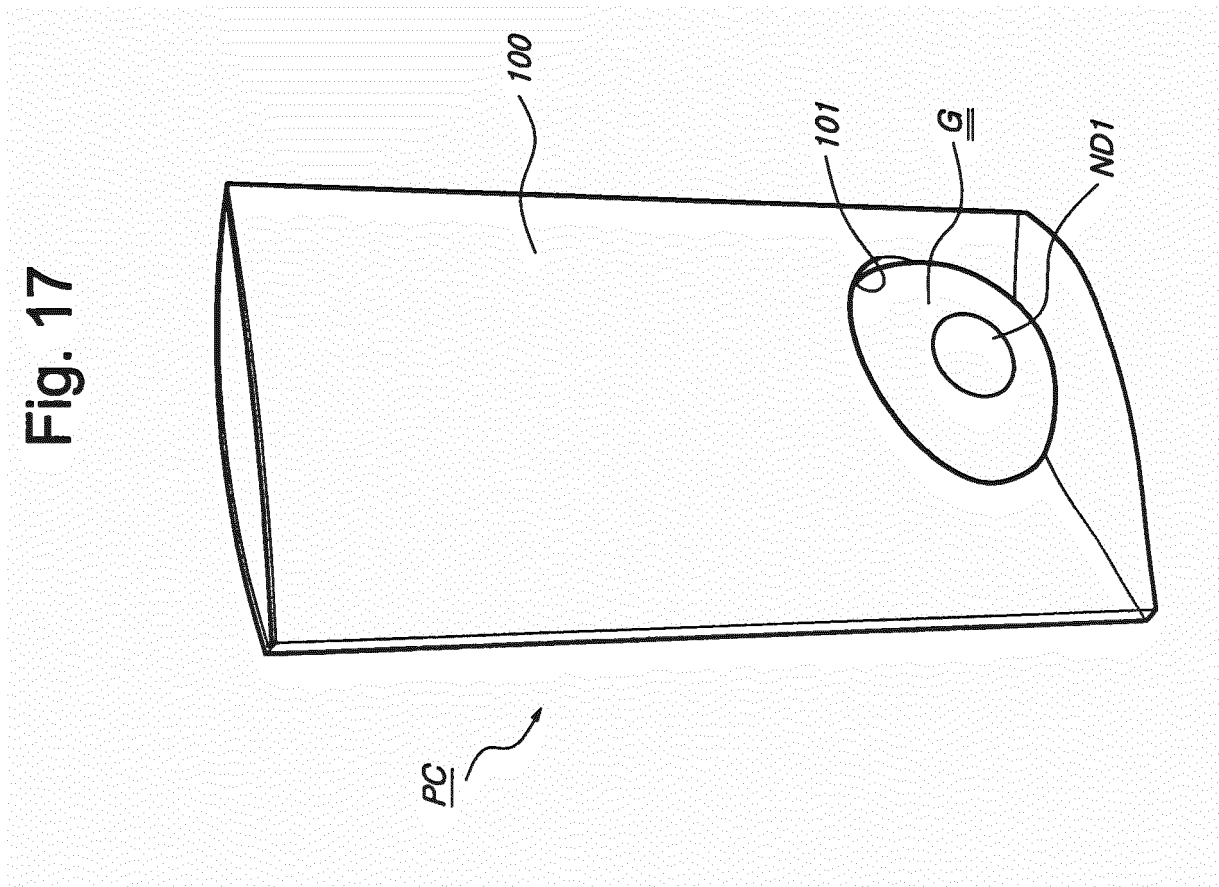


Fig. 17



INTERNATIONAL SEARCH REPORT

International application No.

PCT/KR2013/002507

A. CLASSIFICATION OF SUBJECT MATTER

A63B 37/14(2006.01)i, A63B 37/00(2006.01)i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A63B 37/14; A63B 69/36; A63B 39/00; A63B 37/00

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

Korean Utility models and applications for Utility models: IPC as above

Japanese Utility models and applications for Utility models: IPC as above

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

eKOMPASS (KIPO internal) & Keywords: golf, dimple, diameter, mark, blow, putting, putter

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2003-0211903 A1 (HANADA, Hideto et al.) 13 November 2003 See abstract, claim 1, column 3, lines 3-13 and figure 1.	1-8
A	JP 07-124273A (SUMITOMO RUBBER IND LTD) 16 May 1995 See abstract, claims 1-3, figures 1-4.	1-8
A	US 05662530 A (SELLAR, John G.) 02 September 1997 See abstract, claims 1-10, figures 1-3.	1-8
A	KR 10-2012-0079145 A (THE YOKOHAMA RUBBER CO., LTD.) 11 July 2012 See abstract, claims 23-24, figure 3.	1-8

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

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"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

24 JULY 2013 (24.07.2013)

Date of mailing of the international search report

25 JULY 2013 (25.07.2013)

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/KR2013/002507

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JP 07-124273A	16/05/1995	AU 680049 B2 AU 680049 B2 AU 7755694 A AU 7755694 A CA 2134577 A1 DE69426854 D1 DE69426854 T2 EP 0650745 A1 EP 0650745 B1 JP 03-080290B2 KR 10-0336047 B1 US 05467994 A	17/07/1997 17/07/1997 18/05/1995 18/05/1995 03/05/1995 19/04/2001 04/10/2001 03/05/1995 14/03/2001 21/08/2000 18/11/2002 21/11/1995
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REFERENCES CITED IN THE DESCRIPTION

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- JP 2001321461 A [0013]
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