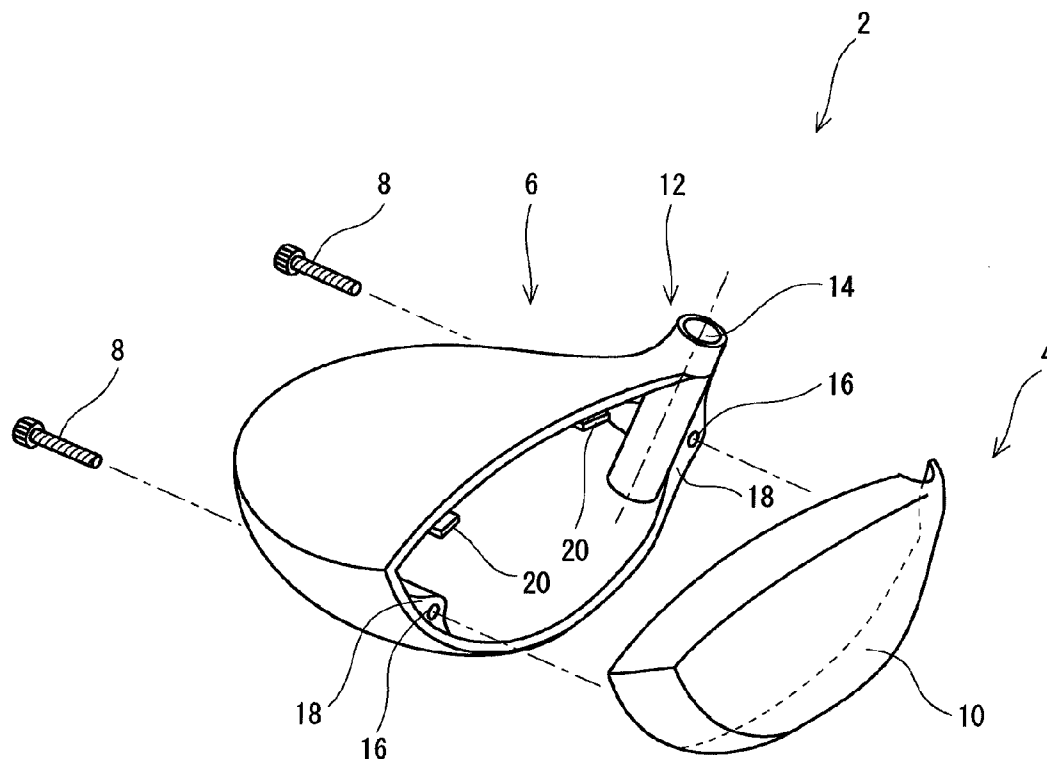




US 20120071258A1

(19) **United States**(12) **Patent Application Publication**
Yamaguchi et al.(10) **Pub. No.: US 2012/0071258 A1**(43) **Pub. Date: Mar. 22, 2012**(54) **GOLF CLUB****Publication Classification**(75) Inventors: **Tetsuo Yamaguchi**, Kobe-shi (JP);
Tomio Kumamoto, Kobe-shi (JP)(51) **Int. Cl.**
A63B 53/00 (2006.01)
A63B 53/16 (2006.01)
A63B 53/06 (2006.01)
(52) **U.S. Cl. 473/287; 473/282; 473/296; 473/314; 473/334**(73) Assignee: **SRI SPORTS LIMITED**, Kobe-shi (JP)(57) **ABSTRACT**(21) Appl. No.: **13/234,208**

A golf club of the present invention comprises at least one adjusting mechanism. In the golf club, at least two specifications can be adjusted independently of each other. Preferably, a head, a shaft, a grip, or a joined part therebetween has an adjusting mechanism (1). The head, the shaft, the grip, or the joined part has further other adjusting mechanism (2). Preferably, the adjusting mechanism (1) and the adjusting mechanism (2) can work independently of each other. The number of the adjusting mechanisms is not restricted. Since the plurality of specifications can be adjusted independently of each other, a degree of freedom of adjustability is improved. These adjusting mechanisms can improve accuracy of the adjustability. The specification capable of being adjusted is not restricted.

(22) Filed: **Sep. 16, 2011**(30) **Foreign Application Priority Data**Sep. 17, 2010 (JP) 2010-208923
Jul. 29, 2011 (JP) 2011-166179

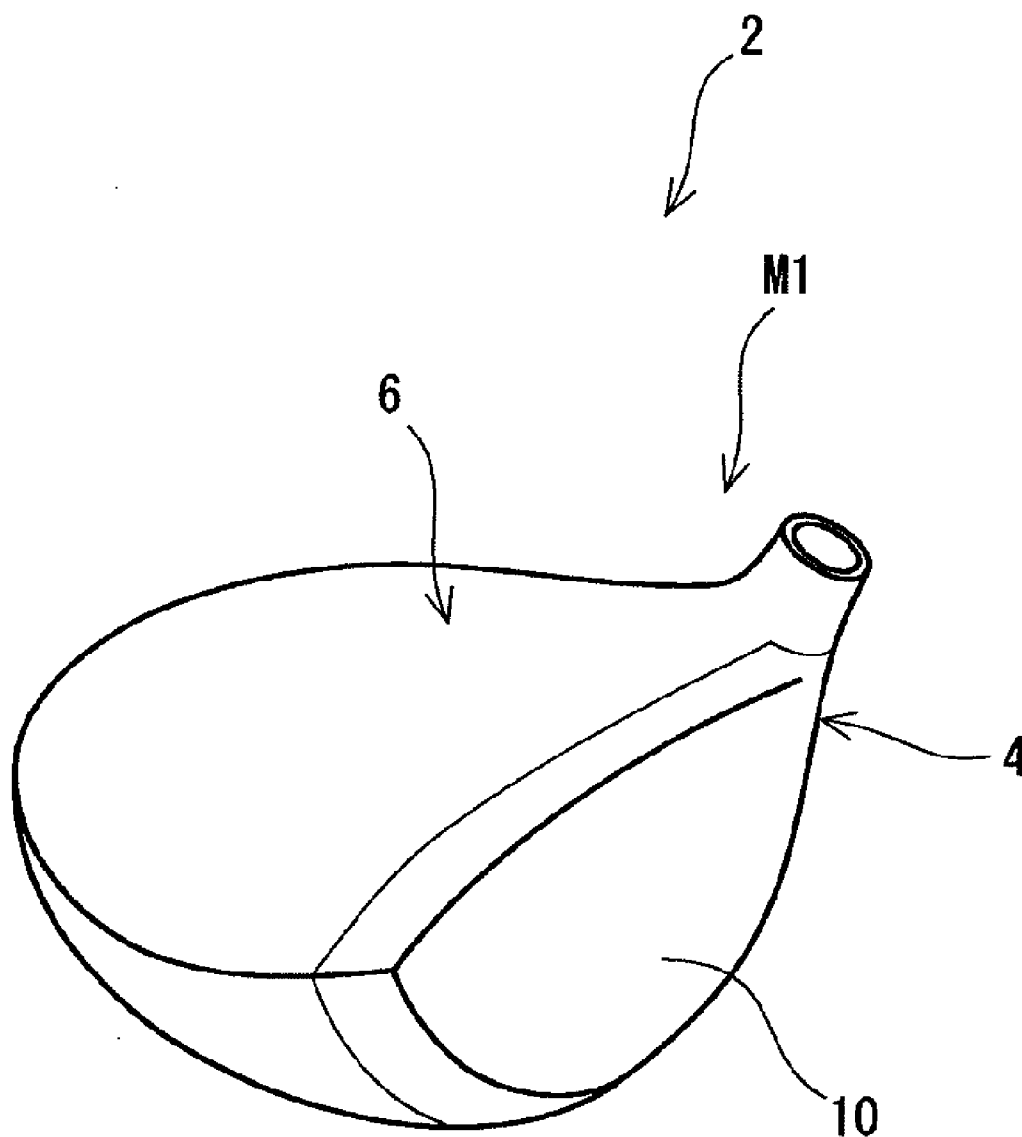


Fig. 1

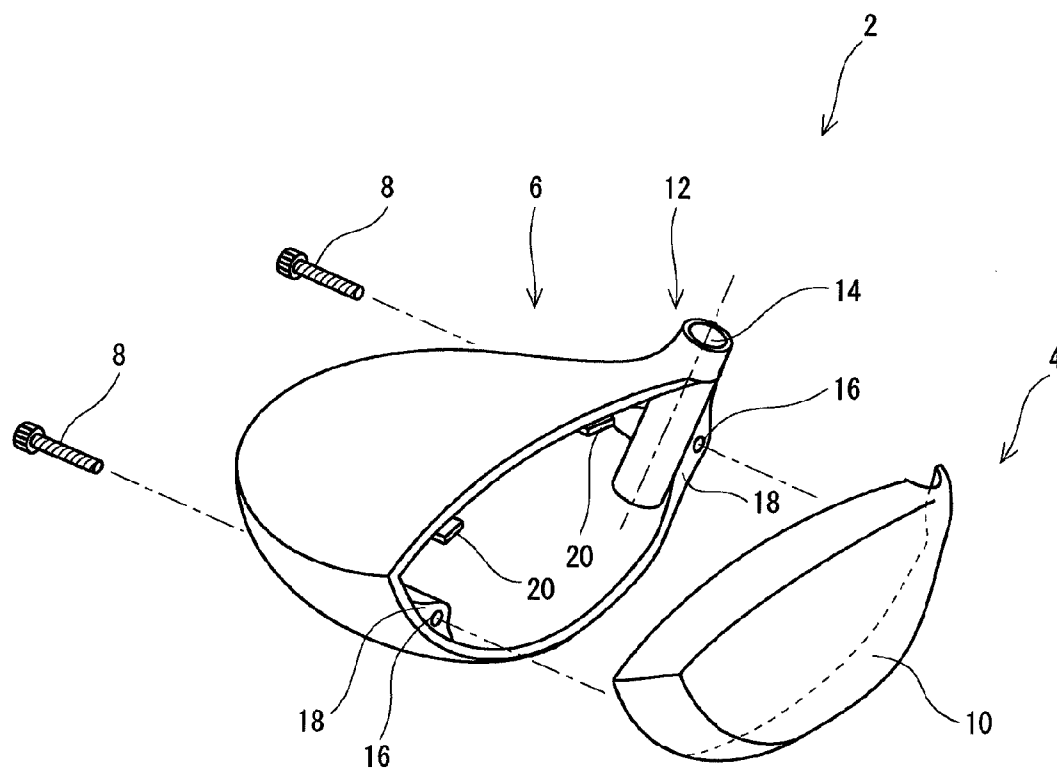


Fig. 2

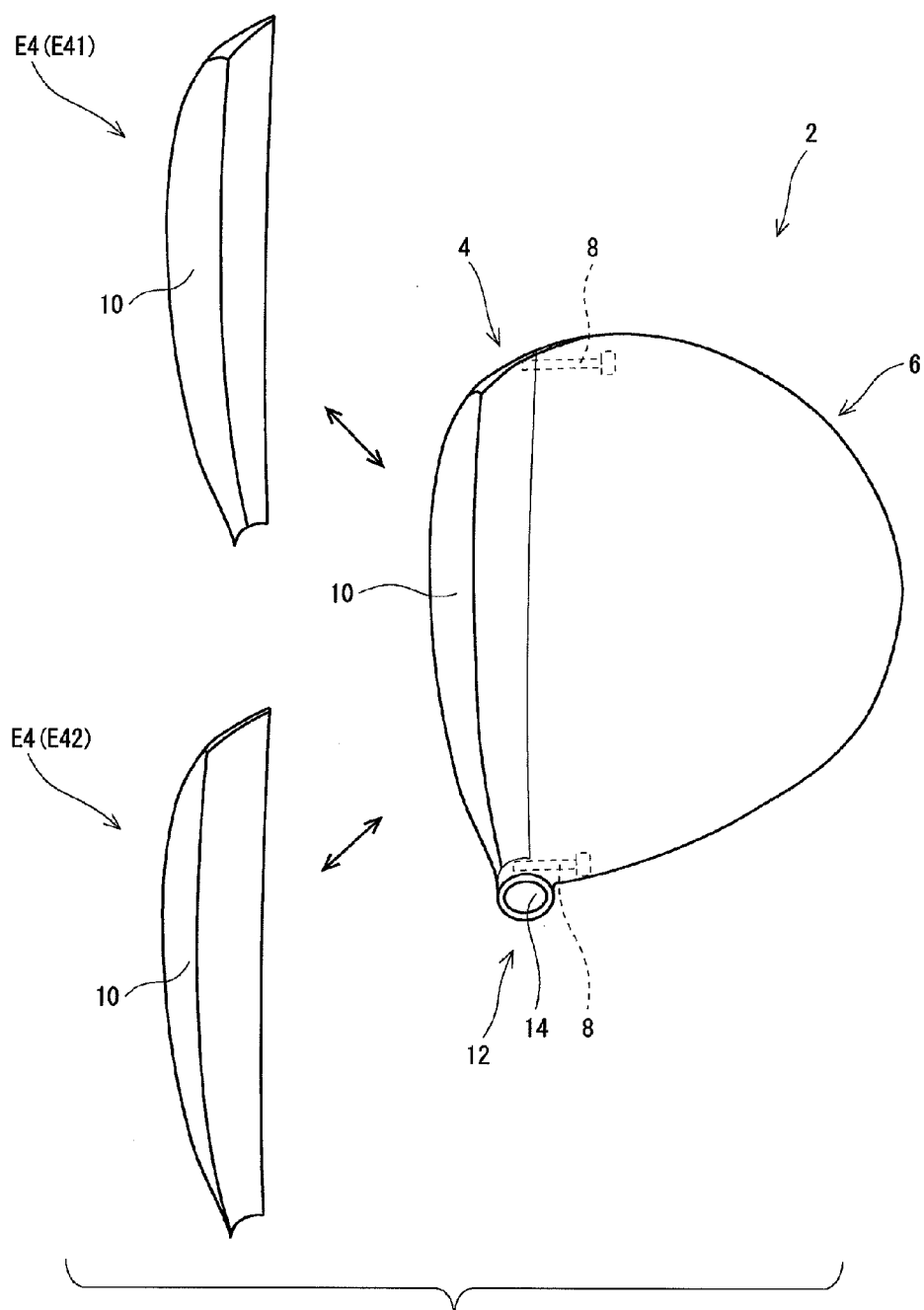


Fig. 3

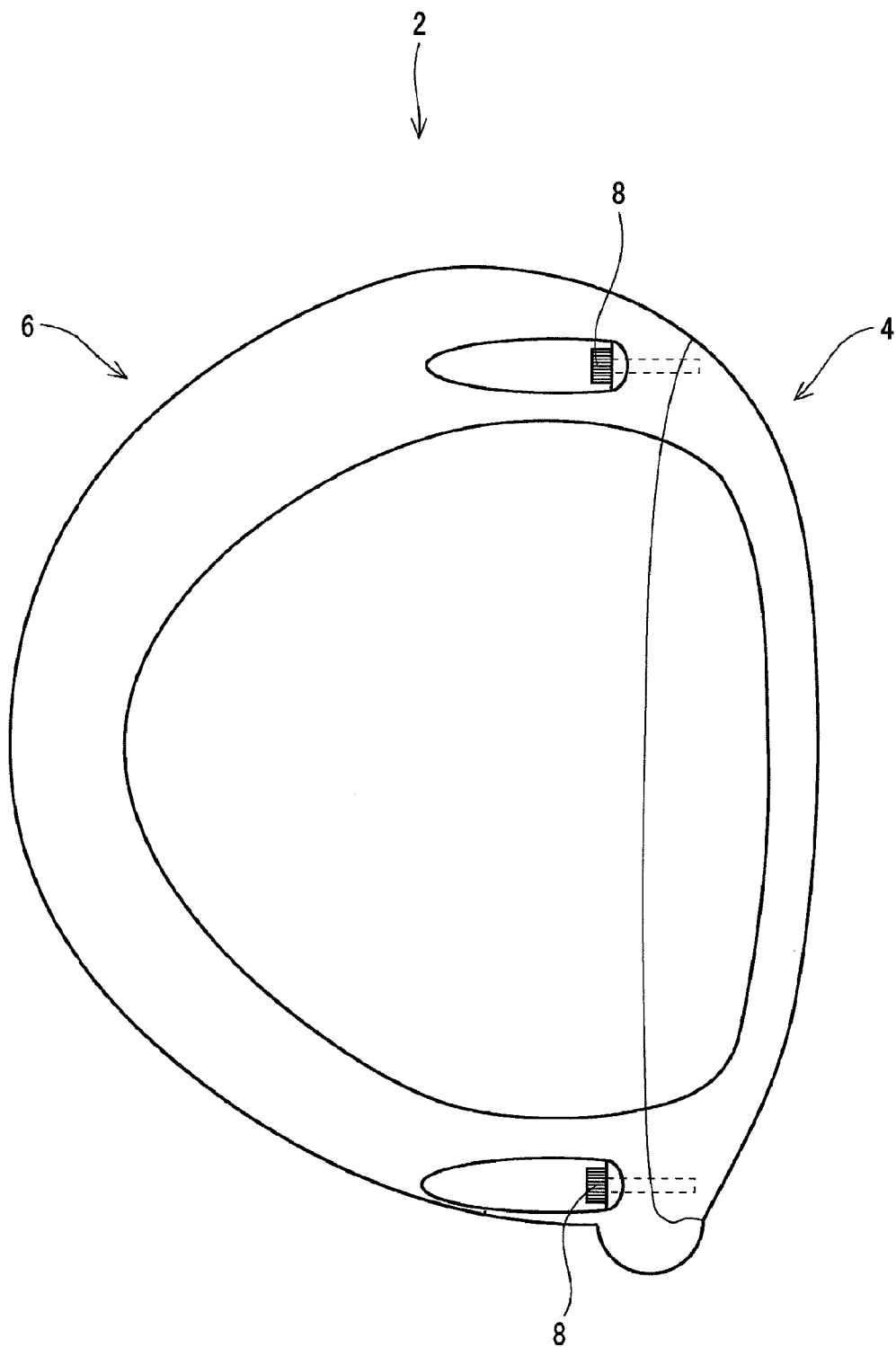


Fig. 4

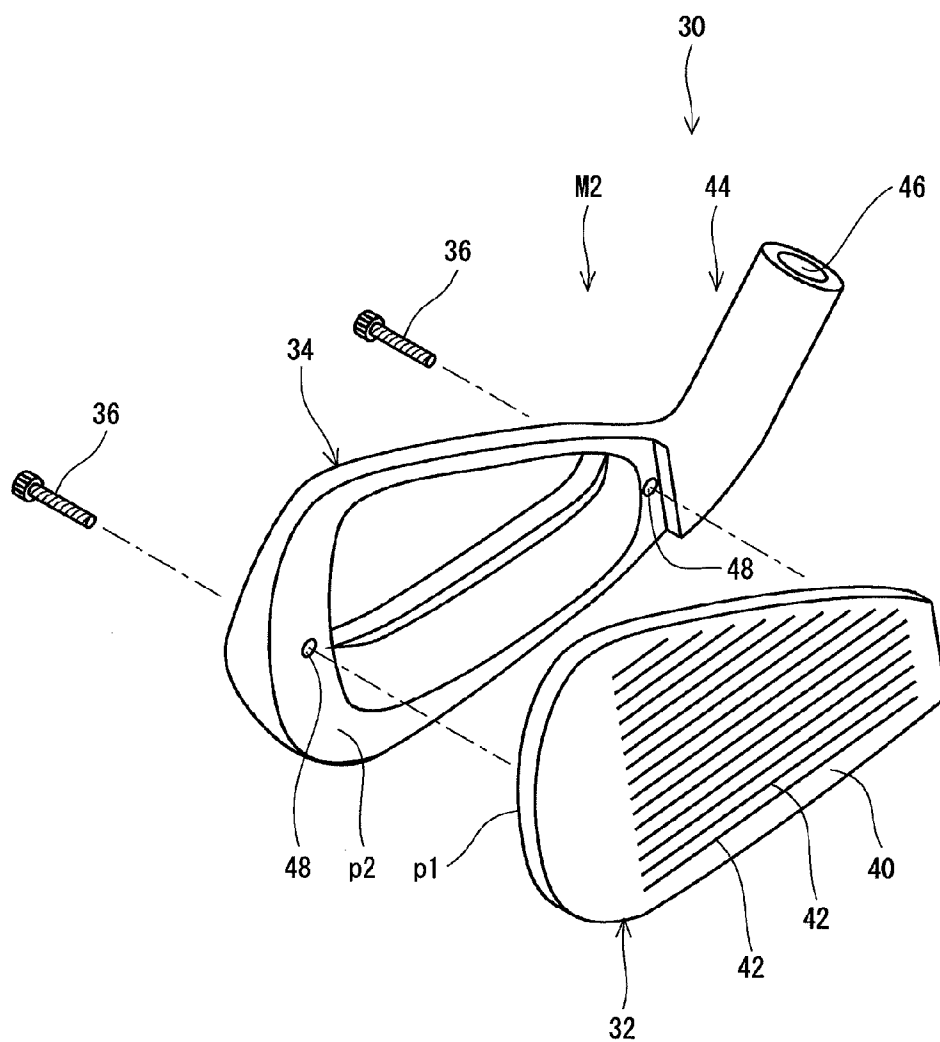


Fig. 5

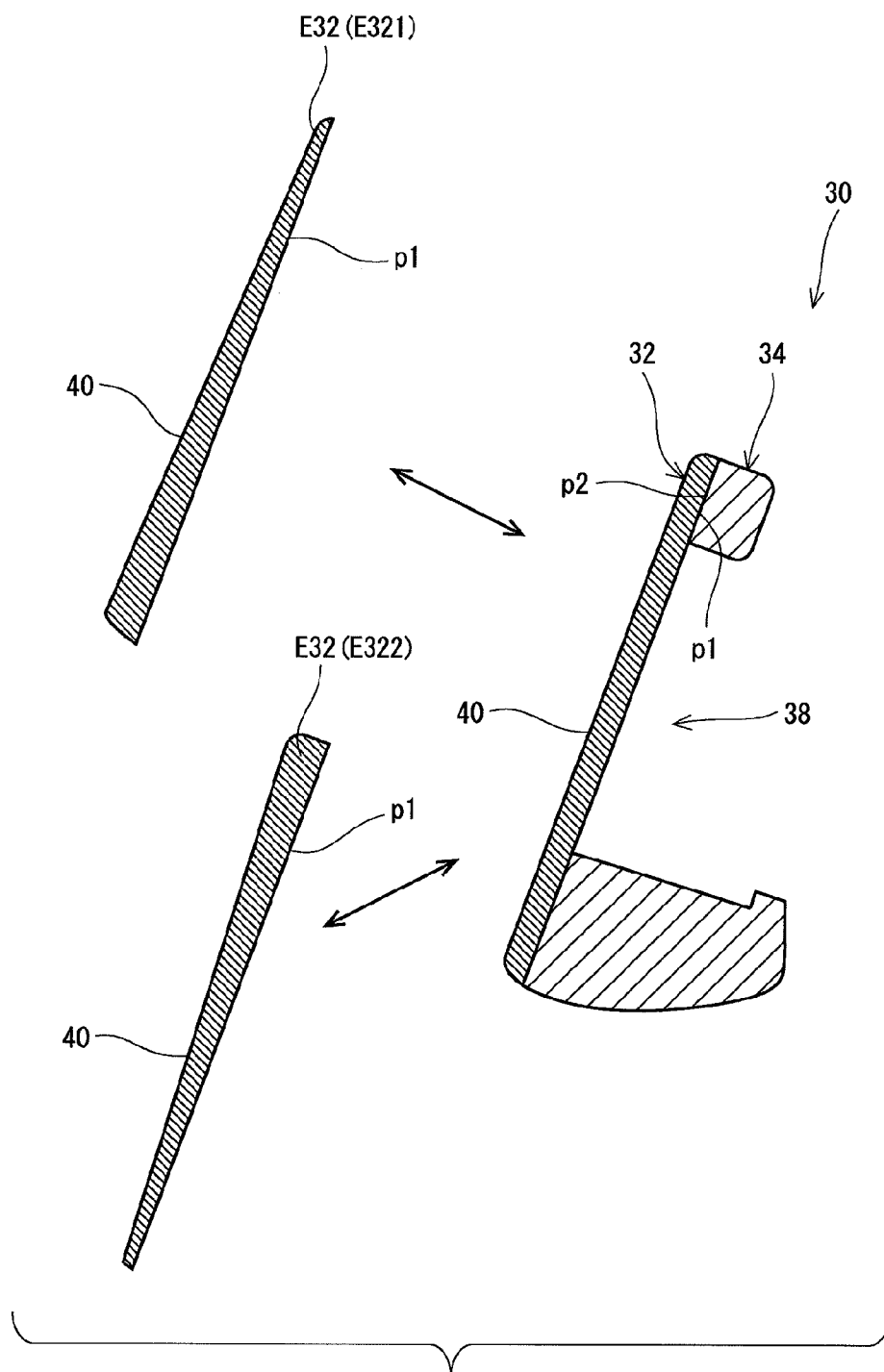


Fig. 6

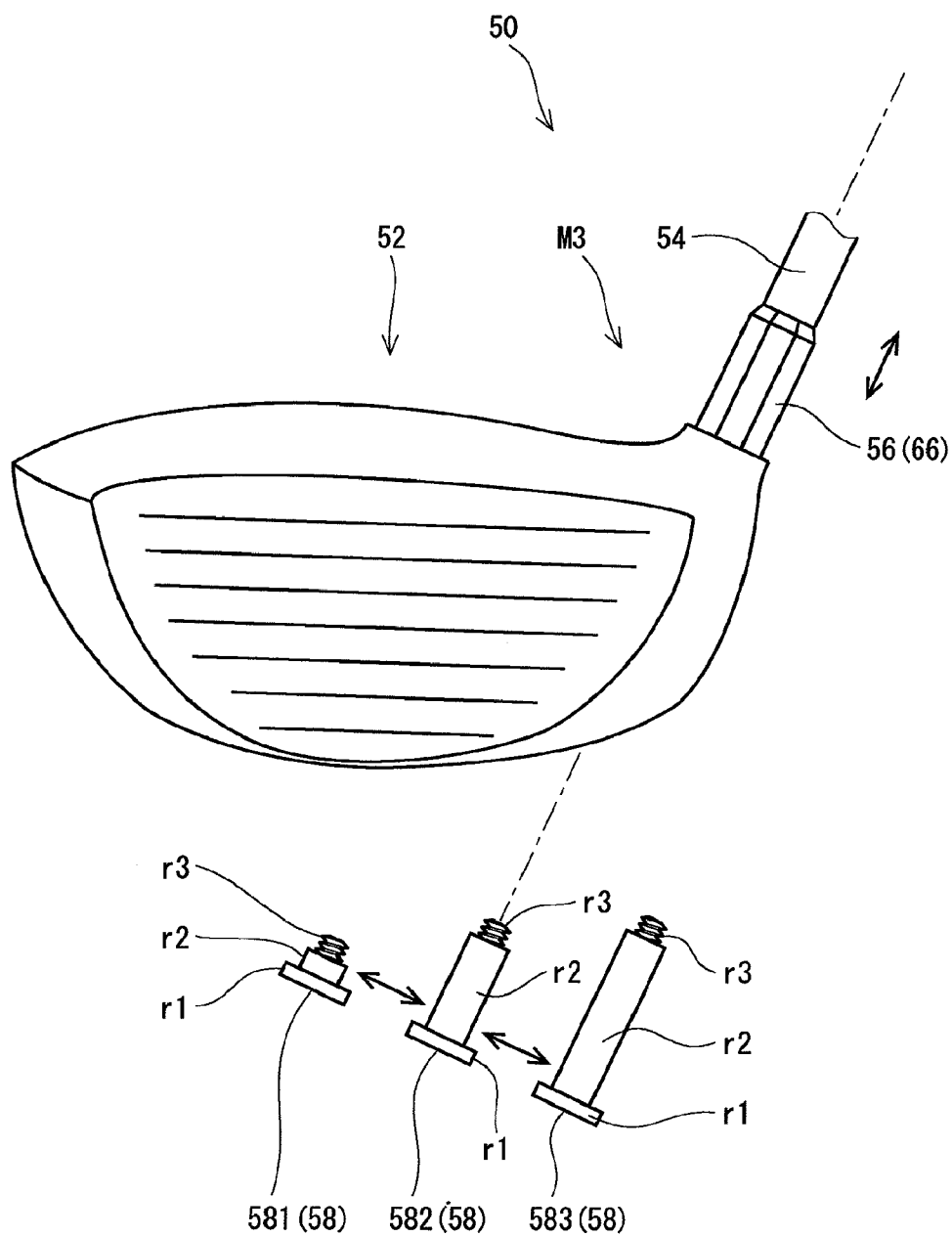
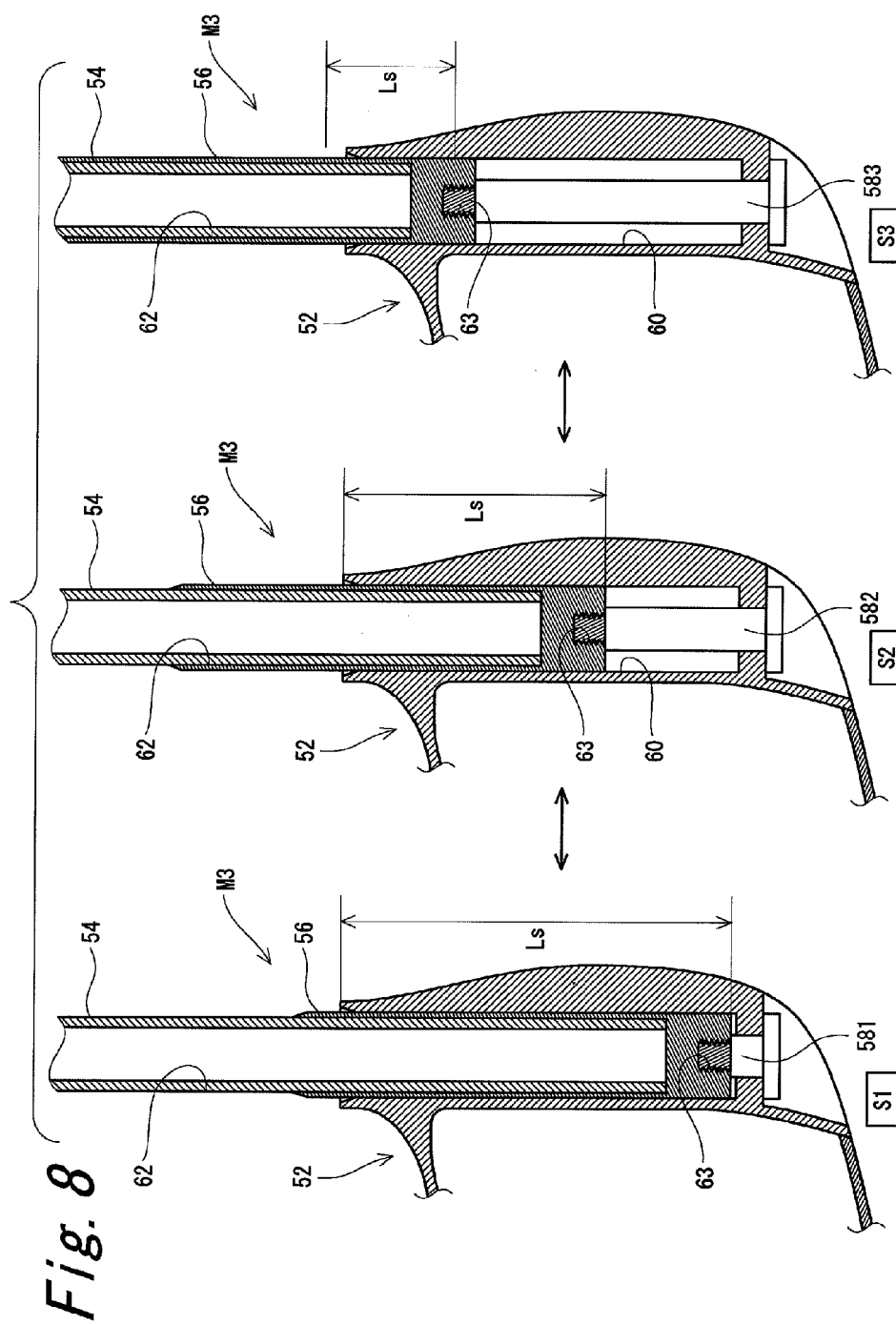


Fig. 7



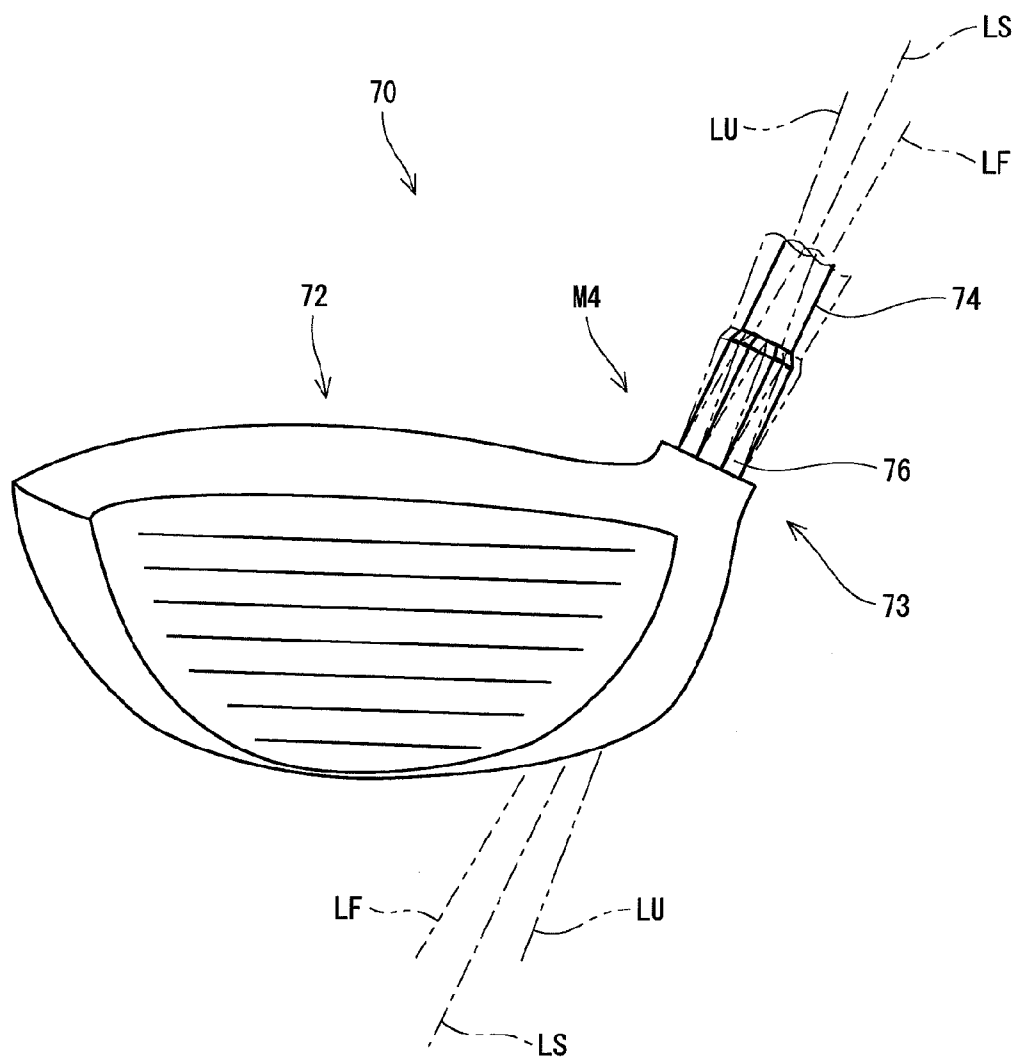


Fig. 9

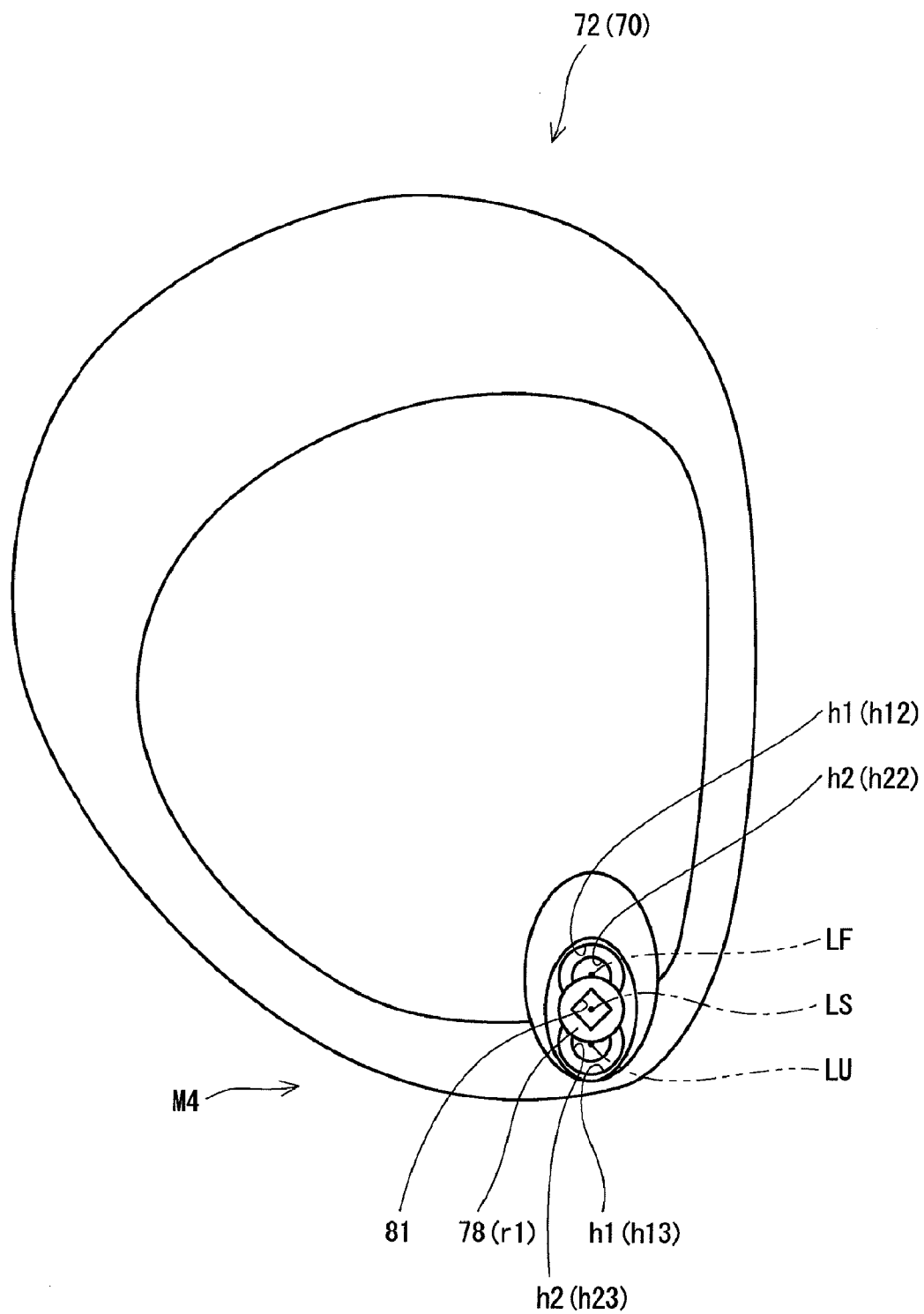


Fig. 10

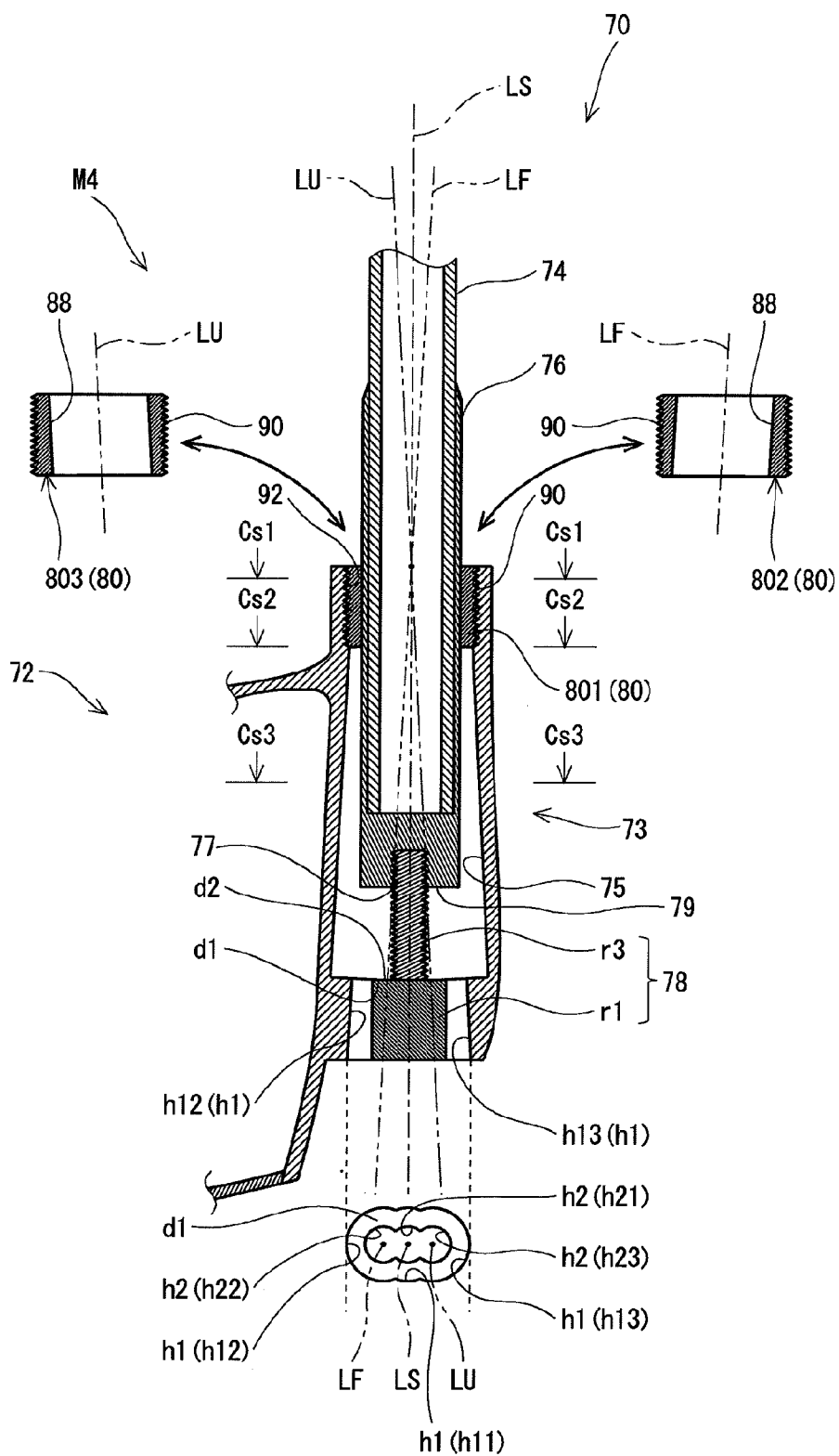


Fig. 11

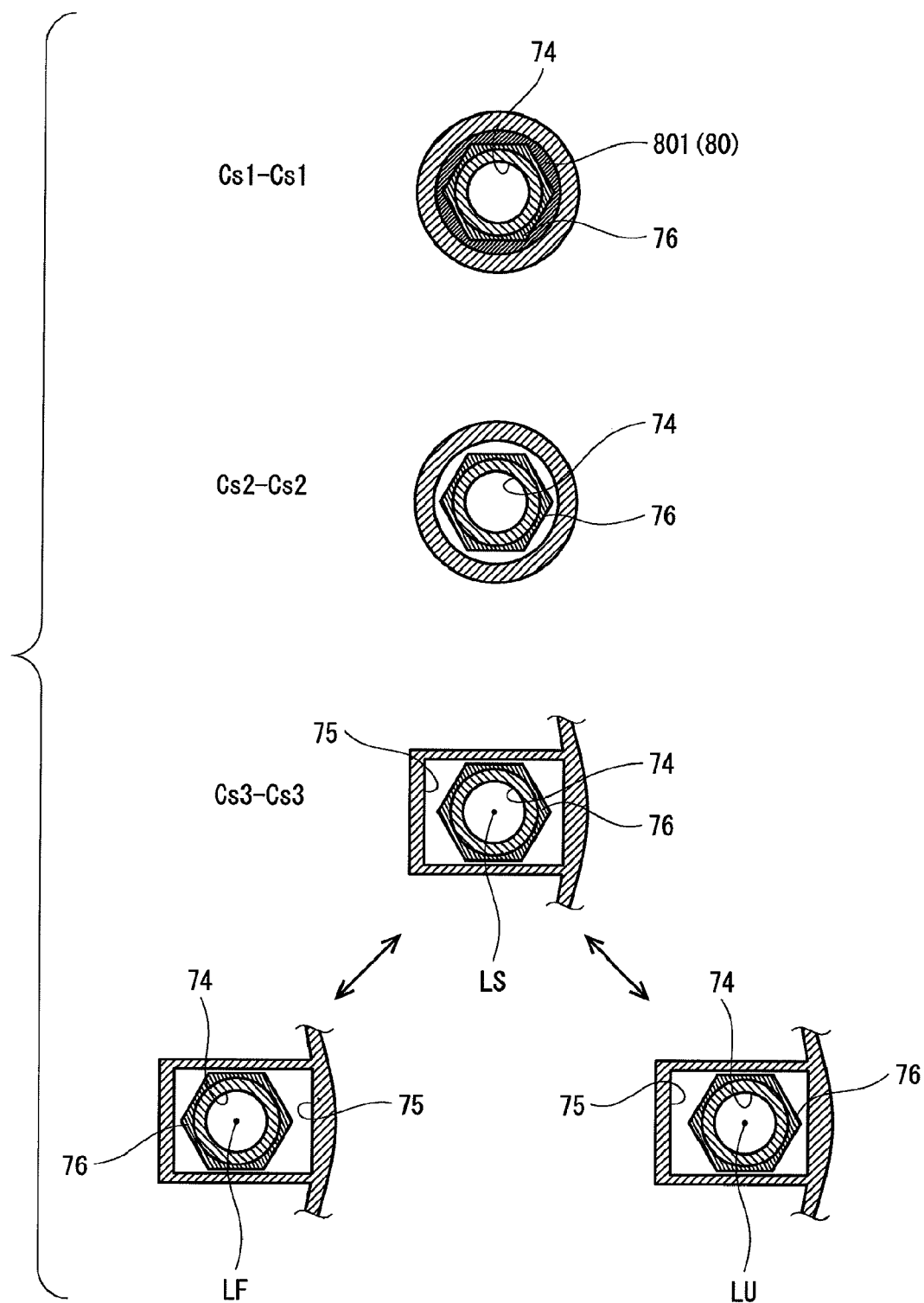
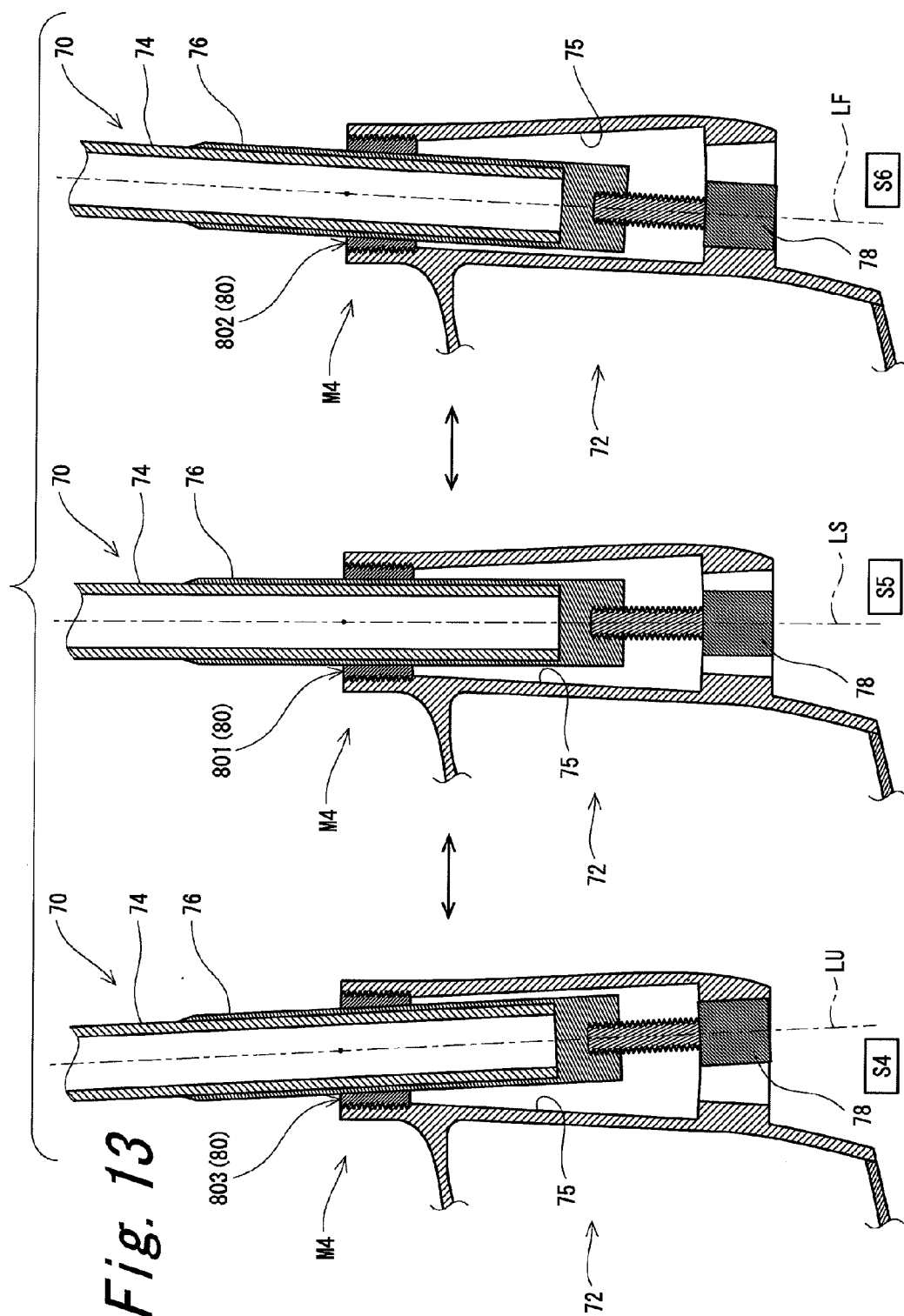


Fig. 12



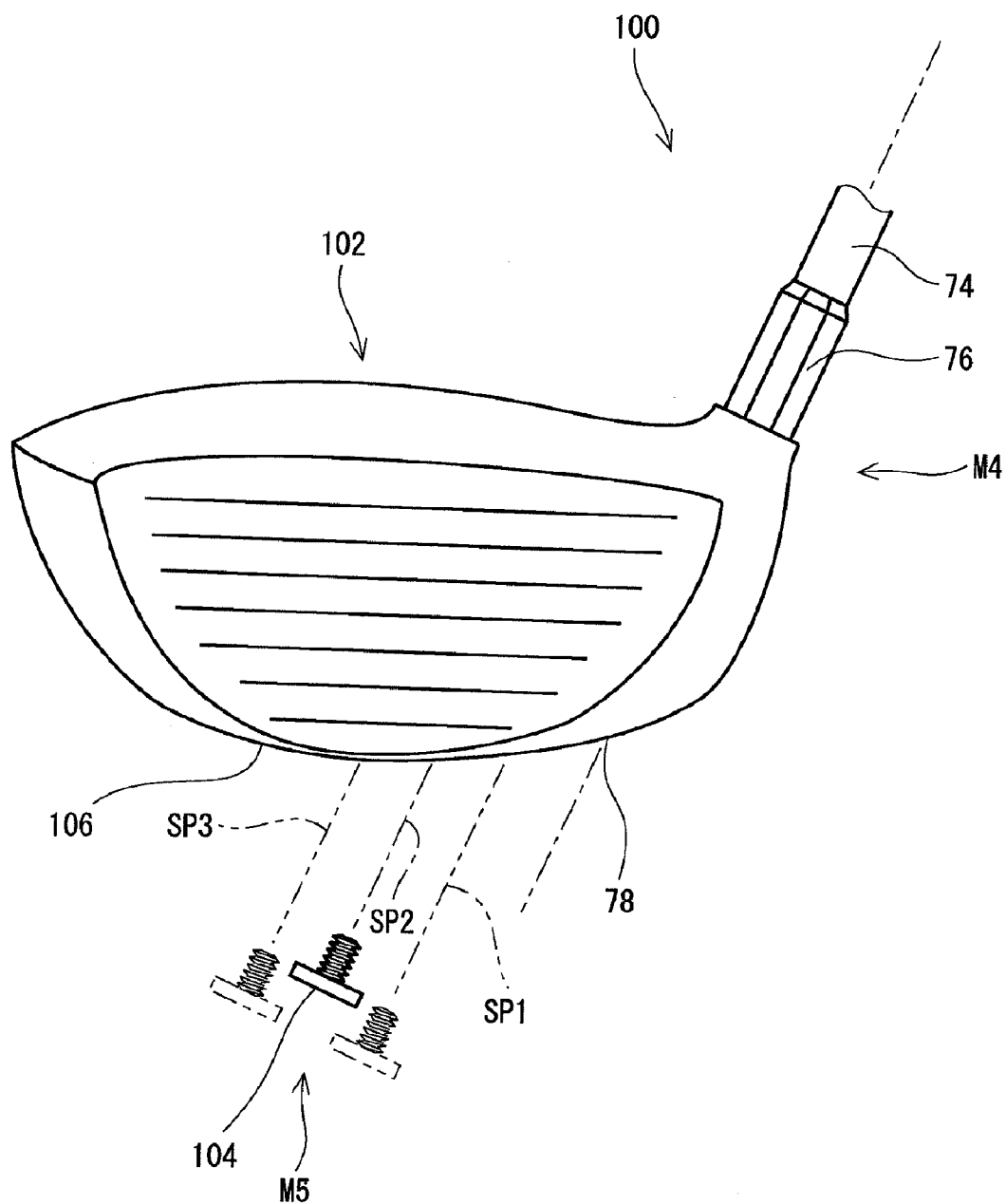


Fig. 14

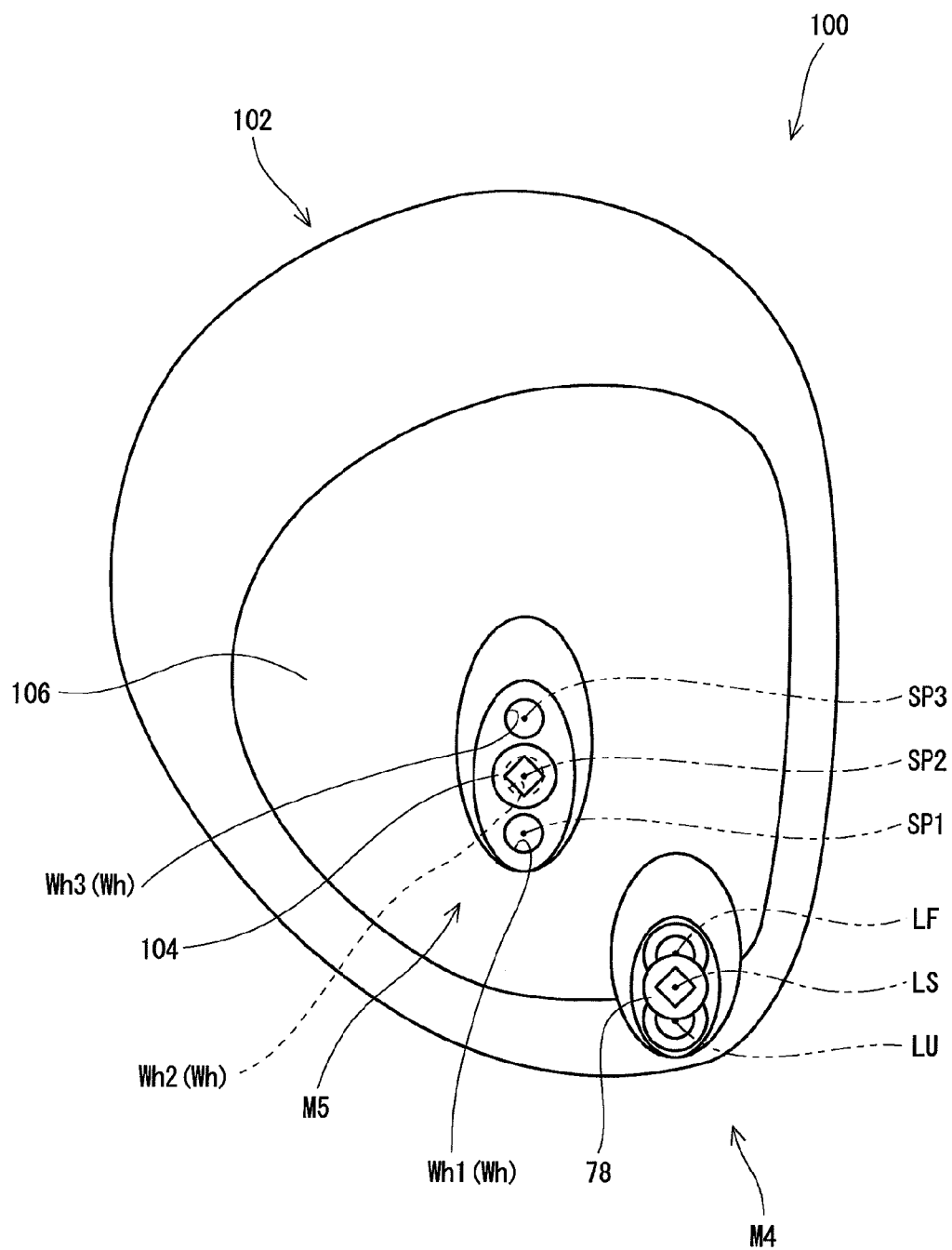


Fig. 15

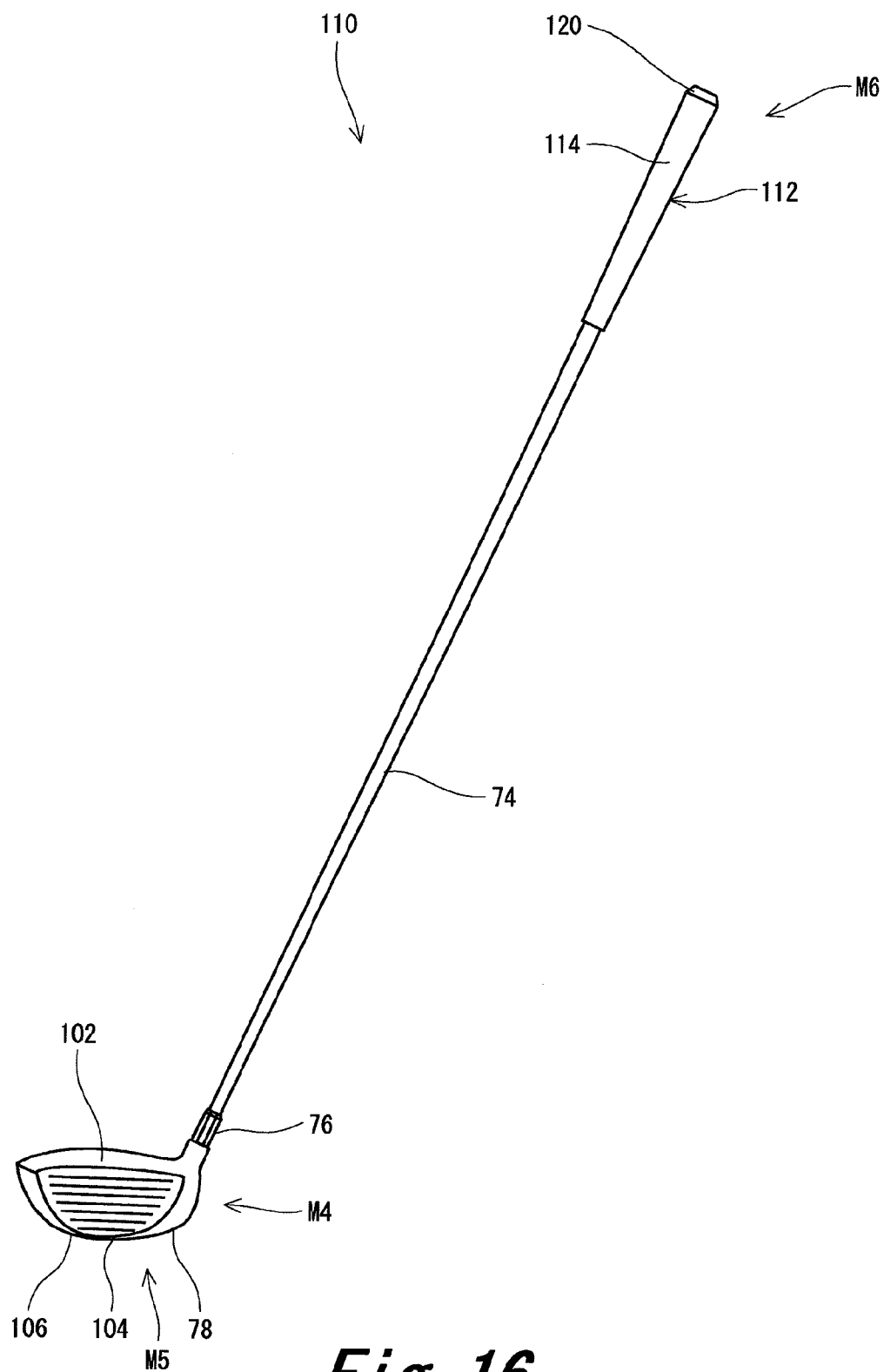


Fig. 16

Fig. 17

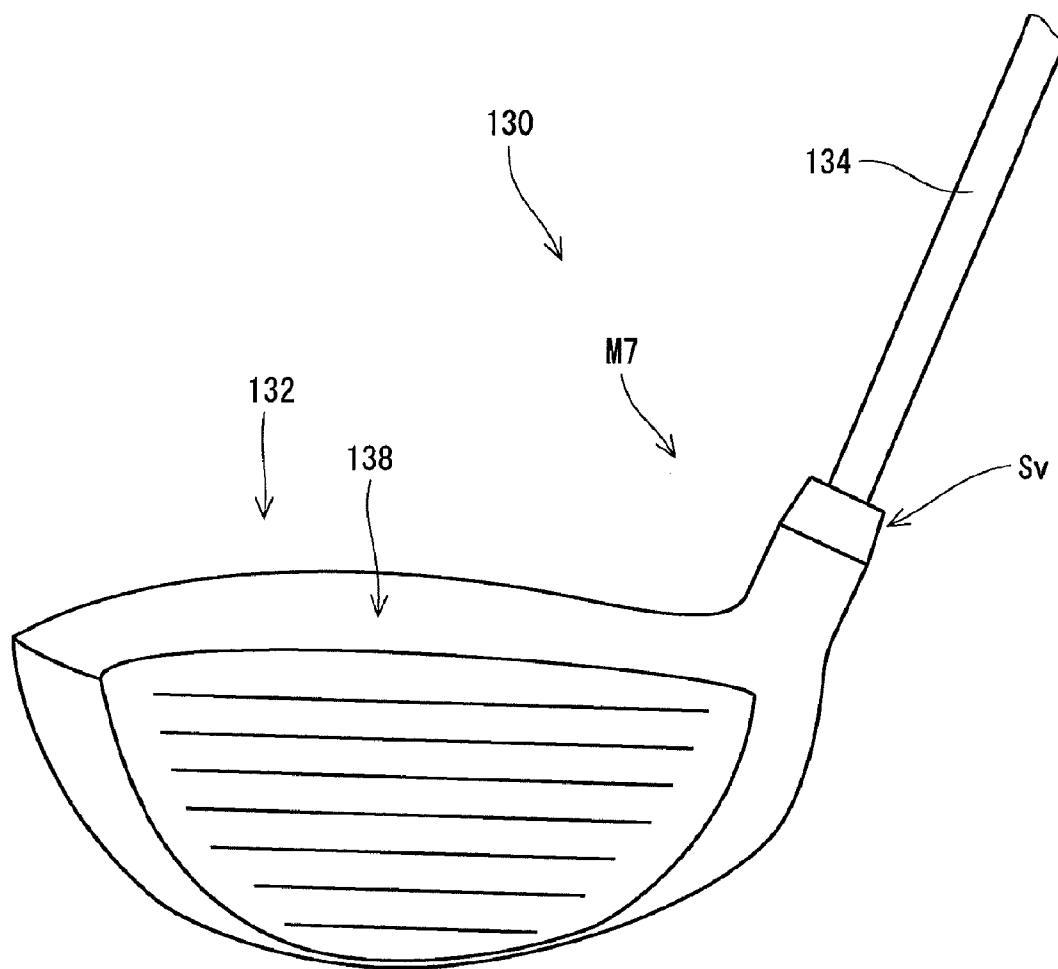


Fig. 18

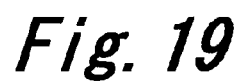


Fig. 20

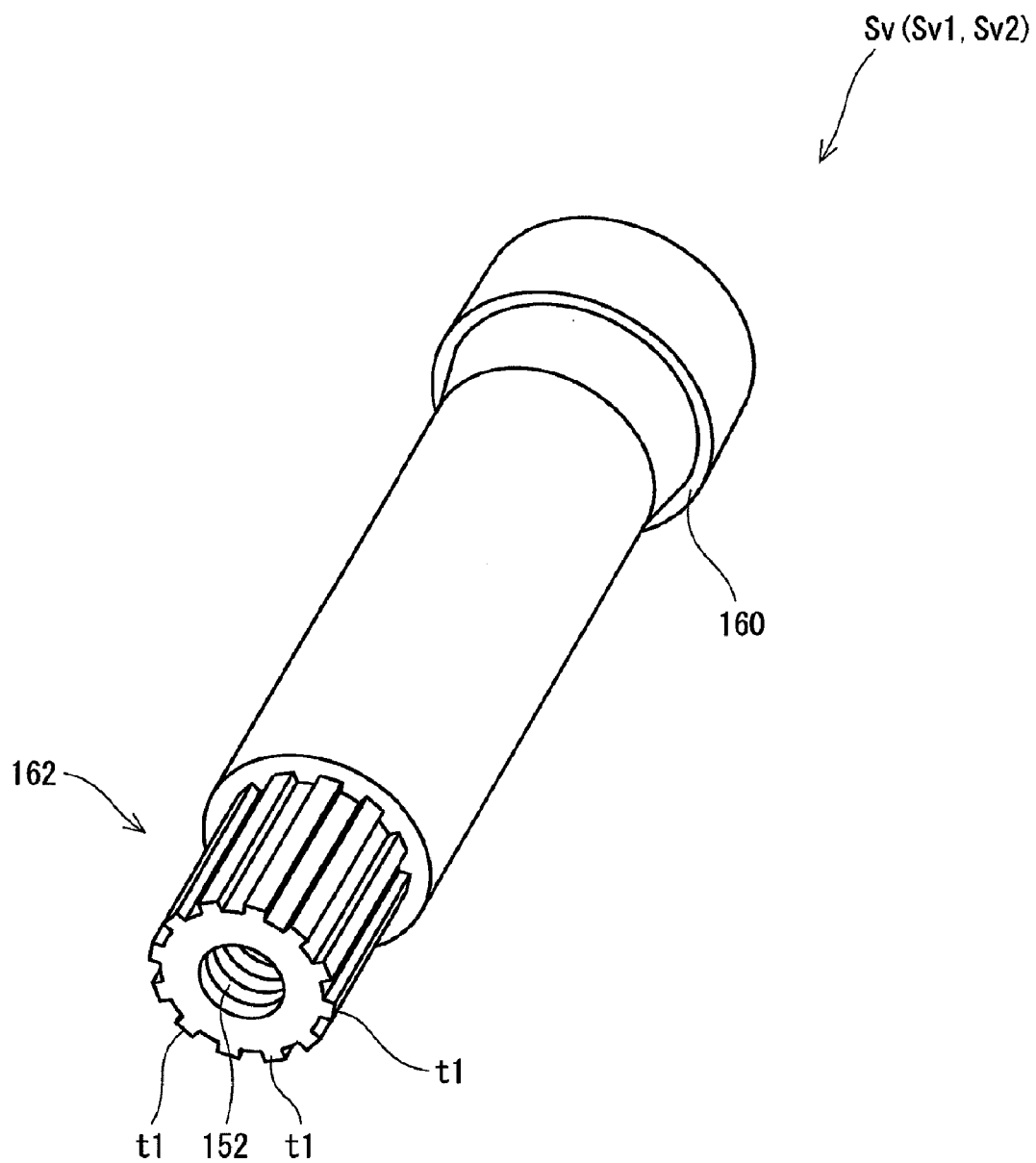


Fig. 21

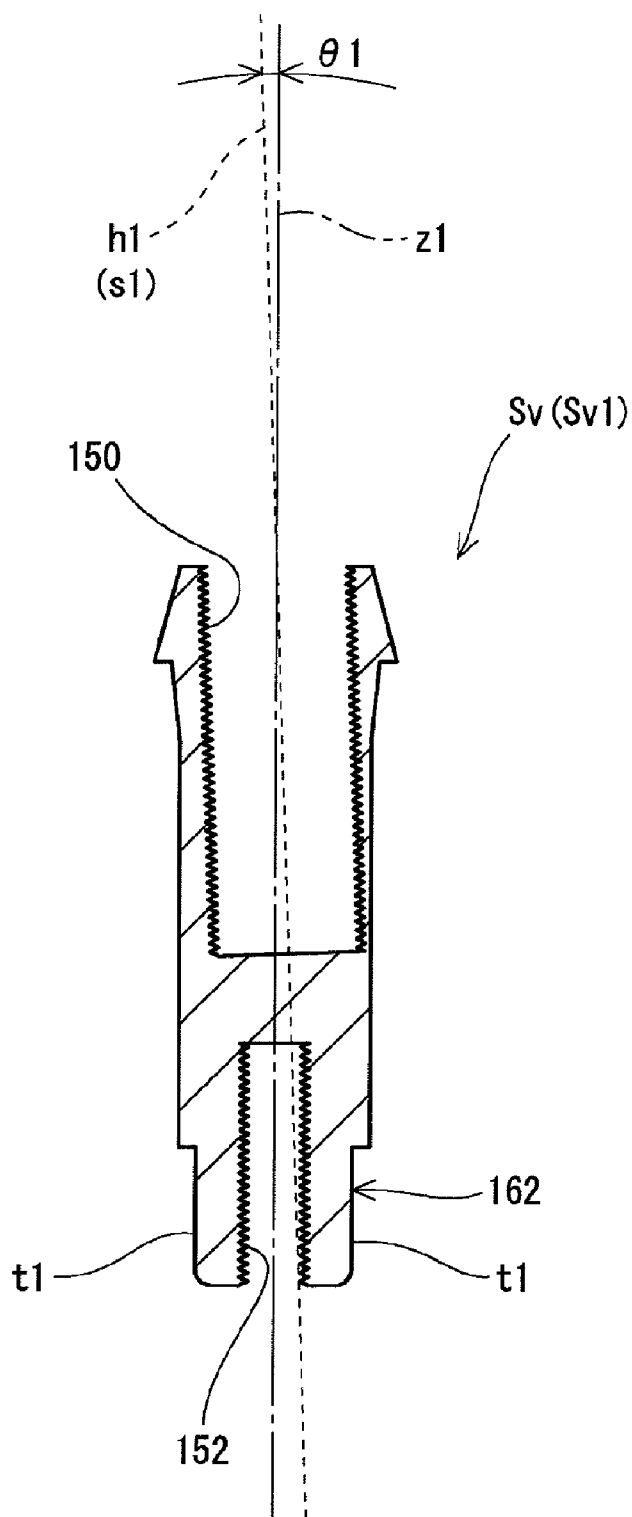


Fig. 22

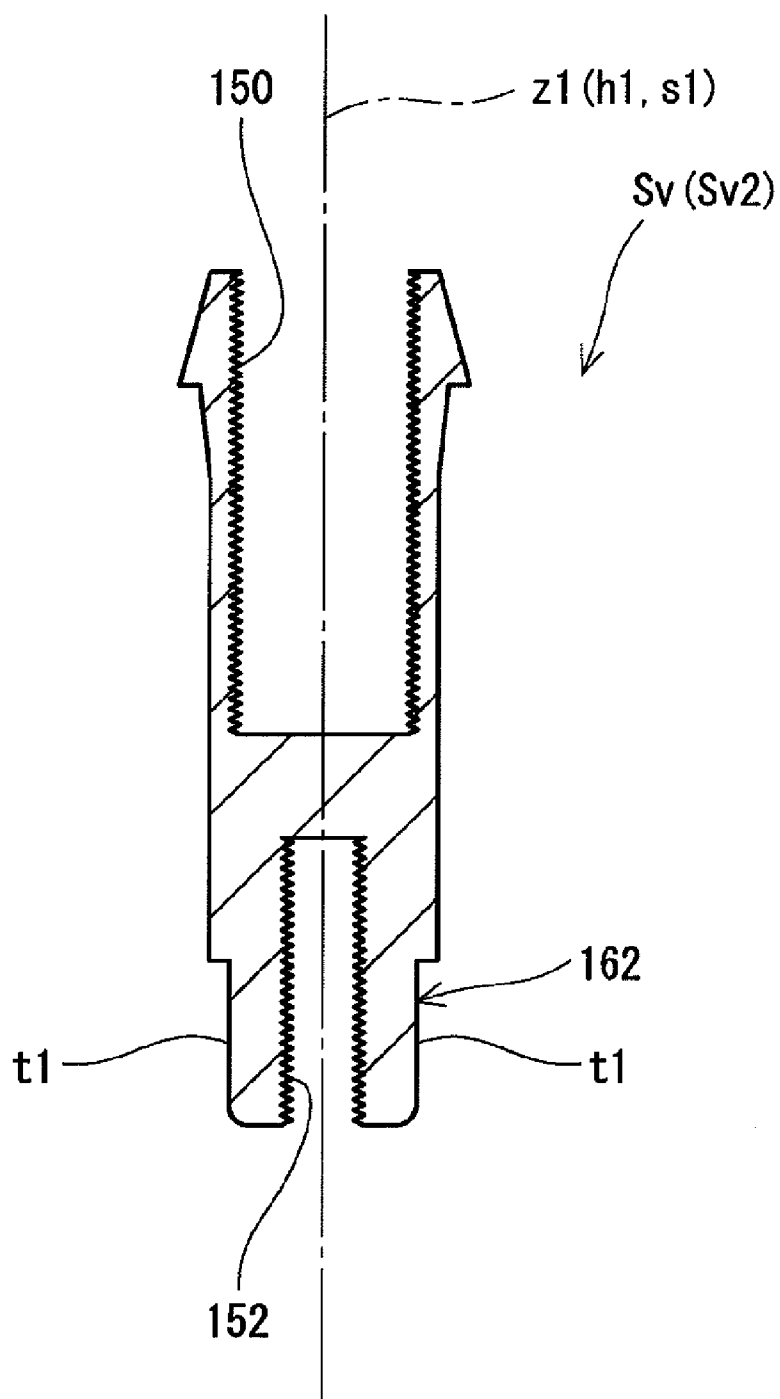


Fig. 23

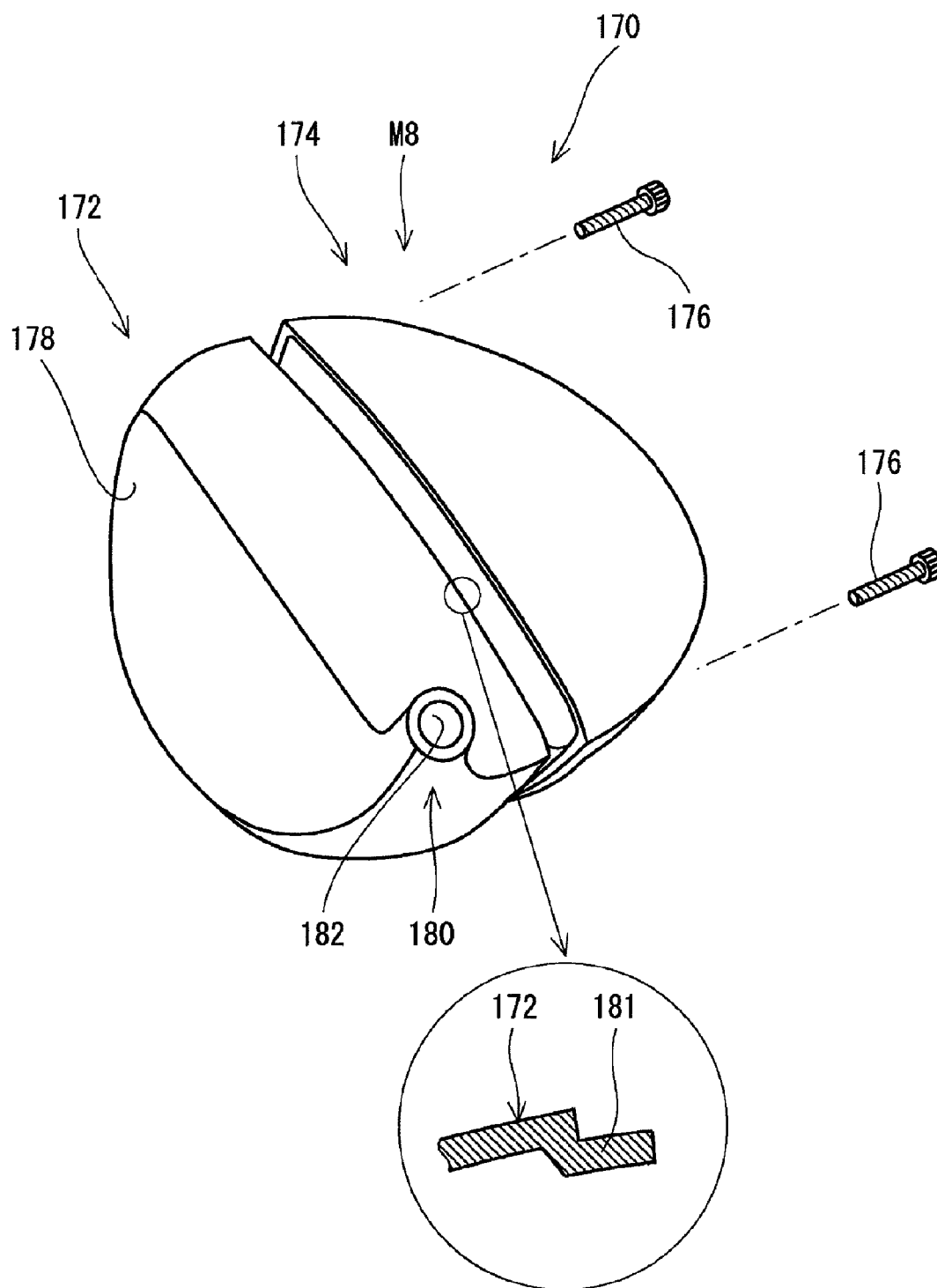
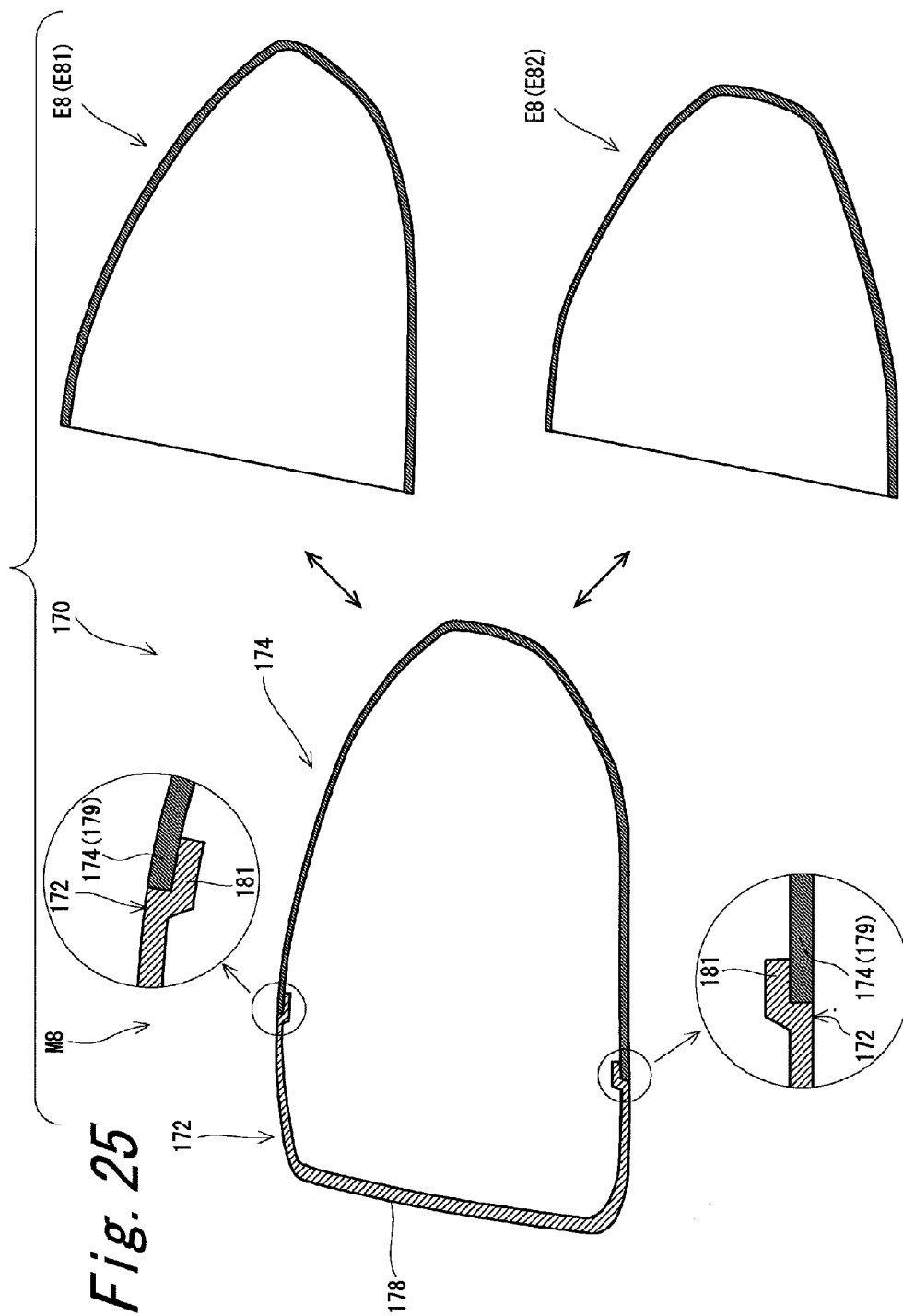


Fig. 24



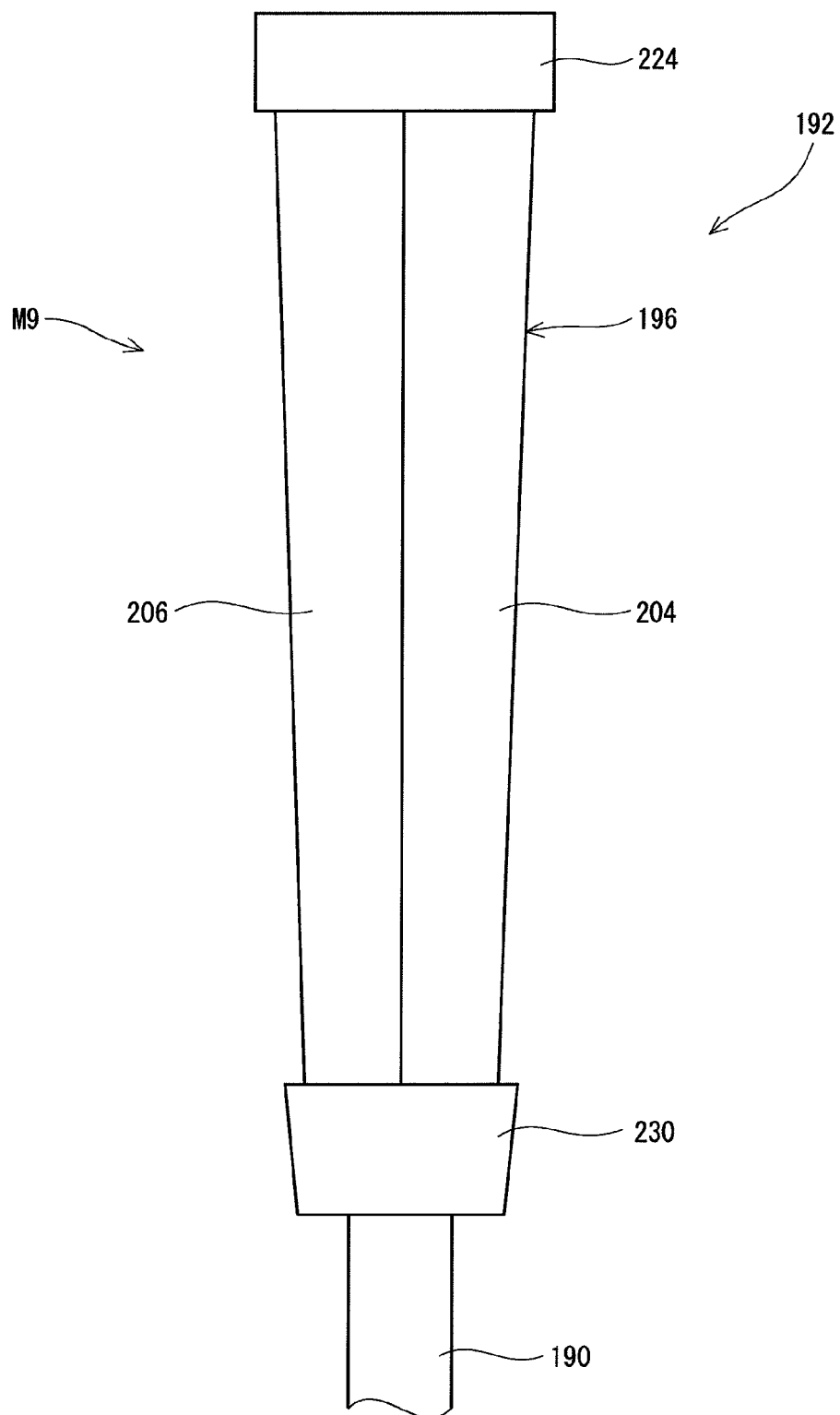


Fig. 26

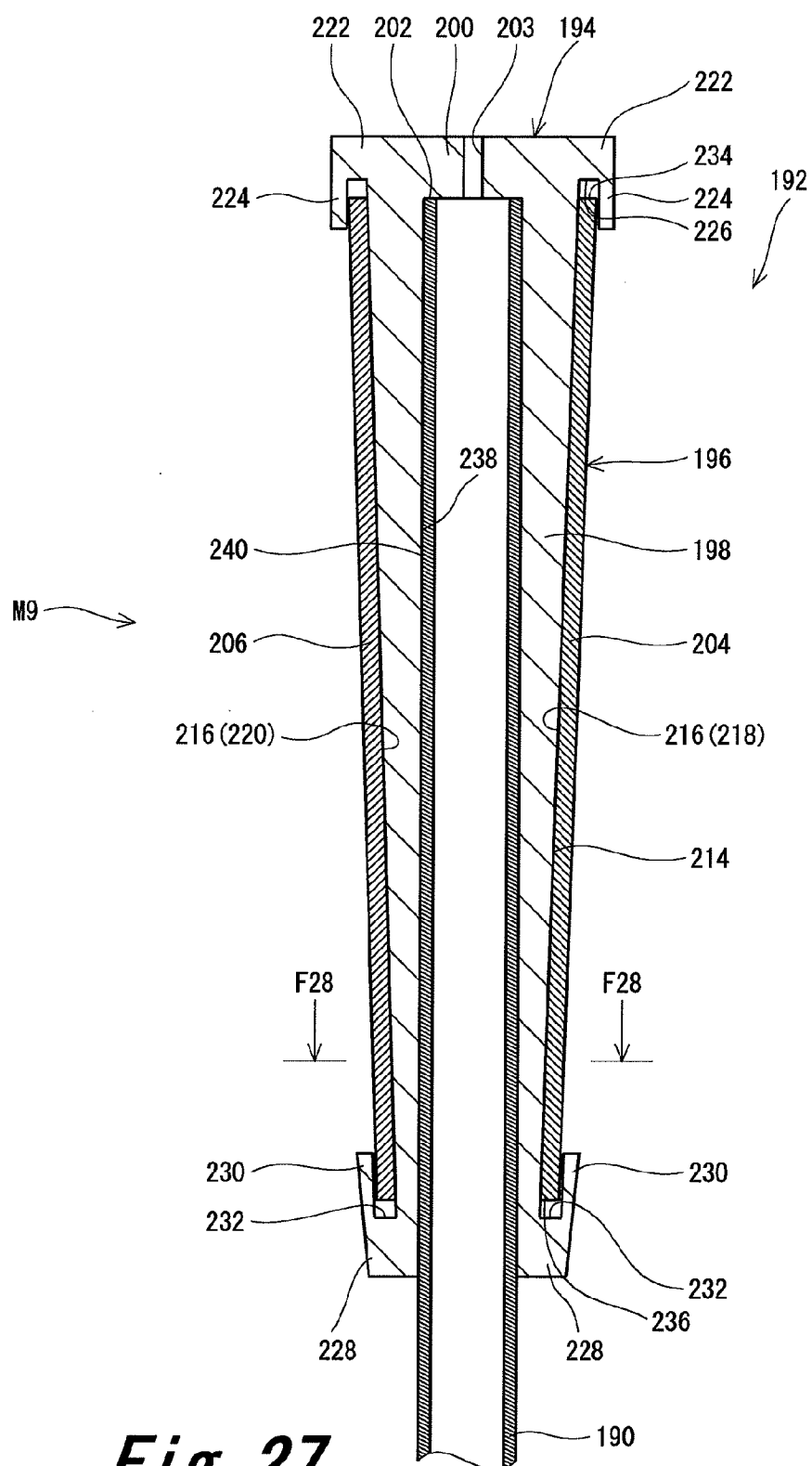


Fig. 27

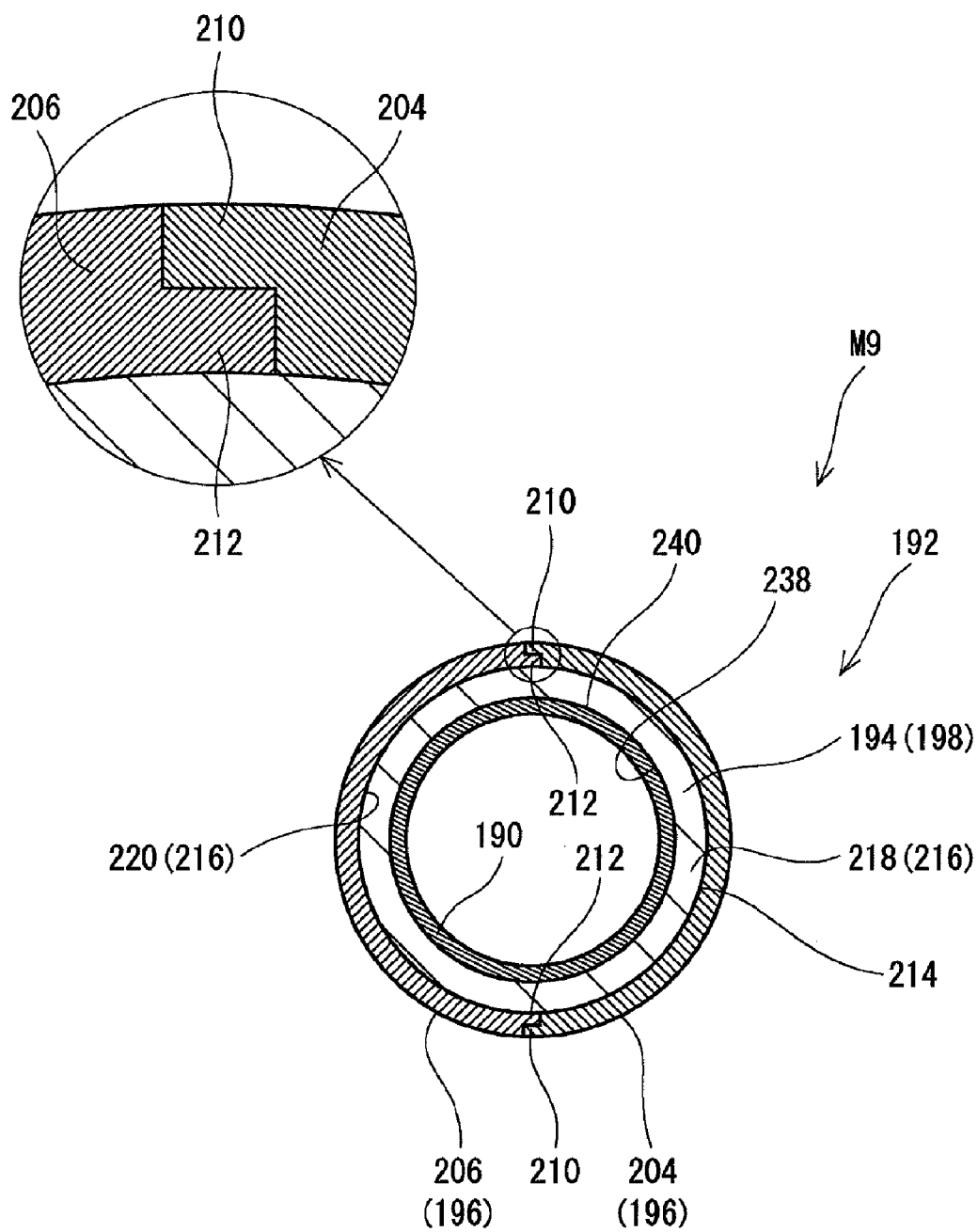


Fig. 28

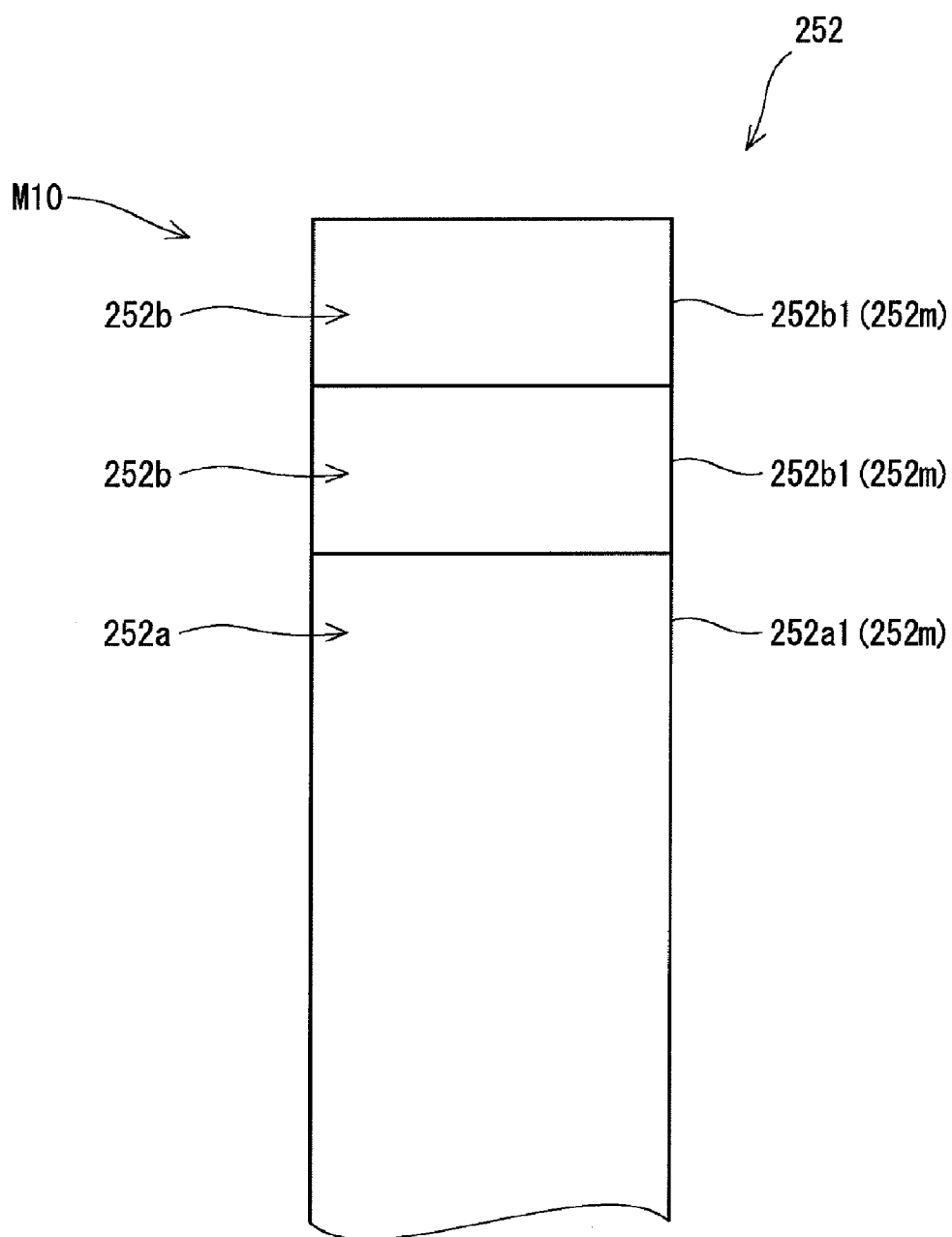


Fig. 29

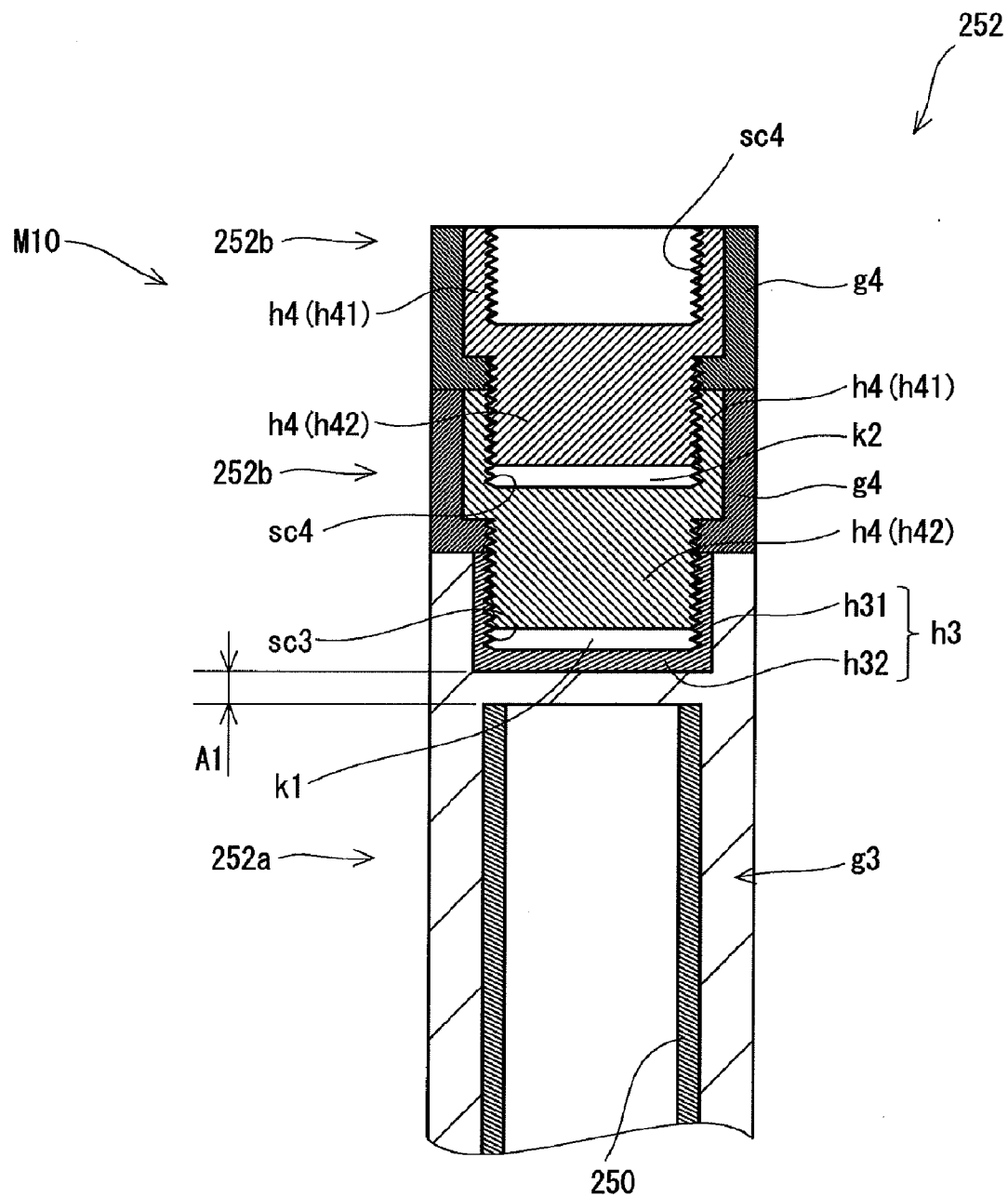


Fig. 30

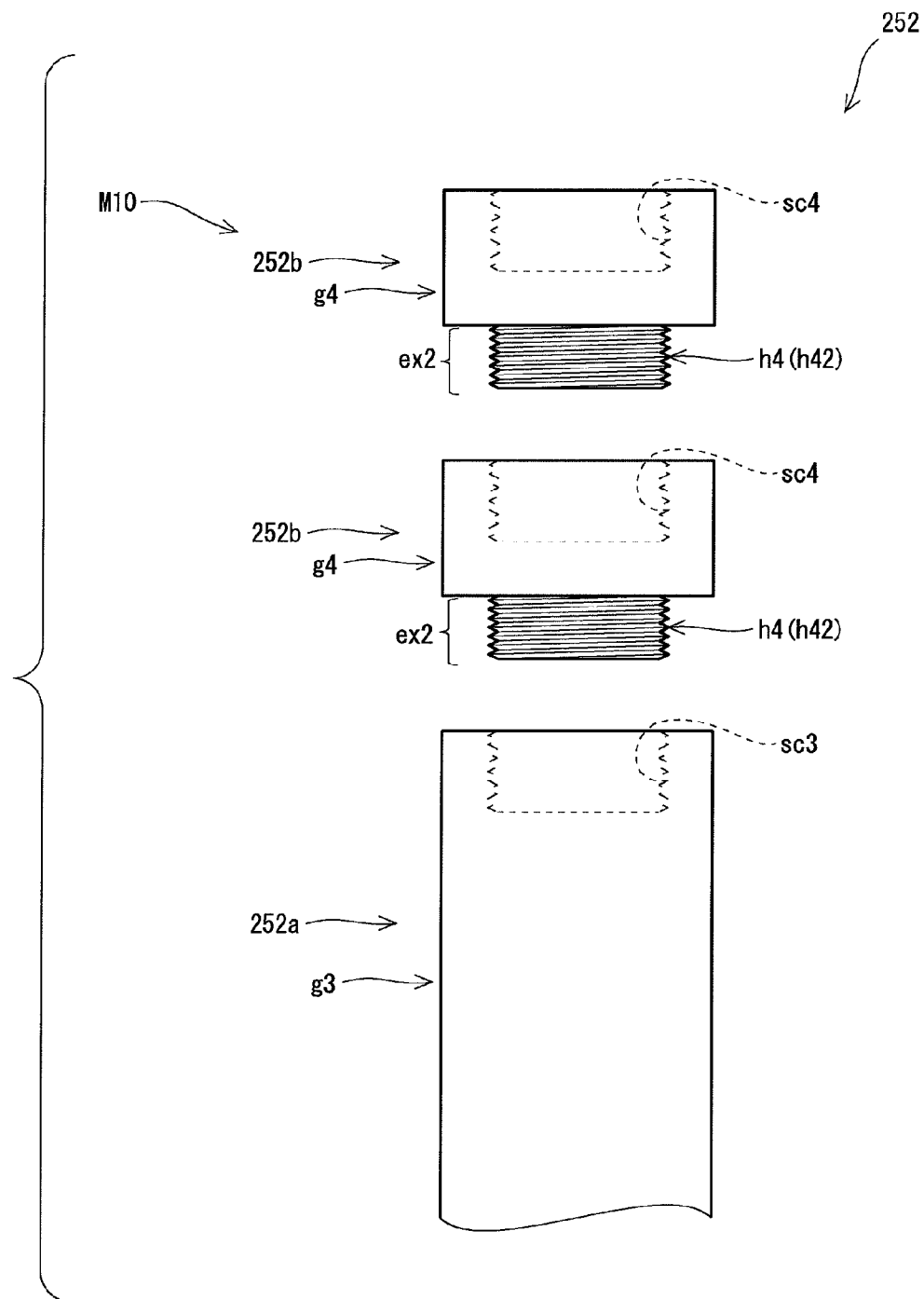


Fig. 31

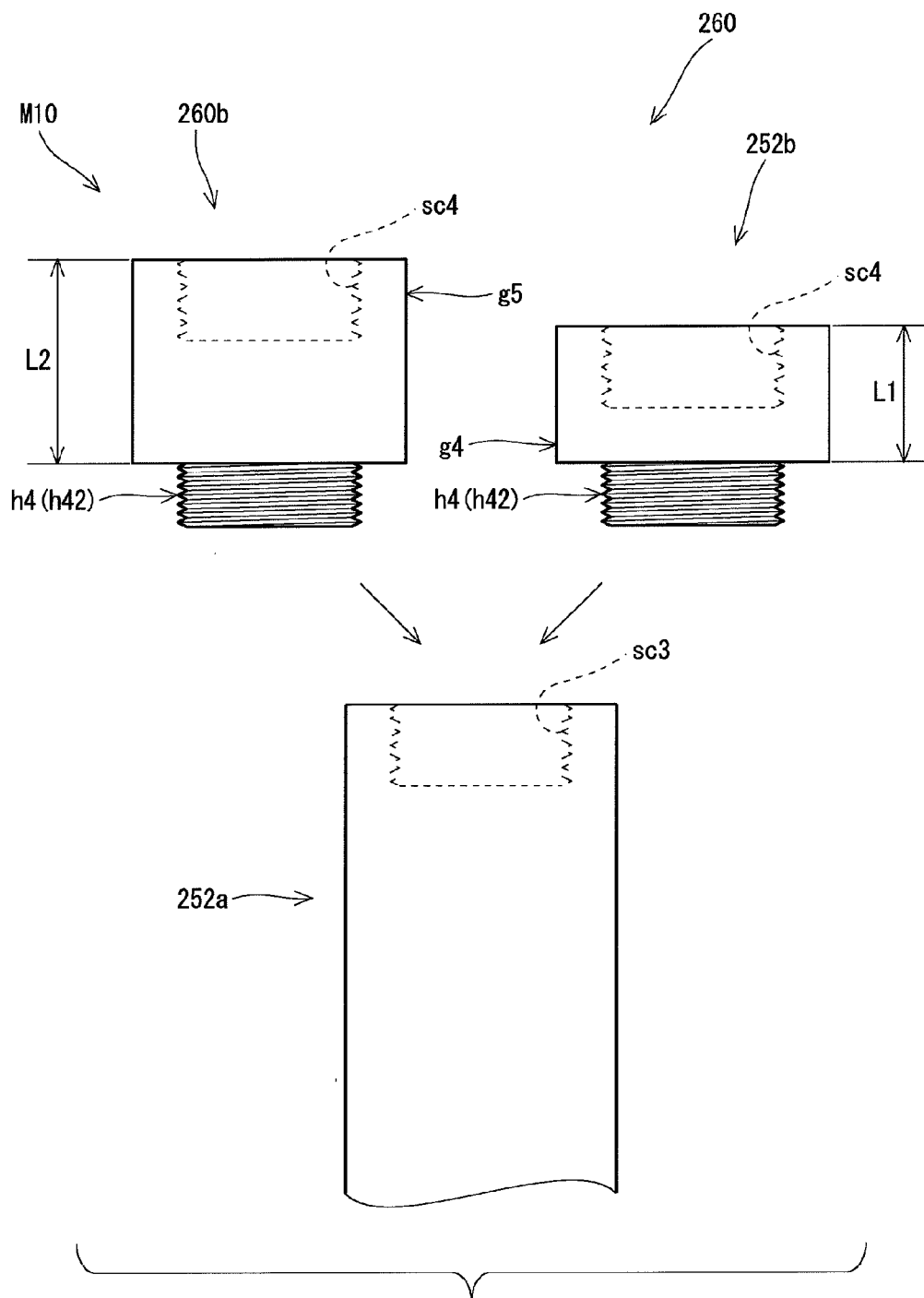


Fig. 32

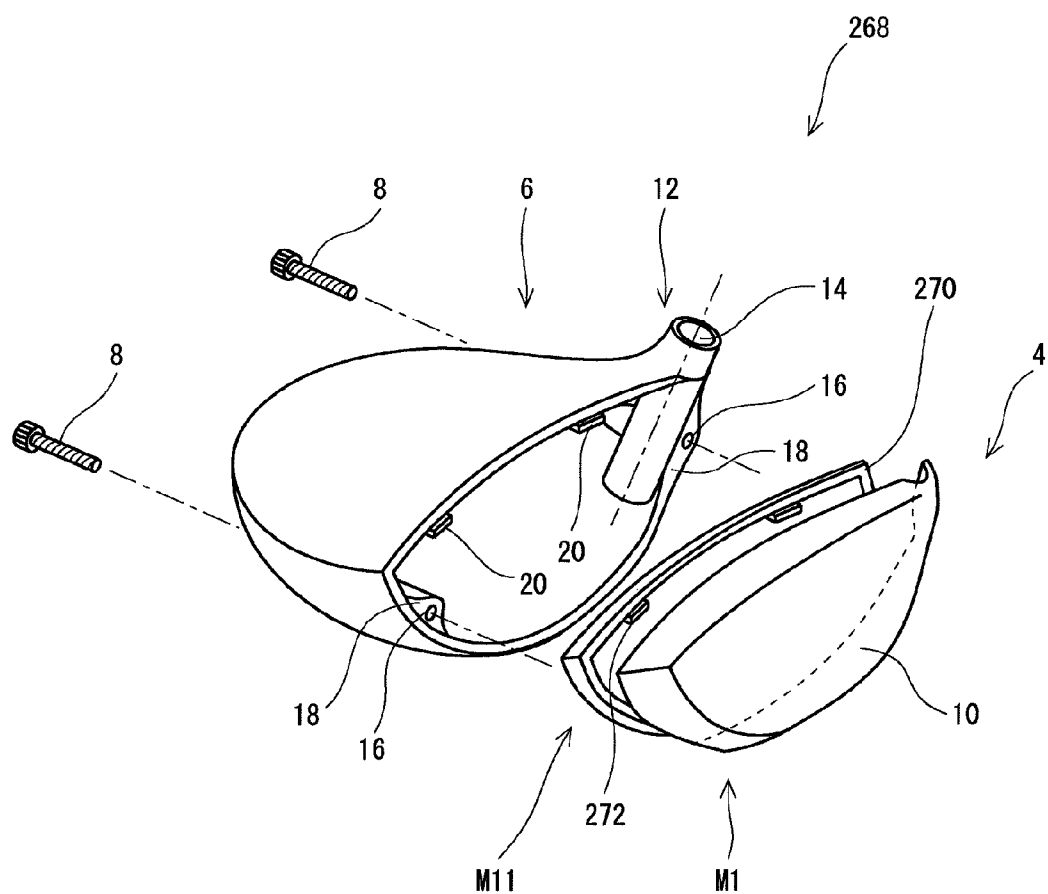


Fig. 33

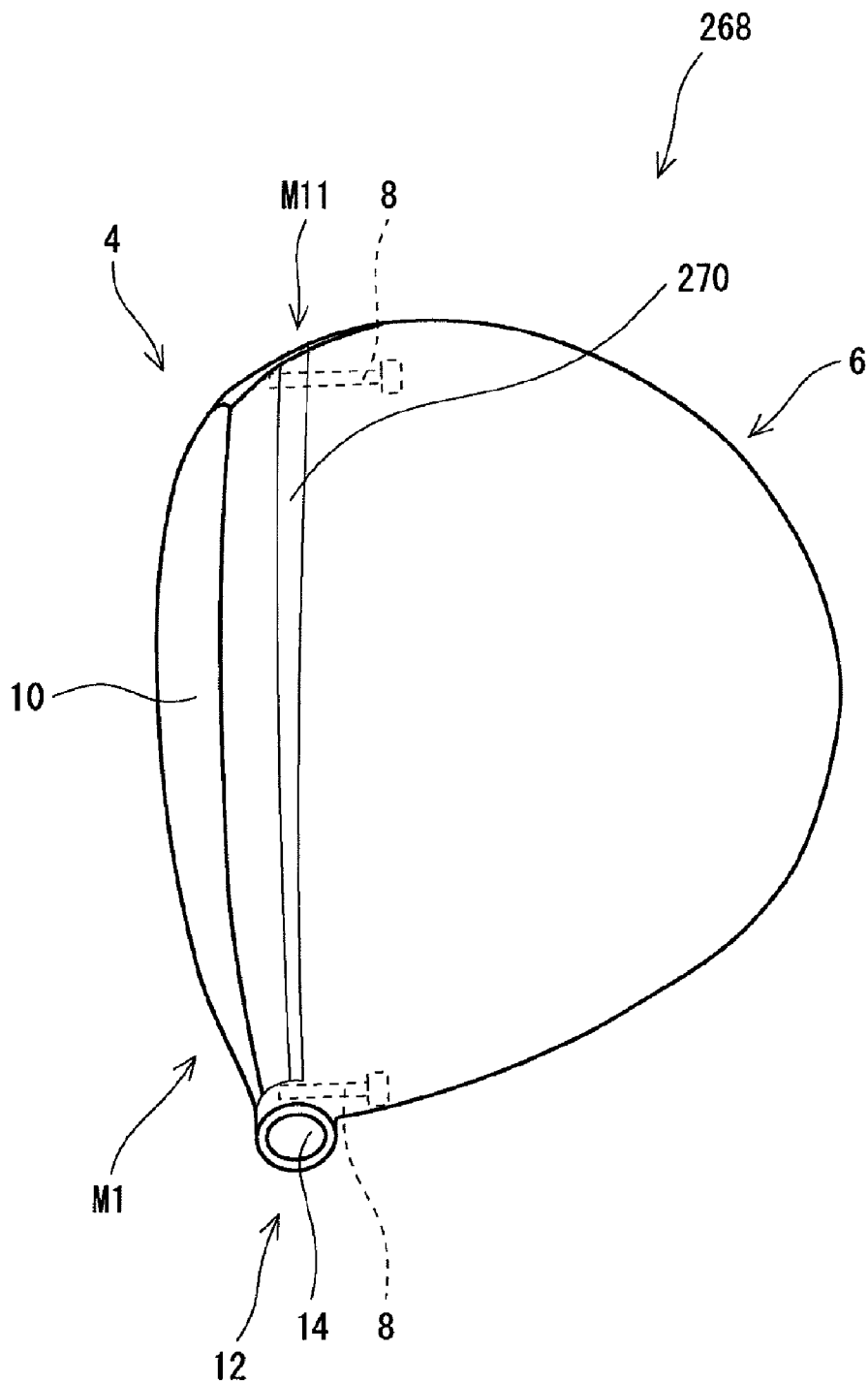


Fig. 34

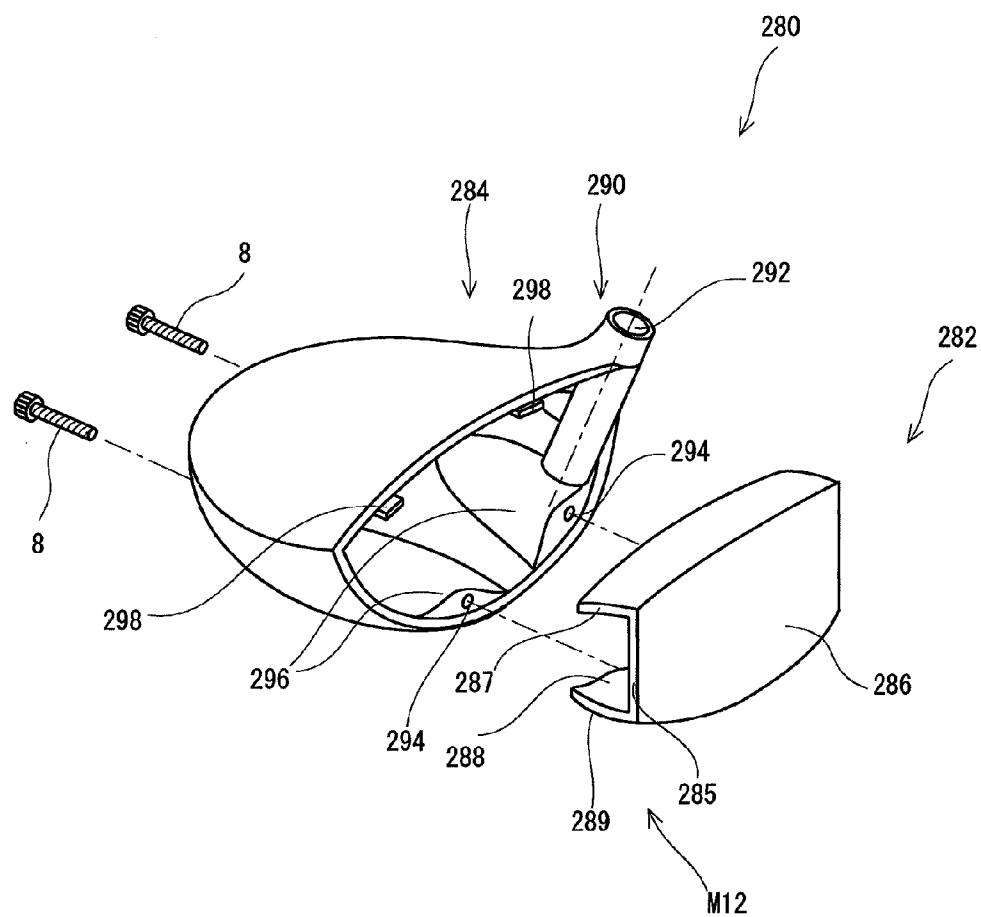


Fig. 35

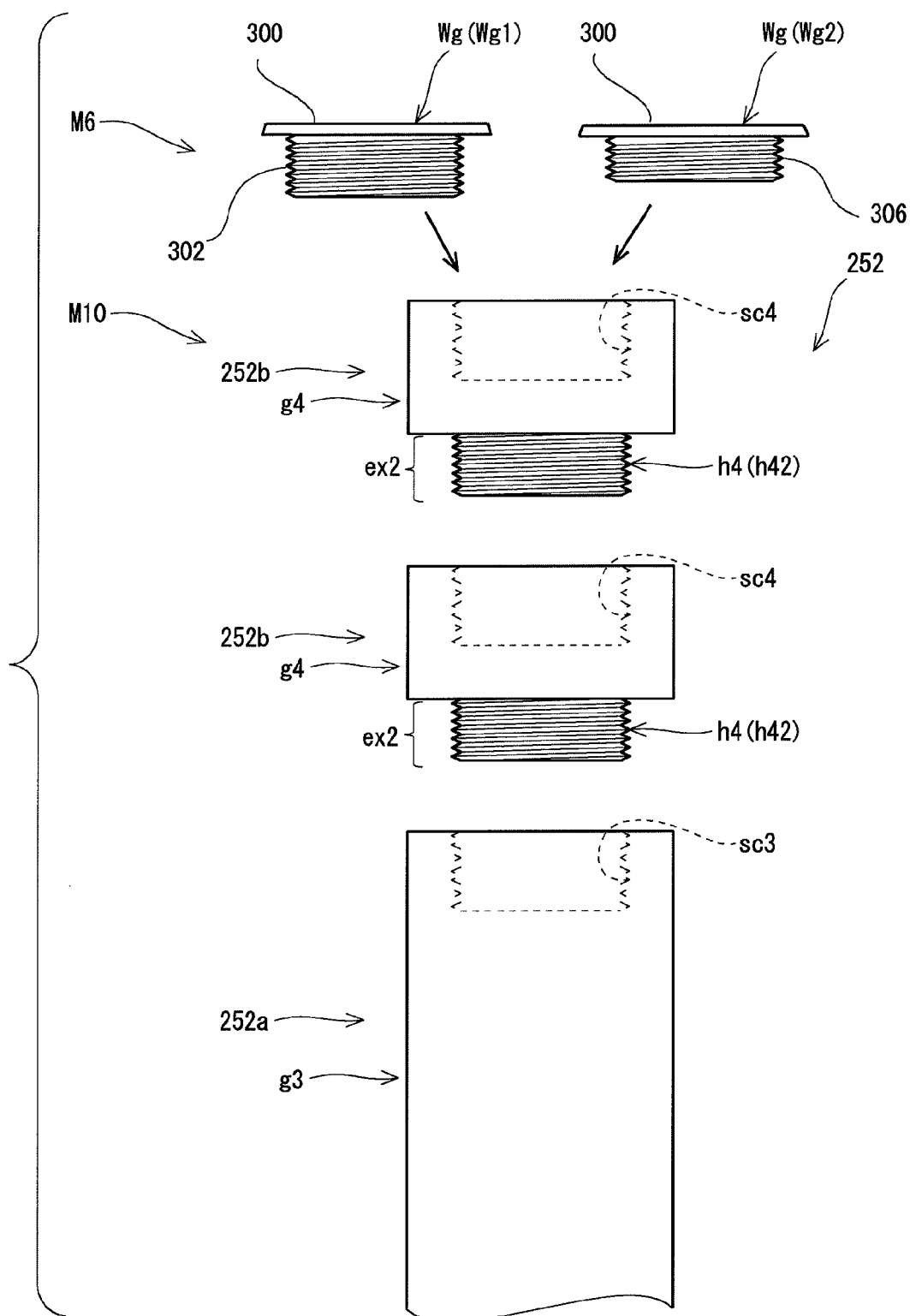


Fig. 36

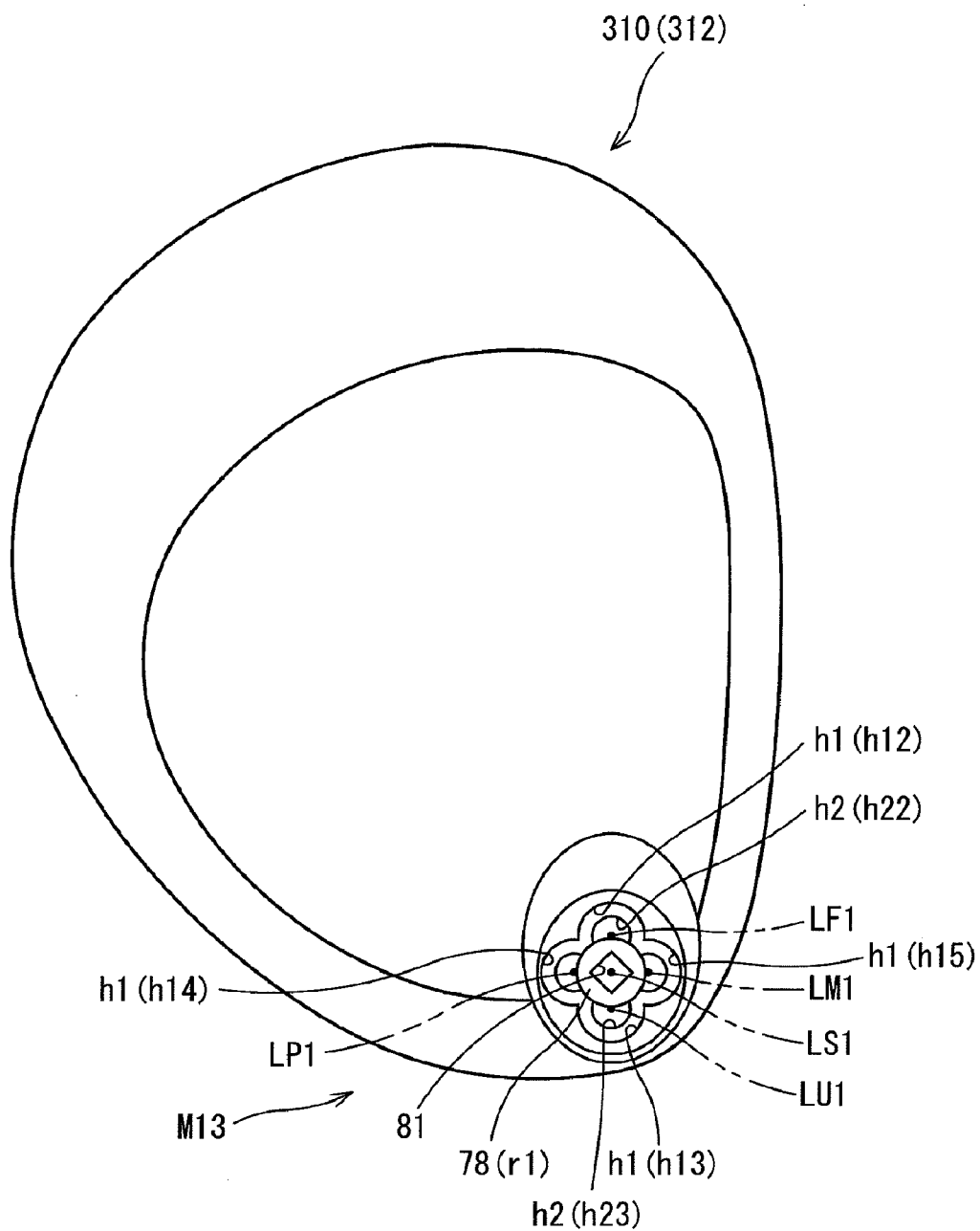


FIG. 37

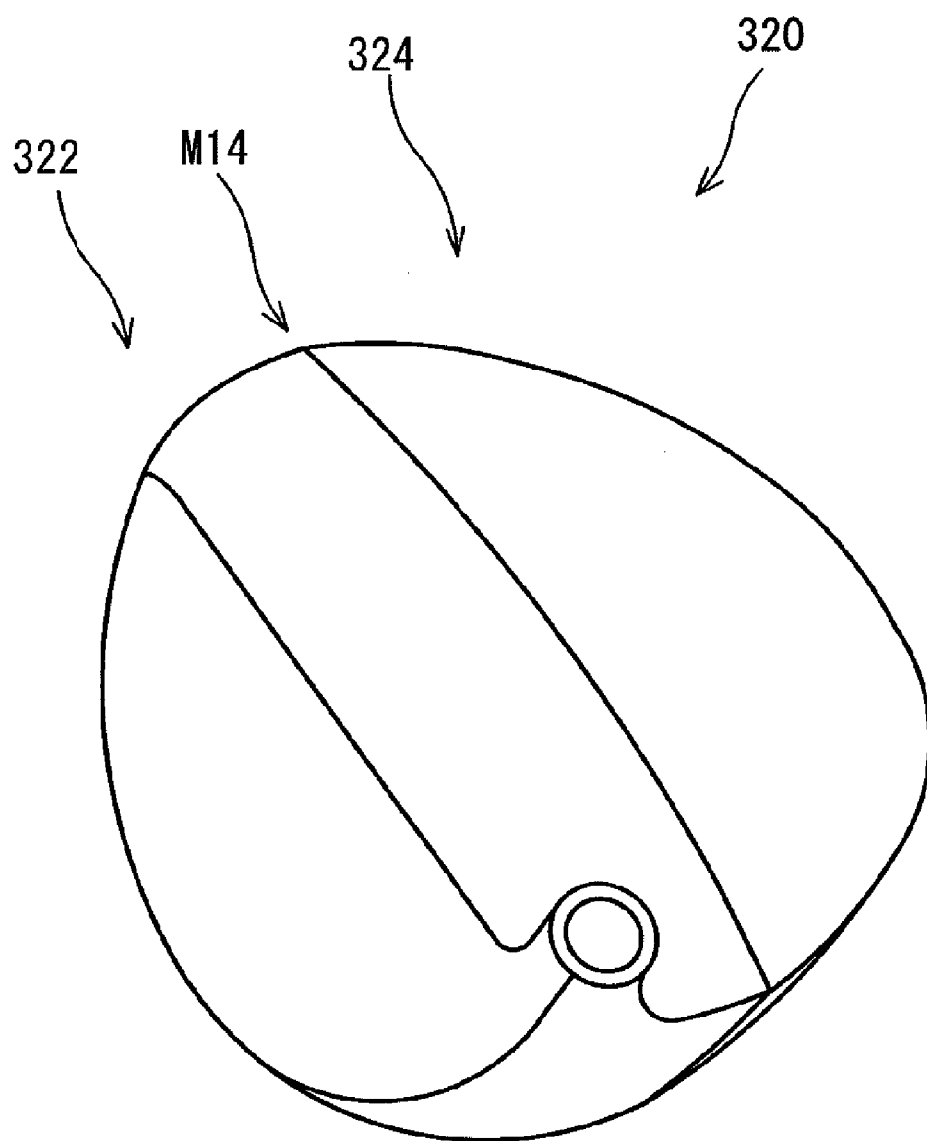


FIG. 38

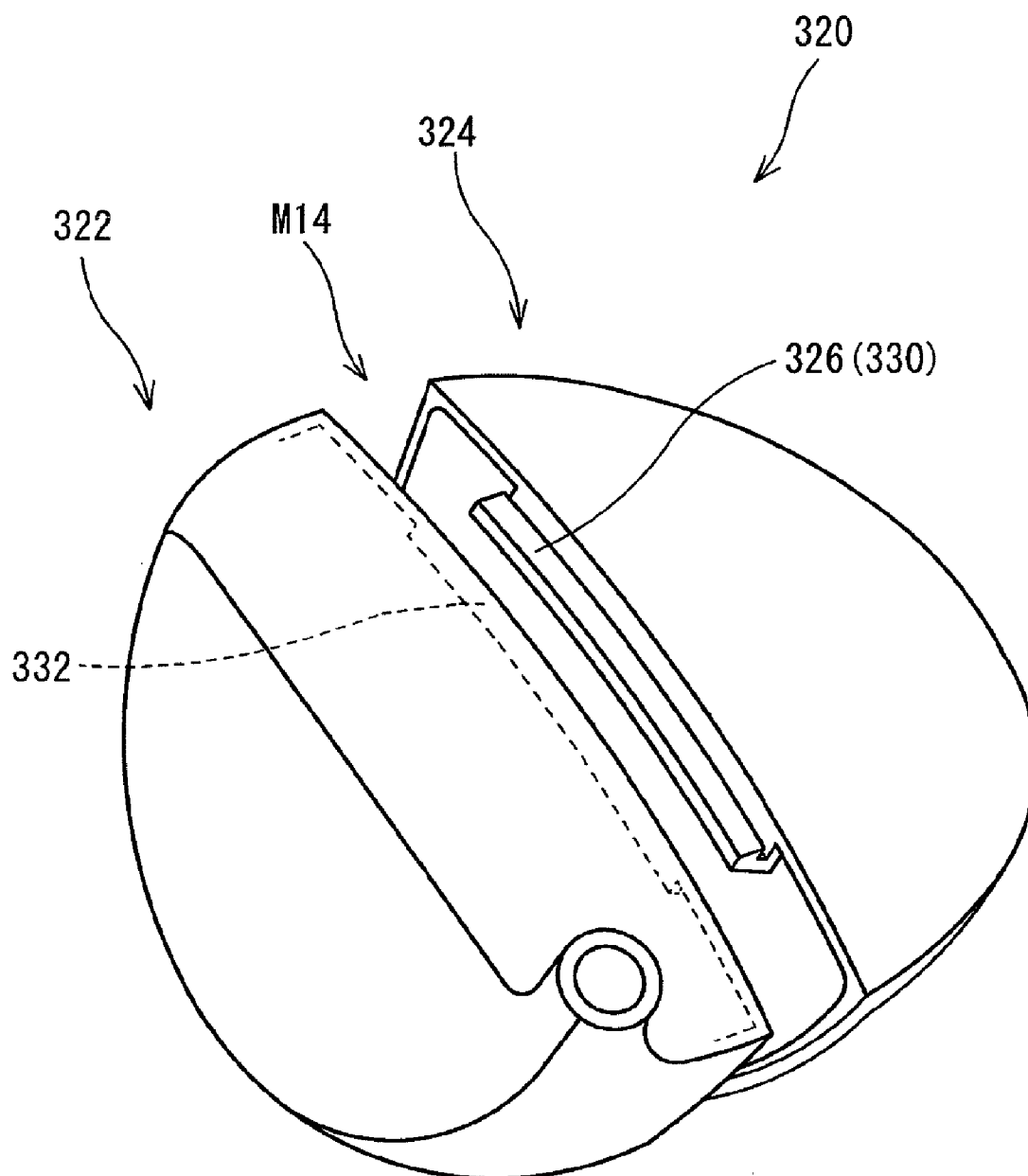


FIG. 39

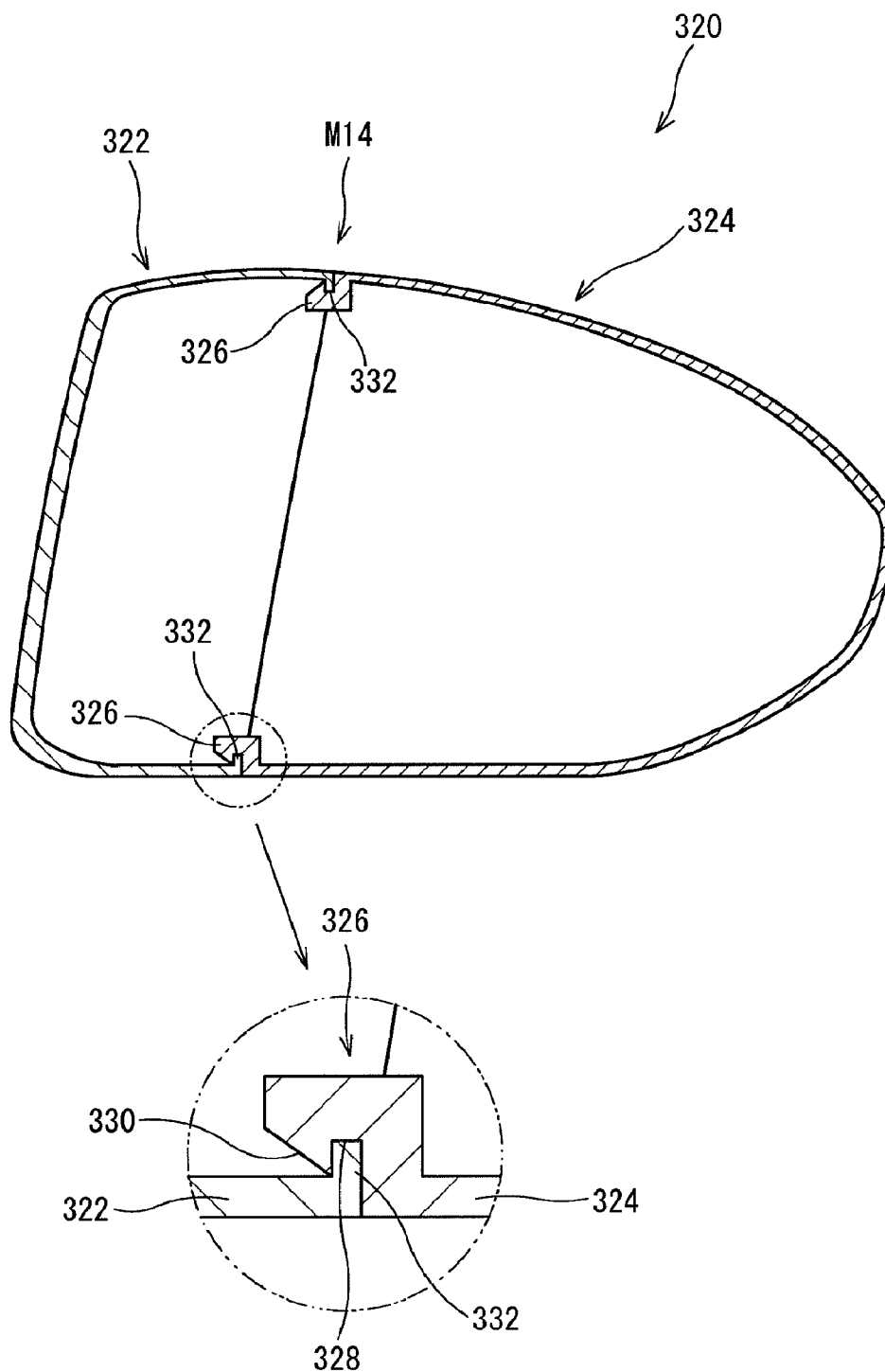


FIG. 40

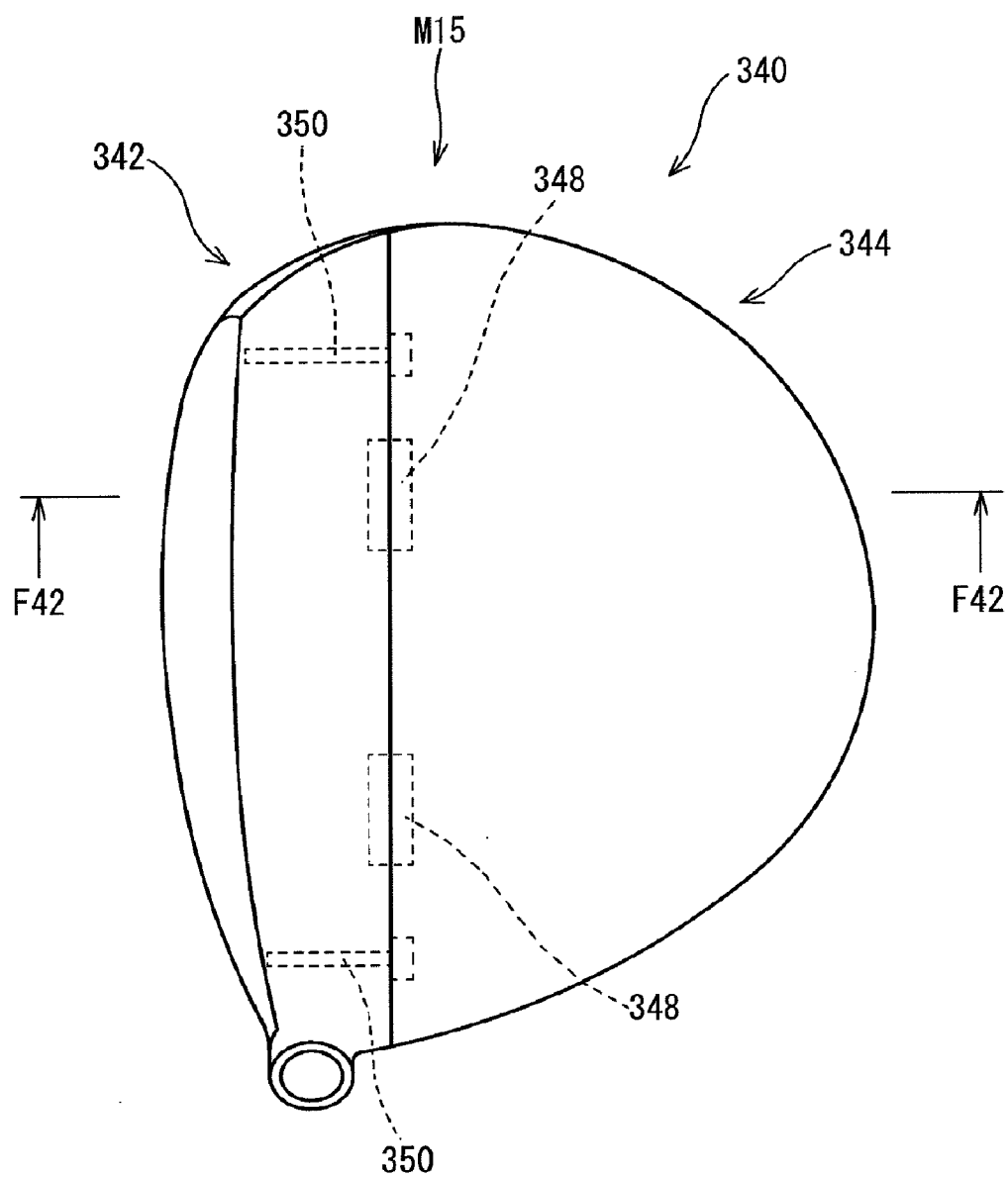


FIG. 41

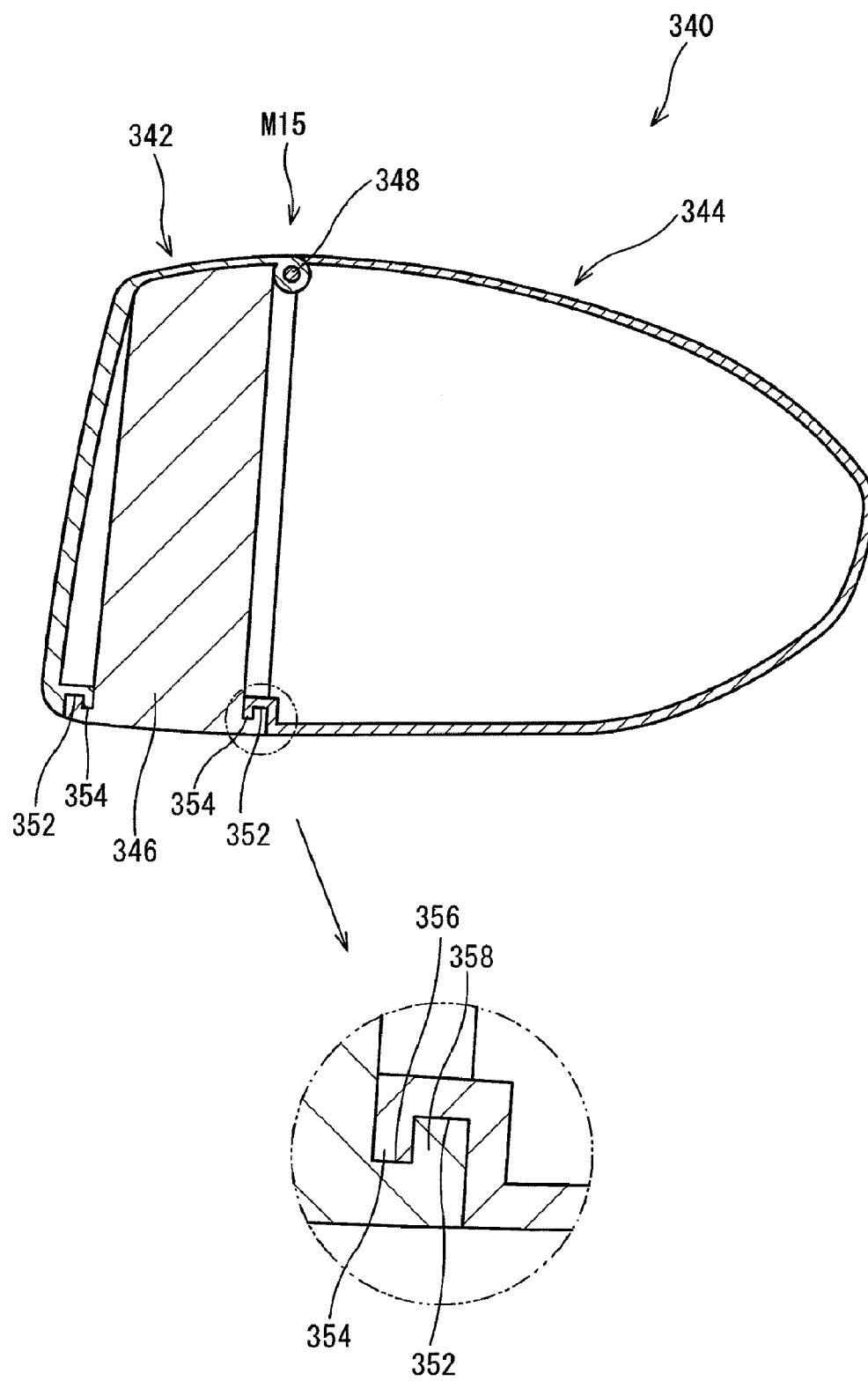


FIG. 42

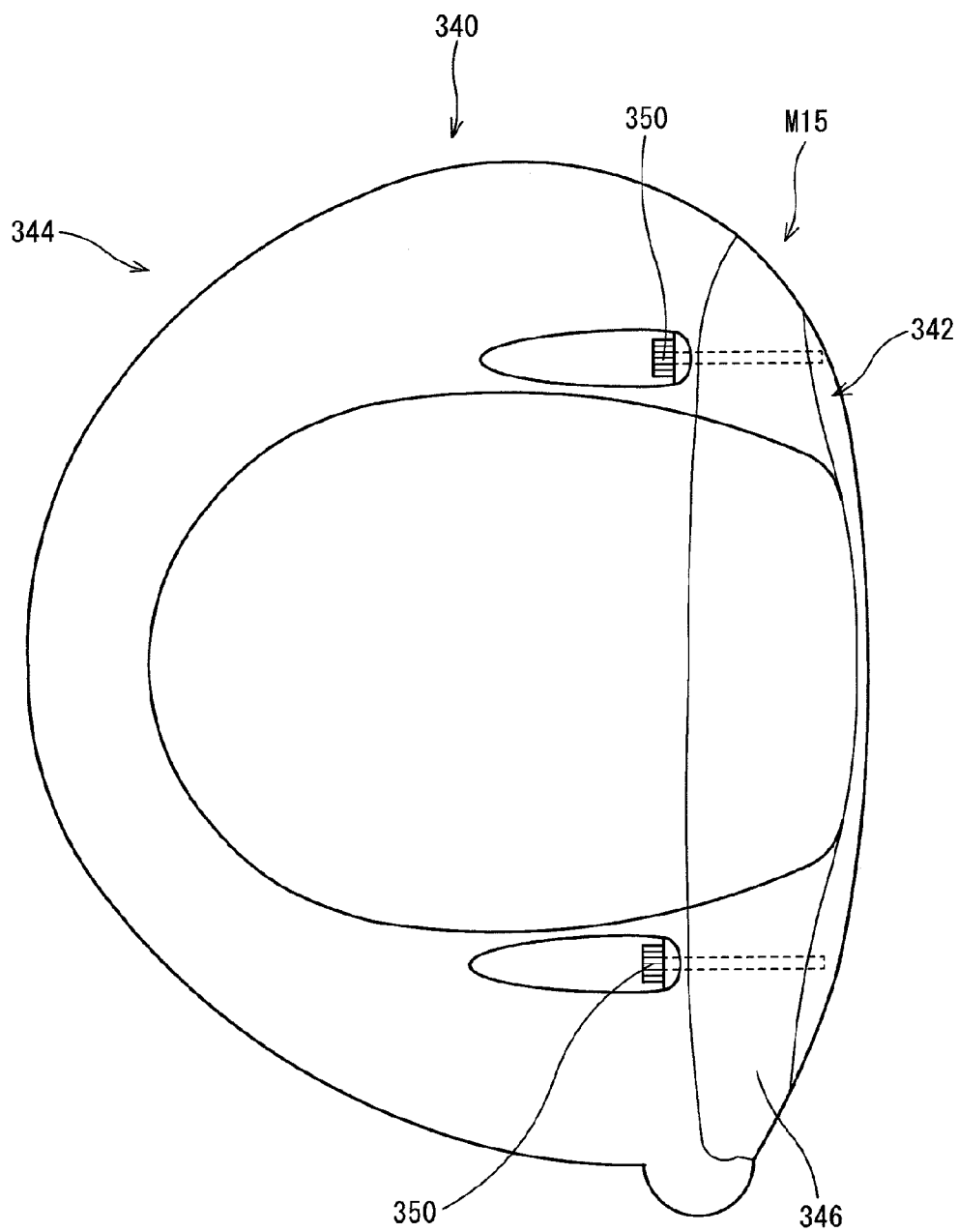


FIG. 43

GOLF CLUB

[0001] The present application claims priority on Patent Application No. 2010-208923 filed in JAPAN on Sep. 17, 2010 and Patent Application No. 2011-166179 filed in JAPAN on Jul. 29, 2011, the entire contents of which are hereby incorporated by reference.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention relates to a golf club. In particular, the present invention relates to a golf club having adjustability.

[0004] 2. Description of the Related Art

[0005] Golf players select and use golf clubs suited to themselves. The number of golf clubs capable of being used during playing golf is 14 in respect of the Golf Rules. The golf players usually select 14 clubs and make a round.

[0006] However, a condition may be varied according to days even in the same golf player. Setting of a golf course also has an influence on selection of the golf club. Weather also has an influence on the selection of the golf club. In order to deal with a plurality of golf courses, it is advantageous to prepare changing golf clubs in addition to 14 clubs to be used. Similarly, in order to deal with weather change, it is advantageous to prepare changing golf clubs. In order to improve a degree of freedom of selection, it is advantageous to prepare changing golf clubs.

[0007] In the golf club having adjustability, a specification can be adjusted. One golf club having adjustability can be adjusted to a plurality of specifications. The adjustability can eliminate the use of the changing golf club.

[0008] A golf club having adjustability has been proposed. Japanese Patent Application Laid-Open No. 9-201433 discloses a golf club having a variable loft angle. Japanese Patent Application Laid-Open No. 2004-267460 discloses a golf club having an adjustable face angle. US 2006/0293115 discloses a structure where a head is easily mounted and detached to and from a shaft. An embodiment in which a shaft axis inclined to a hosel axis is shown in FIG. 17 of US 2006/0293115. In the embodiment of FIG. 17 of US 2006/0293115, a loft angle, a lie angle, and a face angle are varied in relation to each other due to a circumferential position of a sleeve.

SUMMARY OF THE INVENTION

[0009] It was found that there is room for improvement in the adjustability in the conventional technique.

[0010] It is an object of the present invention to provide a golf club having excellent adjustability.

[0011] A golf club of the present invention comprises at least one adjusting mechanism. In the golf club, at least two specifications can be adjusted independently of each other.

[0012] Preferably, a head, a shaft, a grip, or a joined part therebetween has an adjusting mechanism (1). The head, the shaft, the grip, or the joined part has further other adjusting mechanism (2). Preferably, the adjusting mechanism (1) and the adjusting mechanism (2) can work independently of each other. The joined part means a joined part between the head and the shaft, and a joined part between the shaft and the grip.

[0013] Preferably, the adjusting mechanism (1) or the adjusting mechanism (2) is located at a place other than a hosel part.

[0014] Preferably, the adjusting mechanism (1) and the adjusting mechanism (2) are located at places other than a hosel part.

[0015] Preferably, all the adjusting mechanisms are located at places other than a hosel part.

[0016] Preferably, in the golf club, the two or more specifications selected from a loft angle, a lie angle, a face angle, a face area, a position of a center of gravity of a head, a swing-weight, a club length, a position of a center of gravity of a club, a frequency of the club, a club weight, a head shape, a head volume, a head weight, a flex of a shaft, a flex point of a shaft, a torque of the shaft, flexural rigidity distribution of the shaft, torsional rigidity distribution of the shaft, a shaft weight, weight distribution of the shaft, a position of a center of gravity of the shaft, a length of the shaft, a grip outer diameter, a grip weight, a position of a center of gravity of a grip, a grip length, a specification of a face groove, a face progression, a moment of inertia of the head, a moment of inertia of the club, a coefficient of restitution of the head to a ball, and a friction coefficient of the head to the ball can be adjusted independently of each other.

[0017] The number of the specifications capable of being adjusted independently of each other may be equal to or greater than 3, and furthermore equal to or greater than 4.

[0018] Preferably, the plurality of specifications includes one or more specific specifications selected from a loft angle, a lie angle, a club length, and a club weight. An adjustment range is equal to or greater than a width corresponding to two-number clubs in all the specific specifications.

[0019] A golf club set of the present invention comprises the plurality of golf clubs.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] FIG. 1 is a perspective view of a head provided with an adjusting mechanism M1 (front member changing mechanism);

[0021] FIG. 2 is an exploded view of the head of FIG. 1;

[0022] FIG. 3 is a view for explaining change of the front member;

[0023] FIG. 4 is a view of the head of FIG. 1, as viewed from a sole side;

[0024] FIG. 5 is a perspective view of the head provided with an adjusting mechanism M2 (face plate changing mechanism);

[0025] FIG. 6 is a view for explaining change of a face plate;

[0026] FIG. 7 is a view showing a golf club provided with an adjusting mechanism M3 (club length adjusting mechanism);

[0027] FIG. 8 is a view for explaining adjustment of a club length;

[0028] FIG. 9 is a view showing a golf club provided with an adjusting mechanism M4 (lie angle adjusting mechanism);

[0029] FIG. 10 is a view of the golf club of FIG. 9, as viewed from a sole side;

[0030] FIG. 11 is a cross sectional view of the golf club of FIG. 9;

[0031] FIG. 12 is a cross sectional view taken along line Cs1-Cs1 of FIG. 11, a cross sectional view taken along line Cs2-Cs2, and a cross sectional view taken along line Cs3-Cs3;

[0032] FIG. 13 is a view for explaining adjustment of a lie angle;

[0033] FIG. 14 is a view showing a golf club provided with an adjusting mechanism M4 and an adjusting mechanism M5;

[0034] FIG. 15 is a view of the golf club of FIG. 14, as viewed from a sole side;

[0035] FIG. 16 is a view showing a golf club provided with an adjusting mechanism M4, an adjusting mechanism M5, and an adjusting mechanism M6;

[0036] FIG. 17 is a cross sectional view of a golf club provided with an adjusting mechanism M6;

[0037] FIG. 18 is a view of a golf club provided with an adjusting mechanism M7;

[0038] FIG. 19 is an exploded view of the golf club of FIG. 18;

[0039] FIG. 20 is a cross sectional view of the golf club of FIG. 18;

[0040] FIG. 21 is a perspective view of a sleeve used for the golf club of FIG. 18;

[0041] FIG. 22 is a cross sectional view of a first sleeve;

[0042] FIG. 23 is a cross sectional view of a second sleeve;

[0043] FIG. 24 is an exploded perspective view of a golf club head provided with an adjusting mechanism M8;

[0044] FIG. 25 is a view for explaining change of a back member;

[0045] FIG. 26 is a view showing a golf club provided with an adjusting mechanism M9;

[0046] FIG. 27 is a cross sectional view of FIG. 26;

[0047] FIG. 28 is a cross sectional view of the golf club taken along line F28-F28 of FIG. 27;

[0048] FIG. 29 is a view showing a golf club provided with an adjusting mechanism M10;

[0049] FIG. 30 is a cross sectional view of FIG. 29;

[0050] FIG. 31 is an exploded view of FIG. 29;

[0051] FIG. 32 is an exploded view of other golf club provided with an adjusting mechanism M10;

[0052] FIG. 33 is an exploded perspective view of a golf club head provided with an adjusting mechanism M1 and an adjusting mechanism M11;

[0053] FIG. 34 is a view of the head of FIG. 33, as viewed from a crown side;

[0054] FIG. 35 is an exploded perspective view of a head provided with an adjusting mechanism M12;

[0055] FIG. 36 is an exploded view of a club provided with an adjusting mechanism M6 and an adjusting mechanism M10;

[0056] FIG. 37 is a bottom view of a golf club provided with an adjusting mechanism M13;

[0057] FIG. 38 is a perspective view of a golf club head provided with an adjusting mechanism M14;

[0058] FIG. 39 is an exploded perspective view of the head of FIG. 38;

[0059] FIG. 40 is a cross sectional view of the head of FIG. 38;

[0060] FIG. 41 is a plan view of a golf club head provided with an adjusting mechanism M15;

[0061] FIG. 42 is a cross sectional view taken along line F41-F41 of FIG. 41; and

[0062] FIG. 43 is a bottom view of the head of FIG. 41.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0063] The present invention will be described below in detail based on preferred embodiments with reference to the drawings.

[0064] An adjusting mechanism in the present invention satisfies the Golf Rules defined by Royal and Ancient Golf Club of Saint Andrews (R&A). That is, the adjusting mechanism in the present invention satisfies requirements specified in "1b adjustability" in "1 Club" of "Appendix II design of club" defined by R&A. The requirements defined by the "1b adjustability" are the following items (i), (ii), and (iii):

[0065] (i) the adjustment cannot be readily made;

[0066] (ii) all adjustable parts are firmly fixed and there is no reasonable likelihood of them working loose during a round; and

[0067] (iii) all configurations of adjustment conform with the Rules.

[0068] FIG. 1 shows a head 2. The head 2 is provided with an adjusting mechanism M1 capable of being used for the present invention. Preferably, the adjusting mechanism M1 is used with other adjusting mechanisms independent of each other.

[0069] Although not shown in the drawings, a golf club provided with the head 2 is provided with the head 2, a shaft and a grip. The head 2 is a wood type golf club head.

[0070] FIG. 2 is an exploded perspective view of the head 2. The head 2 has a front member 4, a back member 6, and a connecting member 8. The front member 4 is connected to the back member 6 by the connecting member 8. The front member 4 is connected to the back member 6 in a state where no gap substantially exists. The hollow head 2 is completed by the connection.

[0071] The front member 4 has a face surface 10. The front member 4 has the whole face surface 10. Although not shown in the drawings, the front member 4 has a screw hole into which the connecting member 8 is screwed, and a thick part for forming the screw hole. The front member 4 is approximately cup-shaped as a whole. Although illustration is omitted, face grooves are formed in the face surface 10.

[0072] The back member 6 has a hosel part 12. The hosel part 12 has a shaft hole 14. The back member 6 has a through hole 16 through which the connecting member 8 passes, and a thick part 18 for forming the through hole 16. The through hole 16 is formed on each of a toe side and heel side of the head 2. The thick part 18 is also formed on each of the toe side and heel side of the head 2. Positions of the through hole 16 and thick part 18 are not restricted.

[0073] The back member 6 has a protruding part 20. In the embodiment, a plurality of (two) protruding parts 20 is provided. The protruding parts 20 protrude forward from an opening part of the back member 6. The protruding parts 20 facilitate position adjustment of the front member 4. The protruding parts 20 facilitate screwing between the front member 4 and the back member 6.

[0074] The heel side through hole 16 is formed on the heel side from the shaft hole 14. The heel side thick part 18 is formed on the heel side from the shaft hole 14. The disposal can contribute to shortening of a length of the through hole 16. The disposal can contribute to lessening of a volume of the thick part 18. The disposal can contribute to miniaturizing of a screw mechanism.

[0075] The connecting member 8 is a screw. The front member 4 is connected to the back member 6 by the connecting member 8.

[0076] The head 2 has the adjusting mechanism M1. The adjusting mechanism M1 is a screwing mechanism between the front member 4 and the back member 6. The adjusting mechanism M1 can change the front member 4.

[0077] A changing front member E4 is shown with the head 2 in FIG. 3. A changing front member E41 and other changing front member E42 are shown as the changing front member E4 in FIG. 3. The changing front member E41 and the changing front member E42 can be connected to the back member 6 by the connecting member 8. A golf club with an adjusting function includes the head 2 and the at least one changing front member E4.

[0078] For example, a loft angle (real loft angle) is changed by changing the front member 4 to the changing front member E4. For example, a face angle is changed by changing the front member 4 to the changing front member E4.

[0079] Examples of specifications capable of being adjusted by the adjusting mechanism M1 include a loft angle, a face angle, a face area, and a face progression. Each of these specifications can be independently adjusted in the adjusting mechanism M1. Furthermore, in the adjusting mechanism M1, a coefficient of restitution of the head to a ball, and a friction coefficient of the head to the ball can be adjusted. The coefficient of restitution of the head to the ball can be adjusted by, for example, changing the front member to another changing front member having rigidity different from that of the front member. The friction coefficient of the head to the ball can be adjusted by, for example, changing the front member to another changing front member having a face surface having surface roughness different from that of the front member.

[0080] Examples of adjustments of the specifications by the adjusting mechanism M1 include the following adjustments:

[0081] (adjustment 1a) a loft angle is changed and a face angle is not substantially varied;

[0082] (adjustment 1b) a loft angle is changed and a face angle is also changed;

[0083] (adjustment 1c) a loft angle is not substantially changed but a face angle is changed;

[0084] (adjustment 1d) a face area is changed, and a loft angle and a face angle are not varied; and

[0085] (adjustment 1e) a face progression is changed, and a loft angle and a face angle are not varied.

[0086] Although the adjusting mechanism M1 is applied to the wood type golf club head, the adjusting mechanism M1 may be used also for other type golf clubs (iron type, utility type, and putter type golf clubs or the like).

[0087] FIG. 5 is an exploded perspective view of a head 30 provided with an adjusting mechanism M2 according to other embodiment. FIG. 6 is a cross sectional view of the head 30. Although not shown in the drawings, a golf club provided with the head 30 is provided with a shaft and a grip. The head 30 is an iron type golf club head. Preferably, the adjusting mechanism M2 is used with other adjusting mechanism.

[0088] The head 30 has a face plate 32, a head body 34, and a connecting member 36. The face plate 32 is connected to the head body 34 by the connecting member 36. The face plate 32 is connected to the head body 34 in a state where no gap substantially exists. The head 30 having a cavity 38 (see FIG. 6) formed in a back face is completed by the connection. In the head 30, a plane p1 provided on a back surface of the face

plate 32 is brought into surface contact with a plane p2 provided on a front surface of the head body 34 (see FIG. 6).

[0089] The face plate 32 has a face surface 40. The face plate 32 has the whole face surface 40. Although not shown in the drawings, the face plate 32 has a screw hole into which the connecting member 36 is screwed. The face plate 32 is a plate-shaped as a whole. Face grooves 42 are formed in the face surface 40.

[0090] The head body 34 has a hosel part 44. The hosel part 44 has a shaft hole 46. The head body 34 has a through hole 48 through which the connecting member 36 passes. The through hole 48 is formed on each of a toe side and heel side of the head body 34. A position of the through hole 48 is not restricted.

[0091] The connecting member 36 is a screw. The face plate 32 is connected to the head body 34 by the connecting member 36.

[0092] The head 2 has an adjusting mechanism M2. The adjusting mechanism M2 is a screwing mechanism between the face plate 32 and the head body 34. The adjusting mechanism M2 can change the face plate 32.

[0093] FIG. 6 shows a cross sectional view of a changing face plate E32 with a cross sectional view of the head 30. A first changing face plate E321 and a second changing face plate E322 are shown as the changing face plate E32 in FIG. 6. The changing face plate E32 can be connected to the head body 34 by the connecting member 36. A golf club with an adjusting function includes the head 30 and at least one changing face plate E32.

[0094] For example, a loft angle (real loft angle) is changed by changing the face plate 32 to the changing face plate E32. For example, a specification of the face groove is changed by changing the face plate 32 to the changing face plate E32.

[0095] Examples of specifications capable of being adjusted by the adjusting mechanism M2 include a loft angle, a specification of the face groove, a face progression, and a friction coefficient of a head to a ball. Each of these specifications can be independently adjusted in the adjusting mechanism M2.

[0096] Examples of adjustments of the specifications by the adjusting mechanism M2 include the following adjustments:

[0097] (adjustment 2a) a loft angle is changed, and a specification of a face groove is not substantially varied;

[0098] (adjustment 2b) a loft angle is changed, and a specification of a face groove is also changed;

[0099] (adjustment 2c) a loft angle is not substantially changed, and a specification of a face groove is changed; and

[0100] (adjustment 2d) a face progression is changed, and specifications of a loft angle and a face groove are not changed.

[0101] Although the adjusting mechanism M2 is applied to the iron type golf club head, the adjusting mechanism M2 may be used also for other type golf clubs (wood type, utility type, and putter type golf clubs or the like).

[0102] FIG. 7 shows a golf club 50 according to other adjusting mechanism. The golf club 50 is provided with a head 52, a shaft 54, a sleeve 56, and a grip (not shown). The head 52 is a wood type golf club head. The shaft 54 is tube-shaped.

[0103] As described later, the golf club 50 has an adjusting mechanism M3. Preferably, the golf club 50 has other adjusting mechanisms independent of each other, with the adjusting mechanism M3.

[0104] The golf club 50 has a plurality of connecting members 58. The golf club 50 of the embodiment has three connecting members 58 (see FIG. 7). The golf club 50 has a first connecting member 581, a second connecting member 582, and a third connecting member 583 as the connecting members 58.

[0105] FIG. 8 is a cross sectional view of the golf club 50. A section of a hosel portion is shown in FIG. 8. A left side (configuration S1) of FIG. 8 shows a state where the first connecting member 581 is used. A center (configuration S2) of FIG. 8 shows a state where the second connecting member 582 is used. A right side (configuration S3) of FIG. 8 shows a state where the third connecting member 583 is used.

[0106] The head 52 has a hosel hole 60. The sleeve 56 is inserted into the hosel hole 60. A cross sectional shape of the hosel hole 60 corresponds to a cross sectional shape of an outer surface of the sleeve 56.

[0107] The sleeve 56 has a shaft hole 62 and a screw hole 63. The shaft hole 62 is opened upward. The screw hole 63 is downwardly opened.

[0108] As shown in FIG. 8, a tip part of the shaft 54 is inserted into the shaft hole 62. The sleeve 56 is fixed to the tip part of the shaft 54. The sleeve 56 is bonded to the tip part of the shaft 54.

[0109] An outer surface 66 of the sleeve 56 has a portion having a noncircular cross sectional shape. In the embodiment, the outer surface 66 of the sleeve 56 has a hexagonal cross sectional shape. Meanwhile, the hosel hole 60 also has a noncircular (hexagonal) cross sectional shape. Rotation of the sleeve 56 to the hosel hole 60 is regulated by these non-circular cross sectional shapes.

[0110] The outer surface of the sleeve 56 and the hosel hole 60 may have a circular cross sectional shape. Regulation of relative rotation can be also achieved by only the connecting member 58.

[0111] The connecting member 58 has a head part r1, an axis part r2, and a screw part r3. The axis part r2 is provided between the head part r1 and the screw part r3.

[0112] The plurality of connecting members 58 has different lengths. The different lengths are achieved by a difference in the length of the axis part r2.

[0113] As shown in FIG. 8, the screw part r3 of the connecting member 58 is connected to the screw hole 63 of the sleeve 56. Withdrawal of the sleeve 56 from the shaft hole 62 is prevented by the screw connection.

[0114] As shown in FIG. 8, an insertion length Ls (see FIG. 8) of the sleeve 56 to the shaft hole 62 is varied depending on the connecting member 58 to be used. A club length is changed due to the variation.

[0115] The golf club 50 has an adjusting mechanism M3. The adjusting mechanism M3 is an changing mechanism of a shaft insertion length.

[0116] For example, the club length is changed by the adjusting mechanism M3. For example, a swingweight is changed by the adjusting mechanism M3. Examples of adjustments of the specifications by the adjusting mechanism M3 include the following adjustments:

[0117] (adjustment 3a) a club length is changed, and a swingweight is not substantially varied; and

[0118] (adjustment 3b) a club length is changed, and a swingweight is also changed.

[0119] Examples of means for realizing the (adjustment 3a) include reducing a weight of a longer connecting member 58. Examples of the means include using a material having

smaller specific gravity for a longer connecting member 58, and reducing an outer diameter of an axis part r2 of a longer connecting member 58.

[0120] Although the adjusting mechanism M3 is applied to the wood type golf club, the adjusting mechanism M3 may be used also for other type golf clubs (iron type, utility type, and putter type golf clubs or the like).

[0121] FIG. 9 shows a golf club 70 according to other adjusting mechanism. FIG. 10 is a view of the golf club 70, as viewed from a sole side. FIG. 11 is a cross sectional view of a vicinity of a hosel of the golf club 70. FIG. 12 is a cross sectional view in each of positions shown in FIG. 11. The golf club 70 is provided with a head 72, a shaft 74, a sleeve 76, a connecting member 78 (see FIG. 11), and a grip (not shown). The head 72 is a wood type golf club head. The shaft 74 is tube-shaped.

[0122] As described later, the golf club 70 has an adjusting mechanism M4. Preferably, the golf club 70 has further other adjusting mechanism independent of the adjusting mechanism M4.

[0123] The head 72 has a hosel part 73. The hosel part 73 has a sleeve insertion hole 75 (see FIG. 11).

[0124] The sleeve 76 is bonded to the shaft 74. The sleeve 76 has a screw hole 77. The screw hole 77 is formed in a bottom surface 79 of the sleeve 76.

[0125] Furthermore, the golf club 70 has a plurality of sleeve supporting members 80 (see FIG. 11). The golf club 70 has a first sleeve supporting member 801, a second sleeve supporting member 802, and a third sleeve supporting member 803 as the sleeve supporting members 80.

[0126] The connecting member 78 is a screw. The connecting member 78 has a head part r1 and a screw part r3 (see FIG. 11). A concave part 81 for axially rotating the connecting member 78 is formed in the head part r1 of the connecting member 78 (see FIG. 10). The concave part 81 has a noncircular cross sectional shape.

[0127] The connecting member 78 is screw-connected to the screw hole 77. Retention of the shaft 74 is achieved by the screw connection.

[0128] The golf club 70 has the adjusting mechanism M4. The adjusting mechanism M4 can adjust a lie angle. The golf club 70 of the embodiment can be adjusted to three lie angles. The lie angle is adjusted by changing a direction of a shaft axis line. The sleeve insertion hole 75 does not disturb adjustment of the lie angle.

[0129] A shaft axis line in the case of a first lie angle is represented by reference character LS (see FIGS. 9 and 11). A shaft axis line in the case of a second lie angle is represented by reference character LF. A shaft axis line in the case of a third lie angle is represented by reference character LU.

[0130] The head 72 has a plurality of holding holes h1. In the embodiment, the head 72 has a first holding hole h11, a second holding hole h12, and a third holding hole h13. FIG. 11 shows profile lines of the holding holes h1, as viewed from the lower side of the head 72, in addition to a cross sectional view of the golf club 70. A central axis line of the first holding hole h11 coincides with the shaft axis line LS. A central axis line of the second holding hole h12 coincides with the shaft axis line LF. A central axis line of the third holding hole h13 coincides with the shaft axis line LU.

[0131] Each of the holding holes h1 is positioned so that a central axis line of (the head part r1 of) the connecting member 78 coincides with a position of any one of the plurality of shaft axis lines.

[0132] As shown in FIG. 11, the plurality of holding holes h1 is mutually and partially overlapped. Adjustment interval of the lie angle can be reduced by the partial overlapping. The lie angle can be delicately adjusted by the partial overlapping.

[0133] The head 72 has a plurality of insertion holes h2. Into the insertion holes h2, (the screw part r3 of) the connecting member 78 is inserted. In relation to the position of the section, the insertion holes h2 do not appear in the cross sectional view of FIG. 11. In the embodiment, the head 72 has a first insertion hole h21, a second insertion hole h22, and a third insertion hole h23. The profile lines of the insertion holes h2, as viewed from the lower side of the head 72 are also shown. A central axis line of the first insertion hole h21 coincides with the shaft axis line LS. A central axis line of the second insertion hole h22 coincides with the shaft axis line LF. A central axis line of the third insertion hole h23 coincides with the shaft axis line LU.

[0134] As shown in FIG. 11, the plurality of insertion holes 12 is mutually and partially overlapped. Adjustment interval of the lie angle can be reduced by the partial overlapping. The lie angle can be delicately adjusted by the partial overlapping.

[0135] The holding hole h1 and the insertion hole h2 are continuous. A diameter of the holding hole h1 is greater than that of the insertion hole h2. A bump surface d1 exists on a boundary between the holding hole h1 and the insertion hole h2. The bump surface d1 abuts on a bump surface d2 of the connecting member 78.

[0136] As shown in FIGS. 11 and 12, the sleeve supporting member 80 has a through hole 88 and an outer surface 90. A through hole 88 of a first sleeve supporting member 801 corresponds to the shaft axis line LS. A through hole 88 of a second sleeve supporting member 802 corresponds to the shaft axis line LF. A through hole 88 of a third sleeve supporting member 803 corresponds to the shaft axis line LU.

[0137] An outer surface 90 of the sleeve supporting member 80 is a screw. A screw (female screw) 92 capable of being connected to the screw (male screw) of the outer surface 90 is formed in an inner surface of the sleeve insertion hole 75 (see FIG. 11). The sleeve supporting member 80 is fixed to the sleeve insertion hole 75 by screw connection. The screw connection may be absent. For example, the outer surface 90 of the sleeve supporting member 80 may have a noncircular cross sectional shape, and the cross sectional shape of the inner surface of the sleeve insertion hole 75 abutting on the outer surface 90 also may correspond to the cross sectional shape of the outer surface 90. In this case, rotation of the sleeve supporting member 80 to the sleeve insertion hole 75 is prevented due to the noncircular cross sectional shape.

[0138] The sleeve supporting member 80 supports the sleeve 76 along a predetermined axial direction. Simultaneously, the sleeve supporting member 80 disturbs relative rotation of the sleeve 76 and the sleeve insertion hole 75.

[0139] FIG. 13 shows states of three lie angles. A left side (configuration S4) of FIG. 13 shows a cross sectional view when the shaft axis line LU is employed. In this case, the third sleeve supporting member 803 of the plurality of sleeve supporting members 80 is used. The holding hole h13 is used as the holding hole h1. The insertion hole h23 is used as the insertion hole h2. In the configuration S4, the lie angle is comparatively upright. That is, the lie angle is comparatively great.

[0140] A center (configuration S5) of FIG. 13 shows a cross sectional view when the shaft axis line LS is employed. In this case, the first sleeve supporting member 801 of the plurality

of sleeve supporting members 80 is used. The holding hole h11 is used as the holding hole h1. The insertion hole h21 is used as the insertion hole h2.

[0141] A right side (configuration S6) of FIG. 13 shows a cross sectional view when the shaft axis line LF is employed. In this case, a second sleeve supporting member 802 of the plurality of sleeve supporting members 80 is used. The holding hole h12 is used as the holding hole h1. The insertion hole h22 is used as the insertion hole h2. In the configuration S6, the lie angle is comparatively flat. That is, the lie angle is comparatively small.

[0142] In the golf club 70, support of the sleeve 76 in each of the lie angles (each of the shaft axis lines) is achieved by the sleeve supporting member 80 and the holding hole h1. The support of the sleeve 76 in each of the lie angles may be achieved by only the sleeve supporting member 80. The support of the sleeve 76 in each of the lie angles may be achieved by only the holding hole h1. In respect of alleviating dimensional accuracy of the hosel part, the support of the sleeve 76 in each of the lie angles is preferably achieved by either the sleeve supporting member 80 or the holding hole h1. In respect of alleviating the dimensional accuracy of the hosel part, a resin is also preferably used as a material of the sleeve supporting member 80. The sleeve supporting member 80 made of the resin is suitable for supporting the sleeve 76 while being deformed so as to absorb a dimensional gap.

[0143] In the golf club 70, rotation stopping of the sleeve 76 is achieved by the sleeve supporting member 80 and the connecting member 78. The rotation stopping of the sleeve 76 may be achieved by only the sleeve supporting member 80. The rotation stopping of the sleeve 76 may be achieved by only the connecting member 78. When the connecting member 78 is made to function as the rotation stopping of the sleeve 76, the connecting member 78 is preferably tightened by a force received from a ball at hitting the ball. When the connecting member 78 is made to function as the rotation stopping of the sleeve 76, the holding hole h1 and the head part r1 preferably have a noncircular cross sectional shape, to prevent relative rotation of the holding hole h1 and the head part r1.

[0144] FIGS. 14 and 15 show a golf club 100 according to other adjusting mechanism. FIG. 15 is a view, as viewed from a sole side. The golf club 100 is provided with a head 102, a shaft 74, a sleeve 76, a connecting member 78 (see FIG. 15), and a grip (not shown). The head 102 is a wood type golf club head. The shaft 74 is tube-shaped.

[0145] The head 102 has the above-mentioned adjusting mechanism M4. The description of the adjusting mechanism M4 is omitted.

[0146] Furthermore, the head 102 has an adjusting mechanism M5. The adjusting mechanism M5 is a center-of-gravity position adjusting mechanism. The head 102 has a weight body 104 and a disposing hole Wh as the adjusting mechanism M5. As shown in FIG. 15, in the embodiment, a plurality of disposing holes Wh are formed. These disposing holes Wh are formed in a sole 106 of the head 102.

[0147] The disposing hole Wh is a screw hole. The weight body 104 is a screw. The weight body 104 is screwed into the disposing holes Wh. The position of the center of gravity of the head is adjusted depending on the disposing hole Wh in which the weight body 104 is located.

[0148] Examples of specifications capable of being adjusted by the adjusting mechanism M5 include a position of a center of gravity of a head and a moment of inertia of the head.

[0149] Examples of adjustments of the specifications by the adjusting mechanism M5 include the following adjustments:

[0150] (adjustment 5a) Although a distance of a center of gravity is changed, a depth of the center of gravity is not substantially varied, and a height of the center of gravity is not also substantially varied;

[0151] (adjustment 5b) All of a distance of a center of gravity, a depth of the center of gravity, and a height of the center of gravity are varied; and

[0152] (adjustment 5c) A distance of a center of gravity is changed; any one of a depth of the center of gravity and a height of the center of gravity is varied; and the other is not substantially varied.

[0153] As shown in FIG. 15, in the embodiment, the plurality of disposing holes Wh is substantially aligned along a toe-heel direction. That is, a central axis line SP1 of a first disposing hole Wh1, a central axis line SP2 of a second disposing hole Wh2, and a central axis line SP3 of a third disposing hole Wh3 are aligned along the toe-heel direction. In the embodiment, when disposal of the weight body 104 is changed, a distance of a center of gravity is mainly varied by the disposal, and a depth of the center of gravity is hardly varied. Specifically, when an amount of variation of the depth of the center of gravity is defined as Cd (mm) and an amount of variation of the distance of a center of gravity is defined as Cs (mm), a ratio (Cd/Cs) is preferably equal to or less than 0.2, and more preferably equal to or less than 0.1. In this case, the distance of the center of gravity can be selectively adjusted. It is useful to selectively adjust the distance of the center of gravity in order to adjust the direction of the face in impact.

[0154] Although the adjusting mechanism M5 is applied to the wood type golf club head, the adjusting mechanism M5 may be used also for other type golf clubs (iron type, utility type, and putter type golf clubs or the like).

[0155] FIG. 16 shows a golf club 110 according to other adjusting mechanism. The golf club 110 is provided with a head 102, a shaft 74, a sleeve 76, a connecting member 78 (not shown), and a grip 112.

[0156] The head 102 has the above-mentioned adjusting mechanism M4 and adjusting mechanism M5. The descriptions of the adjusting mechanism M4 and the adjusting mechanism M5 are omitted.

[0157] The grip 112 has a main body 114, a weight body Wg, and a holding body 118. Furthermore, the grip 112 has a cover 120.

[0158] The holding body 118 has a screw hole 122. The holding body 118 is disposed medially in the shaft 74. The holding body 118 is bonded to an inner surface of the shaft 74.

[0159] The weight body Wg is detachably mounted to the holding body 118. The mounting/demounting is achieved by a screw mechanism.

[0160] The main body 114 is made of rubber. A concave part 124 is formed in a vicinity of a back end part of the main body 114. The concave part 124 is a circumferential groove. The cover 120 has a convex part 126 corresponding to the concave part 124. The convex part 126 is a flange. The main body 114 made of rubber can be deformed, to fit the convex part 126 into the concave part 124. The cover 120 is detachably mounted.

[0161] The grip 112 has a weight adjusting mechanism as an adjusting mechanism M6. The weight adjusting mechanism is achieved by changing the weight body Wg. The swingweight can be adjusted by changing the weight body Wg to other weight body Wg having a weight different from that of the weight body Wg. For example, the swingweight is lightened by changing a first weight body Wg1 to a second weight body Wg2 having a weight greater than that of the first weight body Wg1. For example, the swingweight is weighted by changing the first weight body Wg1 to a third weight body Wg3 having a weight smaller than that of the first weight body Wg1. The adjusting mechanism M6 has at least two weight bodies Wg having weights different from each other.

[0162] Examples of specifications capable of being adjusted by the adjusting mechanism M6 include a swingweight, a moment of inertia of a club, a grip weight, and a position of a center of gravity of a grip.

[0163] Although the adjusting mechanism M6 is applied to the wood type golf club head, the adjusting mechanism M6 may be used also for other type golf clubs (iron type, utility type, and putter type golf clubs or the like).

[0164] FIG. 18 shows a golf club 130 according to other adjusting mechanism. FIG. 19 is an exploded view of the golf club 130. FIG. 20 is a cross sectional view of the golf club 130.

[0165] As described later, the golf club 130 has an adjusting mechanism M7. Preferably, the golf club 130 further has other adjusting mechanism independent of the adjusting mechanism M7.

[0166] The golf club 130 has a head 132, a shaft 134, a sleeve Sv, a screw cylinder 135, and a connecting member 136. The screw cylinder 135 is fixed to a tip of the shaft 134. A grip (not shown) is mounted to a back end of the shaft 134.

[0167] The head 132 has a head body 138 and an engaging member 140. The head body 138 has a hosel hole 142 into which the sleeve Sv is inserted, and a through hole 144 into which the connecting member 136 is inserted. The through hole 144 penetrates a bottom part of the hosel hole 142. The head body 138 has a sole hole 146 opened in a sole (see FIG. 20). The sole hole 146 is continuous with the hosel hole 142 via the through hole 144.

[0168] The engaging member 140 is fixed to the head body 138 (see FIG. 20). The fixing method is not restricted, and examples thereof include bonding, welding, fitting, and a combination thereof. The engaging member 140 is introduced into the hosel hole 142 from an upper side opening of the hosel hole 142. The engaging member 140 is fixed to the bottom part of the hosel hole 142.

[0169] FIG. 21 is a perspective view of the sleeve Sv. FIG. 22 is a cross sectional view of the sleeve Sv.

[0170] The sleeve Sv has a shaft insertion hole 150 and a lower side hole 152. The shaft insertion hole 150 is opened to an upper side. The lower side hole 152 is opened to a lower side. The lower side hole 152 is disposed on a lower side of the shaft insertion hole 150.

[0171] The sleeve Sv has an engaging part 162. The engaging part 162 has a convex part t1. A plurality of convex parts t1 is aligned in the circumferential direction. The convex parts t1 are equally disposed in the circumferential direction. The convex parts t1 are disposed at every 30 degrees.

[0172] Although not shown in the drawings, an engaging surface capable of being engaged with the engaging part 162 of the sleeve Sv is formed in an inner surface of the engaging member 140. A cross sectional shape of the engaging surface

corresponds to that of an outer surface of the engaging part 162. Rotation of the sleeve Sv to the hosel hole 142 is prevented by engagement between the engaging surface (inner surface) of the engaging member 140 and the engaging part 162.

[0173] The shaft insertion hole 150 is a screw hole. That is, the shaft insertion hole 150 is a female screw.

[0174] The screw cylinder 135 is approximately cylindrical-shaped as a whole. An outer surface of the screw cylinder 135 is a screw. The outer surface of the screw cylinder 135 is a male screw. An inner surface 154 of the screw cylinder 135 is a circumferential surface. An outer surface 156 of the shaft 134 is bonded to the inner surface 154 of the screw cylinder 135.

[0175] As shown in FIG. 20, the shaft insertion hole 150 of the sleeve Sv is screw-connected to the screw cylinder 135. The shaft 134 is fixed to the sleeve Sv by the screw connection.

[0176] Retention of the sleeve Sv is achieved by the screw connection. As shown in FIG. 20, the lower side hole 152 of the sleeve Sv is screw-connected to the connecting member 136. Withdrawal of the sleeve Sv is prevented by the screw connection. An axial force caused by the screw connection brings a hosel end face 158 into close contact with a bump surface 160 of the sleeve Sv. In order to collateralize the axial force, a clearance K1 exists between a tip of the connecting member 136 and a bottom surface of the lower side hole 152 in a state where the screw connection is completed (see FIG. 20).

[0177] In the embodiment, a first sleeve Sv1 and a second sleeve Sv2 are prepared as the sleeve Sv (see FIG. 19). The sleeve Sv1 and the sleeve Sv2 are mutually changeable. As described above, this is because the sleeve Sv is detachably mounted to the shaft 134 (screw cylinder 135) by the screw mechanism.

[0178] FIG. 22 is a cross sectional view of the first sleeve Sv1. As shown in FIG. 22, an axis line h1 of the shaft insertion hole 150 is inclined to an axis line z1 of the sleeve Sv. The inclination angle $\theta 1$ is a maximum value of an angle between the axis line h1 and the axis line z1. The axis line z1 of the sleeve Sv is substantially equal to an axis line of the hosel hole 142.

[0179] FIG. 23 is a cross sectional view of the second sleeve Sv2. As shown in FIG. 23, the axis line h1 of the shaft insertion hole 150 is not inclined to the axis line z1 of the sleeve Sv. The axis line h1 of the shaft insertion hole 150 coincides with the axis line z1 of the sleeve Sv.

[0180] Although not shown in the drawings, other sleeve Sv having an inclination angle $\theta 2$ different from the inclination angle $\theta 1$ may be used.

[0181] Variation of the sleeve Sv is not restricted to the inclination angle of the shaft insertion hole 150. For example, other sleeve Sv in which a position of the shaft insertion hole 150 is changed may be also used. For example, other sleeve Sv in which the shaft insertion hole 150 of the second sleeve Sv2 is moved in parallel may be used. In this case, although the axis line z1 is parallel to the axis line h1, the axis line z1 does not coincide with the axis line h1.

[0182] The adjusting mechanism M7 of the embodiment is a sleeve changing mechanism. In the adjusting mechanism M7, one or more specifications selected from a loft angle, a lie angle, and a face angle are adjusted by changing the sleeve Sv.

[0183] Examples of specifications capable of being adjusted by the adjusting mechanism M7 include a face pro-

gression, a lie angle, a loft angle, a face angle, a swingweight, a club length, a position of a center of gravity of a club, a frequency of the club, a moment of inertia of the club, a flex point of a shaft, a torque of the shaft, flexural rigidity of the shaft, torsional rigidity of the shaft, a shaft weight, weight distribution of the shaft, a position of a center of gravity of the shaft, and a length of the shaft.

[0184] Examples of adjustments of the specifications by the adjusting mechanism M7 include the following adjustments:

[0185] (adjustment 7a) although a lie angle is changed, a loft angle and a face angle are not substantially varied;

[0186] (adjustment 7b) although a loft angle and a face angle are changed, a lie angle is not substantially varied;

[0187] (adjustment 7c) although a club length is changed, a loft angle, a face angle, and a lie angle are not substantially varied;

[0188] (adjustment 7d) although a flex point of a shaft is changed, a loft angle, a face angle, and a lie angle are not substantially varied;

[0189] (adjustment 7e) although a face progression is changed, a loft angle, a face angle, and a lie angle are not substantially varied; and

[0190] (adjustment 7f) although a distance of a center of gravity (a distance between a shaft axis line and a center of gravity of a head) is changed, a loft angle, a face angle, and a lie angle are not substantially varied.

[0191] When the inclination angle $\theta 1$ of the sleeve Sv is 0 degree, the shaft can be changed without varying the loft angle, the lie angle, and the face angle.

[0192] A plurality of sleeves Sv in which the inclination angle $\theta 1$ is 0 degree and positions of the shaft insertion holes 150 are different from each other may be prepared. In this case, the axis line of the shaft insertion hole 150 can be moved in parallel by changing the sleeve Sv. In this case, the adjustment 7e and the adjustment 7f are possible.

[0193] FIG. 25 is an exploded perspective view of a head 170 used for a golf club according to other adjusting mechanism. FIG. 26 is a cross sectional view of the head 170. Although not shown in the drawings, the golf club is provided with the head 170, and a shaft, and a grip. The head 170 is a wood type golf club head.

[0194] As described later, the head 170 has an adjusting mechanism M8. Preferably, the golf club having the head 170 is further provided with other adjusting mechanism independent of the adjusting mechanism M8.

[0195] The head 170 has a front member 172, a back member 174, and a connecting member 176. The front member 172 is connected to the back member 174 by the connecting member 176. The front member 172 is connected to the back member 174 in a state where no gap substantially exists. The hollow head 170 is completed by the connection.

[0196] The front member 172 has a face surface 178. The front member 172 has the whole face surface 178. Although not shown in the drawings, the front member 172 has a screw hole into which the connecting member 176 is screwed, and a thick part for forming the screw hole. The front member 172 has a hosel part 180. The hosel part 180 has a shaft hole 182. Although illustration is omitted, face grooves are formed in the face surface 178.

[0197] A back part of the front member 172 has an opening. An extending part 181 capable of supporting an edge part 179 of the back member 174 from an inner side is formed in an

edge of the opening. The extending part **181** facilitates position adjustment of the back member **174** to the front member **172**.

[0198] Although not shown in the drawings, the back member **174** has a through hole through which the connecting member **176** passes and a thick part for forming the through hole.

[0199] The connecting member **176** is a screw. The front member **172** is connected to the back member **174** by the connecting member **176**.

[0200] The head **170** has the adjusting mechanism **M8**. A structure of the adjusting mechanism **M8** is similar to the above-mentioned adjusting mechanism **M1**. The adjusting mechanism **M8** is a screwing mechanism. The adjusting mechanism **M8** can change the back member **174**.

[0201] A changing back member **E8** is shown with the head **170** in FIG. **24**. A changing back member **E81** and other changing back member **E82** are shown as the changing back member **E8** in FIG. **25**. The changing back member **E81** and the changing back member **E82** can be connected to the front member **172** by the connecting member **176**. A golf club with an adjusting function includes the head **170** and at least one changing back member **E8**.

[0202] For example, a head shape is changed by changing the back member **174** to the changing back member **E8**. For example, a position of a center of gravity is changed by changing the back member **174** to the changing back member **E8**. For example, a head volume is changed by changing the back member **174** to the changing back member **E8**. A coefficient of restitution of a head to a ball can be varied by changing the back member **174** to the changing back member **E8**.

[0203] Examples of adjustments of the specifications by the adjusting mechanism **M8** include the following adjustments:

[0204] (adjustment 8a) a head shape is changed, and a position of a center of gravity of a head is not substantially varied;

[0205] (adjustment 8b) a head volume is changed, and a position of a center of gravity of a head is not substantially varied;

[0206] (adjustment 8c) a position of a center of gravity is changed, and a head shape is not varied;

[0207] (adjustment 8d) a moment of inertia is changed, and a head shape is not varied; and

[0208] (adjustment 8e) two or more adjustments selected from a head shape, a head volume, and a position of a center of gravity of a head, and a moment of inertia are changed.

[0209] It is preferable that a head weight is not varied in the adjusting mechanism **MB** in respect of maintaining the swing weight.

[0210] Although the adjusting mechanism **M8** is applied to the wood type golf club, the adjusting mechanism **MB** may be used also for other type golf clubs (iron type, utility type, and putter type golf clubs or the like).

[0211] FIG. **26** shows a vicinity of a grip of a golf club according to other adjusting mechanism. The golf club has a head (not shown), a shaft **190**, and a grip **192**. The head is mounted to one end part of the shaft **190**. The grip **192** is mounted to the other end part of the shaft **190**.

[0212] As described later, the golf club has an adjusting mechanism **M9**. Preferably, the golf club has other adjusting mechanism independent of the adjusting mechanism **M9**.

[0213] FIG. **27** is a cross sectional view of FIG. **26**. FIG. **28** is a cross sectional view of a golf club taken along line **F28-F28** of FIG. **27**.

[0214] As shown in FIGS. **27** and **28**, the shaft **190** is tube-shaped. The inside of the shaft **190** is a cavity.

[0215] The grip **192** has an inner side grip member **194** and an outer side grip member **196**. The inner side grip member **194** has a cylindrical shaft insertion part **198**. As shown in FIGS. **27** and **28**, the shaft **190** is inserted into the shaft insertion part **198**.

[0216] The inner side grip member **194** has an end part **200**. An end face **202** of the shaft **190** abuts on the end part **200**. A through hole **203** is formed in a center of the end part **200**.

[0217] The outer side grip member **196** has a first division body **204** and a second division body **206**. The first division body **204** is semitube-shaped. The second division body **206** is also semitube-shaped. The tubular outer side grip member **196** is formed by the first division body **204** and the second division body **206**. As shown in FIG. **28**, a bump part **210** is formed in an edge of the first division body **204**. As shown in FIG. **28**, a bump part **212** is formed in an edge of the second division body **206**. A shape of the second division body **206** is the same as that of the first division body **204** except for a shape of the bump part.

[0218] In the outer side grip member **196**, the bump part **210** of the first division body **204** abuts on the bump part **212** of the second division body **206**. The bump part **210** is in mesh with the bump part **212**. The outer side grip member **196** has an overlapping part in which the first division body **204** overlaps the second division body **206**. The bump part **210** and the bump part **212** form the overlapping part in which the first division body **204** overlaps the second division body **206**. A thickness of the outer side grip member **196** is set constant in the whole circumference of the circumferential direction, including the overlapping part. In the outer side grip member **196**, no gap exists in a portion in which the first division body **204** abuts on the second division body **206**. The cylindrical outer side grip member **196** is formed by a combination of the first division body **204** and the second division body **206**.

[0219] An outer surface **214** of the shaft insertion part **198** is covered with the outer side grip member **196**. At least a part of the outer surface **214** is covered with the outer side grip member **196**. Preferably, the whole outer surface **214** is covered with the outer side grip member **196**.

[0220] An inner surface **216** of the outer side grip member **196** includes an inner surface **218** of the first division body **204** and an inner surface **220** of the second division body **206**. The inner surface **218** of the first division body **204** is applied to the outer surface **214** of the shaft insertion part **198**. The inner surface **220** of the second division body **206** is also applied to the outer surface **214** of the shaft insertion part **198**.

[0221] As shown in FIG. **27**, the inner side grip member **194** has a first annular part **222** extending outside in the radial direction from a grip-end side end of the shaft insertion part **198**, and a first cylindrical part **224** extending to a head side from a radial outer side edge of the first annular part **222**. The first annular part **222** is a single annular portion. The first cylindrical part **224** is a single cylindrical portion. A first concave part **226** having the first annular part **222** formed as a bottom is formed by the first annular part **222** and the first cylindrical part **224**.

[0222] As shown in FIG. **27**, the inner side grip member **194** has a second annular part **228** extending outside in the radial direction from a head side end of the shaft insertion part

198, and a second cylindrical part 230 extending to a grip end side from a radial outer side edge of the second annular part 228. The second annular part 228 is a single annular portion. The second cylindrical part 230 is a single cylindrical portion. A second concave part 232 having the second cylindrical part 230 formed as a bottom is formed by the second annular part 228 and the second cylindrical part 230.

[0223] As shown in FIG. 27, the outer side grip member 196 has a grip-end side end 234. Each of the first division body 204 and the second division body 206 has the grip-end side end 234. The grip-end side end 234 is inserted into the first concave part 226. The grip-end side end 234 is covered with the first cylindrical part 224. The grip-end side end 234 is protected by the first cylindrical part 224. Since the grip-end side end 234 is not exposed to the outside, the grip-end side end 234 is hardly turned up. Therefore, the first division body 204 and the second division body 206 are hardly peeled off.

[0224] The outer side grip member 196 has a head side end 236. Each of the first division body 204 and the second division body 206 has the head side end 236. The head side end 236 is inserted into the second concave part 232. The head side end 236 is covered with the second cylindrical part 230. The head side end 236 is protected by the second cylindrical part 230. Since the head side end 236 is not exposed to the outside, the head side end 236 is hardly turned up. Therefore, the first division body 204 and the second division body 206 are hardly peeled off.

[0225] The whole inner side grip member 194 is integrally formed. The first annular part 222 and the first cylindrical part 224 are integrated with the shaft insertion part 198. The second annular part 228 and the second cylindrical part 230 are integrated with the shaft insertion part 198.

[0226] An inner circumferential surface 238 of the inner side grip member 194 is bonded to an outer surface 240 of the shaft 190 by a double-stick tape. The inner side grip member 194 is mounted to the shaft 190 in the same way as a general grip.

[0227] The inner surface 216 of the outer side grip member 196 is bonded to the outer surface 214 of the shaft insertion part 198 by a double-stick tape. In other words, the inner surface 218 of the first division body 204 is bonded to the outer surface 214 by a double-stick tape, and the inner surface 220 of the second division body 206 is bonded to the outer surface 214 by a double-stick tape.

[0228] For example, a procedure for applying the outer side grip member 196 to the shaft insertion part 198 of the inner side grip member 194 is as follows:

[0229] (1b) A double-stick tape is applied to the inner surface 218 of the first division body 204. A double-stick tape is applied to the inner surface 220 of the second division body 206;

[0230] (2b) Any one of the first division body 204 and the second division body 206 is applied to the shaft insertion part 198; and

[0231] (3b) The other of the first division body 204 and the second division body 206 is applied to shaft insertion part 198. At this time, the bump part 210 is meshed with the bump part 212.

[0232] In the steps (2b) and (3b), the grip-end side end 234 is inserted into the first concave part 226, and the head side end 236 is inserted into the second concave part 232. The grip-end side end 234 is inserted into the first concave part 226 while the first cylindrical part 224 is turned up. The head

side end 236 is inserted into the second concave part 232 while the second cylindrical part 230 is turned up.

[0233] A method for removing the first division body 204 is as follows. The first division body 204 is removed by turning up the first cylindrical part 224 or the second cylindrical part 230, and pulling the grip-end side end 234 or the head side end 236. A method for removing the second division body 206 is the same as that of the first division body 204. Thus, the first division body 204 and the second division body 206 are easily removed. The first division body 204 and the second division body 206 are changeable.

[0234] The adjusting mechanism M9 is a changing mechanism for the outer side grip member. In the adjusting mechanism M9, a position of a center of gravity of the club and a swingweight can be adjusted by changing the outer side grip member to the division bodies 204 and 206 having different weights in relation to each other. A grip weight can be changed without varying a grip outer diameter by changing specific gravity of the division bodies 204 and 206. An outer diameter of the grip 192 is changed by changing thicknesses of the division bodies 204 and 206.

[0235] A material of the inner side grip member 194 is not restricted. Preferably, the material of the inner side grip member 194 is rubber. Examples of the rubber include crude rubber (specific gravity: 0.91 to 0.93), styrene-butadiene rubber (specific gravity: 0.92 to 0.97), EPDM (specific gravity: 0.86 to 0.87), isoprene rubber (0.92 to 0.93), and a mixture thereof. In respect of formability, ethylene-propylene diene rubber (EPDM) and styrene-butadiene rubber (SBR) are preferable. When the inner side grip member 194 is rubber, the first cylindrical part 224 and the second cylindrical part 230 can be turned up.

[0236] A material of the outer side grip member 196 is not restricted. Preferably, the material of the outer side grip member 196 is rubber. Examples of the rubber include crude rubber (specific gravity: 0.91 to 0.93), styrene-butadiene rubber (specific gravity: 0.92 to 0.97), EPDM (specific gravity: 0.86 to 0.87), isoprene rubber (0.92 to 0.93), and a mixture thereof. In respect of formability, ethylene-propylene diene rubber (EPDM) and styrene-butadiene rubber (SBR) are preferable. In respect of facilitating weight adjustment, rubber blended with a metal powder having specific gravity equal to or greater than 10 is preferable, and rubber blended with a metal powder having specific gravity equal to or greater than 15 is more preferable. Examples of the metal powder include a tungsten alloy powder.

[0237] Examples of adjustments of the specifications by the adjusting mechanism M9 include the following adjustments:

[0238] (adjustment 9a) a thickness of a grip (grip outer diameter) is changed, and a swingweight is not substantially varied;

[0239] (adjustment 9b) a thickness of a grip is changed, and a swingweight is also changed;

[0240] (adjustment 9c) a grip weight and a swingweight are changed, and a thickness of a grip is not substantially varied; and

[0241] (adjustment 9d) a grip weight and a swingweight are changed, and a thickness of a grip is also changed.

[0242] FIG. 29 shows a vicinity of a grip end of a golf club provided with an adjusting mechanism M10 according to other embodiment. The golf club has a head (not shown), a shaft 250, and a grip 252. The head is mounted to one end part of the shaft 250. The grip 252 is mounted to the other end part of the shaft 250.

[0243] Preferably, the golf club is further provided with other adjusting mechanism independent of the adjusting mechanism M10.

[0244] Although a groove is formed in an outer surface (grip grasping surface) of the grip 252, the description of the groove is omitted in FIGS. 29 to 32.

[0245] FIG. 30 is a cross sectional view of FIG. 29. FIG. 31 is an exploded view of FIG. 29.

[0246] The grip 252 has a grip body 252a and two extending members 252b. The two extending members 252b are mounted to a back end of the grip body 252a.

[0247] The grip body 252a is fixed to a back end part of the shaft 250 by a double-stick tape. A bonding method using the double-stick tape is the same as a usual grip bonding method.

[0248] The first extending member 252b is mounted to the back end of the grip body 252a. The second extending member 252b is mounted to a back end of the first extending member 252b.

[0249] An outer surface 252a1 of the grip body 252a is substantially steplessly connected to an outer surface 252b1 of the extending member 252b. Furthermore, the outer surfaces 252b1 of the extending members 252b are substantially steplessly connected to each other. A grasping surface 252m is formed by the outer surface 252a1 and the two outer surfaces 252b1.

[0250] The grip body 252a has a rubber part g3 and a hard base h3. A material of the rubber part g3 is rubber.

[0251] The hard base h3 is provided medially in the rubber part g3. The hard base h3 is covered with the rubber part g3. The outer surface 252a1 of the grip body 252a is an outer surface of the rubber part g3.

[0252] As shown in FIGS. 30 and 31, the hard base h3 has a screw hole sc3. The hard base h3 has a cylinder part h31 and a bottom face part h32. An inner surface of the cylinder part h31 is the screw hole sc3. The screw hole sc3 is opened upward.

[0253] The hard base h3 is fixed to the rubber part g3. The fixing method is not restricted, and for example, is bonding using an adhesive.

[0254] The first extending member 252b is located between the grip body 252a and the second extending member 252b. The first extending member 252b has a rubber part g4 and a hard connector h4. A material of the rubber part g4 is rubber. An upper part of the hard connector h4 is covered with the rubber part g4.

[0255] The hard connector h4 is provided medially in the rubber part g4. The outer surface 252b1 of the extending member 252b is an outer surface of the rubber part g4.

[0256] The hard connector h4 has a cylindrical part h41 and a columnar part h42 (see FIG. 30). An inner surface of the cylindrical part h41 is a screw hole sc4 (female screw). An outer surface of the columnar part h42 is a male screw. The cylindrical part h41 is disposed coaxially with the columnar part h42. The columnar part h42 has an exposed part ex2 exposed from the rubber part g4 (see FIG. 31). At least a part of the columnar part h42 is the exposed part ex2. The exposed part ex2 protrudes downward.

[0257] The columnar part h42 (male screw) is screwed into the screw hole sc3 (female screw) of the grip body 252a for connection between the first extending member 252b and the grip body 252a. The columnar part h42 of the second extending member 252b is screwed into the screw hole sc4 of the first extending member 252b for connection between the extending members 252b.

[0258] All the extending members 252b are common. The screw hole sc3 is similar to the screw hole sc4.

[0259] An axial length of the exposed part ex2 is shorter than that of the screw hole sc3. Therefore, a clearance K1 exists between the bottom face part h32 and the columnar part h42 in a state where the grip body 252a is connected to the extending member 252b (see FIG. 30). The clearance K1 prevents a gap from occurring in a boundary between the outer surface 252a1 of the grip body 252a and the outer surface 252b1 of the extending member 252b.

[0260] The axial length of the exposed part ex2 is shorter than that of the screw hole sc4. Therefore, a clearance K2 exists between an end face of the columnar part h42 and a bottom surface of the cylindrical part h41 in a state where the extending members 252b are connected to each other (see FIG. 30). The clearance K2 prevents a gap from occurring in a boundary between the outer surfaces 252b1 of the extending members 252b.

[0261] The second extending member 252b is located on a grip back end side rather than the first extending member 252b. The second extending member 252b is a back most extending member 252b.

[0262] The second extending member 252b is the same as the above-mentioned first extending member 252b. Therefore, the description of the second extending member 252b is omitted.

[0263] Thus, in the embodiment, the grip body 252a can be joined to the extending member 252b by screw connection. Furthermore, the extending members 252b can be joined to each other by screw connection.

[0264] In the embodiment, the extending member 252b is detachably mounted. The extending member 252b is removed by rotating the extending member 252b and releasing the screw connection. A grip length can be adjusted by mounting/demounting the extending member 252b.

[0265] In the embodiment, the case where the number of the extending members 252b is 2 is shown. The grip length can be further changed by changing the number of the extending members 252b. The grip length can be shortened when the number of the extending members 252b is 0. The number of the extending members 252b may be 1.

[0266] The number of the extending members 252b may be equal to or greater than 3. Since a joining structure of the extending members 252b is the same, the number of the extending members 252b to be joined can be freely selected.

[0267] Thus, the adjusting mechanism M10 according to the embodiment is a grip length adjusting mechanism. The adjusting mechanism M10 is also a club length adjusting mechanism.

[0268] FIG. 32 is an exploded view of a grip 260 according to other embodiment using the adjusting mechanism M10. The grip 260 has a grip body 252a, an extending member 252b, and an extending member 260b. The grip body 252a is used for the above-mentioned grip 252. The extending member 252b is also used for the above-mentioned grip 252.

[0269] The extending member 260b has a rubber part g5 and a hard connector h4. The hard connector h4 of the extending member 260b is the same as that of the above-mentioned extending member 252b. A difference between the extending member 252b and the extending member 260b is only a length of the rubber part.

[0270] A length of a rubber part g4 of the extending member 252b is shown by a double pointed arrow L1 in FIG. 32. A length of a rubber part g5 of the extending member 260b is

shown by a double pointed arrow L2 in FIG. 32. The length L1 is different from the length L2. In the embodiment, a length of the grip 260 can be adjusted by selecting any one of the extending members 252b and 260b.

[0271] A material of the hard base is harder than that of a grip grasping surface. Certainty of the connection and rigidity of the inner part of the grip can be improved by using the hard base. A material of the hard base is preferably a metal or a resin, and more preferably the metal. Examples of the resin include a thermoplastic resin and a carbon fiber reinforced resin. In respect of processability, preferable examples of the resin include nylon, polyether block amide copolymer (PEBAX), and polycarbonate. Examples of the metal include stainless steel, an aluminium alloy, and a titanium alloy. In respect of a swingweight, a high specific gravity metal (specific gravity: equal to or greater than 12) such as tungsten and a tungsten alloy can be also used.

[0272] A material of the hard connector is harder than that of a grip grasping surface. Certainty of the connection and rigidity of the inner part of the grip can be improved by using the hard connector. A material of the hard connector is preferably a metal or a resin, and more preferably the metal. Examples of the resin include a thermoplastic resin and a carbon fiber reinforced resin. In respect of processability, preferable examples of the resin include nylon, polyether block amide copolymer (PEBAX), and polycarbonate. Examples of the metal include stainless steel, an aluminium alloy, and a titanium alloy. In respect of a swingweight, a high specific gravity metal (specific gravity: equal to or greater than 12) such as tungsten and a tungsten alloy can be also used.

[0273] The rubber which is a material of the rubber part is not restricted. The rubber is preferably a rubber elastic body made of vulcanized rubber or the like. It should be understood that a thermoplastic elastomer is also included in the rubber. In respect of low slidability or the like, crude rubber (specific gravity: 0.91 to 0.93), styrene-butadiene rubber (specific gravity: 0.92 to 0.97), EPDM (specific gravity: 0.86 to 0.87), isoprene rubber (specific gravity: 0.92 to 0.93), and a mixture thereof are preferable.

[0274] Examples of specifications capable of being adjusted by the adjusting mechanism M10 include a club length, a position of a center of gravity of a club, a frequency of the club, a moment of inertia of the club, a grip weight, a position of a center of gravity of a grip, and a grip length.

[0275] Examples of adjustments of the specifications by the adjusting mechanism M10 include the following adjustments:

[0276] (adjustment 10a) a grip length and a club length are changed, and a swingweight is also changed; and

[0277] (adjustment 10b) a grip length and a club length are changed, and a swingweight is not substantially varied.

[0278] The club length is extended by mounting the extending member. The extension of the club length increases the swingweight. On the other hand, an effect of so-called counter balance is caused by mounting the extending member. The counter balance decreases the swingweight. The setoff of both the club length and the swingweight can be promoted by setting a weight and length of the extending member. The promotion can suppress increase of the swingweight while increasing the club length. Furthermore, variation of the swingweight can be substantially eliminated while increasing the club length.

[0279] In all the specifications described in the present application, the term "is not substantially varied" means an amount of variation of less than 10%. The term "is not substantially varied" for the swingweight means variation equal to or less than ± 1 point. The swingweight is a 14 inch form. The swingweight is also referred to as swing balance.

[0280] FIG. 33 is an exploded perspective view of a head 268. FIG. 34 is a view of the head 268, as viewed from a crown side. The head 268 is provided with an adjusting mechanism M11 in addition to the above-mentioned adjusting mechanism M1. Although not shown in the drawings, a golf club provided with the head 268 is provided with the head 268, a shaft, and a grip. The head 268 is a wood type golf club head.

[0281] In the embodiment, the adjusting mechanism M1 is used as a loft angle adjusting mechanism. On the other hand, the adjusting mechanism M11 is used as a face angle adjusting mechanism.

[0282] A constitution of the head 268 is the same as that of the above-mentioned head 2 except for existence of the adjusting intermediate member 270. The same portions of the head 268 as those of the head 2 are designated by the same reference numerals as those of the head 2, and the repeated description is omitted.

[0283] The adjusting mechanism M11 has the adjusting intermediate member 270 and a changing adjusting intermediate member (not shown). The adjusting intermediate member 270 is disposed between the front member 4 and the back member 6. The front member 4, the adjusting intermediate member 270, and the back member 6 are connected to each other in a state where no gap substantially exists. The adjusting intermediate member 270 is fixed with the adjusting intermediate member 270 sandwiched between the front member 4 and the back member 6. The fixation is achieved by screw connection of the connecting member 8.

[0284] The adjusting intermediate member 270 is a ring-shaped member. The adjusting intermediate member 270 has a protruding part 272 (see FIG. 33). The protruding part 272 protrudes toward the front member 4. The protruding part 272 facilitates position adjustment of the adjusting intermediate member 270 and the front member 4.

[0285] A face angle can be adjusted by varying a plane shape (see FIG. 34) of the adjusting intermediate member 270. The face angle can be adjusted by changing the adjusting intermediate member 270 to other adjusting intermediate member which is not shown.

[0286] Thus, the head 268 has the plurality of (two) adjusting mechanisms M1 and M11. The plurality of adjusting mechanisms M1 and M11 can be adjusted independently of each other. In the head 268, the loft angle and the face angle can be adjusted independently of each other.

[0287] Examples of specifications capable of being adjusted by the adjusting mechanism M11 include a face angle and a loft angle. The face angle and the loft angle can be adjusted by only the adjusting mechanism M11 without using the adjusting mechanism M1.

[0288] Examples of adjustments of the specifications by the adjusting mechanism M11 include the following adjustments:

[0289] (adjustment 11a) a face angle is changed, and a loft angle is also varied;

[0290] (adjustment 11b) a face angle is changed, and a loft angle is not substantially varied; and

[0291] (adjustment 11c) a loft angle is changed, and a face angle is not substantially varied.

[0292] FIG. 35 is an exploded perspective view of a head 280 provided with an adjusting mechanism M12. Although not shown in the drawings, a golf club provided with the head 280 is provided with the head 280, a shaft, and a grip. The head 280 is a wood type golf club head.

[0293] The head 280 has a front member 282, a back member 284, and a connecting member 8. The front member 282 is connected to the back member 284 by the connecting member 8. The front member 282 is connected to the back member 284 in a state where no gap substantially exists.

[0294] The front member 282 has a face surface 286. The front member 282 has the whole face surface 286. Although not shown in the drawings, the front member 282 has a screw hole into which the connecting member 8 is screwed. The front member 282 further has a thick part 288 for forming the screw hole. Two thick parts 288 are provided at two positions.

[0295] The front member 282 has a plate-shaped face part 285, an upper side backward extending part 287, and a lower side backward extending part 289. Both the two thick parts 288 are provided in the lower side backward extending part 289.

[0296] The front member 282 may not have the upper side backward extending part 287 and the lower side backward extending part 289. That is, the whole front member 282 may be plate-shaped. In this case, the thick part 288 can be eliminated. In this case, the screw hole can be formed in the plate-shaped front member 282.

[0297] The back member 284 has a hosel part 290. The hosel part 290 has a shaft hole 292. The back member 284 has a through hole 294 through which the connecting member 8 passes and a thick part 296 for forming the through hole 294. The thick part 296 is formed on each of the toe side and heel side of a sole of the head 280.

[0298] The back member 284 has a protruding part 298. In the embodiment, a plurality of (two) protruding parts 298 are provided. The protruding parts 298 protrude forward from an opening part of the back member 284. The protruding parts 298 facilitate position adjustment of the front member 282. The protruding parts 298 facilitate screwing between the front member 282 and the back member 284.

[0299] The connecting member 8 is a screw. The front member 282 is connected to the back member 284 by the connecting member 8. The protruding parts 298 improve certainty of the connection.

[0300] The head 2 has the adjusting mechanism M12. The adjusting mechanism M12 is similar to the above-mentioned adjusting mechanism M1. A main difference between the adjusting mechanism M12 and the adjusting mechanism M1 is a shape of the front member. The front member 282 has a shape formed by cutting a toe portion and heel portion of the above-mentioned front member 4 (see FIG. 2). The front member 282 does not close the whole opening part of the back member 284. A hollow part of the head 280 is opened to the outside on the toe side of the front member 282. Furthermore, the hollow part of the head 280 is opened to the outside on the heel side of the front member 282.

[0301] The adjusting mechanism M12 can change the front member 282. For example, a loft angle (real loft angle) is changed by changing the front member 282. For example, a face angle is changed by changing the front member 282.

[0302] Examples of specifications capable of being adjusted by the adjusting mechanism M12 include a loft angle, a face angle, a face area, and a face progression. Each of these specifications can be independently adjusted by the

adjusting mechanism M12. Furthermore, a coefficient of restitution of the head to a ball, and a friction coefficient of the head to the ball can be adjusted by the adjusting mechanism M12. The coefficient of restitution of the head to the ball can be adjusted by, for example, changing the front member to a changing front member having rigidity different from that of the front member. The friction coefficient of the head to the ball can be adjusted by, for example, changing the front member to a changing front member having a face surface having surface roughness different from that of the front member.

[0303] In the adjusting mechanism M12, a shape of the front member is simplified as compared with the above-mentioned adjusting mechanism M1. A mold for the front member can be manufactured at low cost by the simplification. The simplification of the shape reduces a manufacture cost of the front member.

[0304] Examples of adjustments of the specifications by the adjusting mechanism M12 include the following adjustments:

[0305] (adjustment 12a) a loft angle is changed, and a face angle is not substantially varied;

[0306] (adjustment 12b) a loft angle is changed, and a face angle is also changed;

[0307] (adjustment 12c) a loft angle is not substantially changed, and a face angle is changed;

[0308] (adjustment 12d) a face area is changed, and a loft angle and a face angle are not varied; and

[0309] (adjustment 12e) a face progression is changed, and a loft angle and a face angle are not varied.

[0310] Although the adjusting mechanism M12 is applied to the wood type golf club head, the adjusting mechanism M12 may be used also for other type golf clubs (iron type, utility type, and putter type golf clubs or the like).

[0311] FIG. 37 is a view of a golf club 310 having an adjusting mechanism M13, as viewed from a sole side. The club 310 has a head 312. The adjusting mechanism M13 is a modification example of the above-mentioned adjusting mechanism M4. The adjusting mechanism M13 can adjust a real loft angle in addition to a lie angle. Although the number of positions of the shaft axis line capable of being selected is 3 in the above-mentioned adjusting mechanism M4, the number of positions of the shaft axis line capable of being selected is 5 in the adjusting mechanism M13.

[0312] A reference shaft axis line is represented by reference character LS1 (see FIG. 37). A second shaft axis line is represented by reference character LF1. A third shaft axis line is represented by reference character LU1. A fourth shaft axis line is represented by reference character LP1. A fifth shaft axis line is represented by reference character LM1.

[0313] Although the number of the holding holes h1 is 3 in the above-mentioned adjusting mechanism M4, the number of the holding holes h1 is 5 in the adjusting mechanism M13. That is, the head 312 has five holding holes h1. In the embodiment, the head 312 has a first holding hole h11, a second holding hole h12, a third holding hole h13, a fourth holding hole h14, and a fifth holding hole h15. A constitution of the golf club 310 is the same as that of the above-mentioned adjusting mechanism M4 (golf club 70) except that the five holding holes h1 are formed; a space is secured so that the positions of the five kinds of shaft axis lines are allowed; and five kinds of sleeve supporting members 80 (described above) are provided.

[0314] The lie angle can be adjusted to three kinds by the adjusting mechanism M13. The three kinds of lie angles are achieved by the reference shaft axis line LS1, the second shaft axis line LF1, and the third shaft axis line LU1. Furthermore, in the adjusting mechanism M13, the real loft angle can be adjusted to three kinds. The three kinds of real loft angles are achieved by the reference shaft axis line LS1, the fourth shaft axis line LP1, and the fifth shaft axis line LM1. The real loft angle is increased in the fourth shaft axis line LP1 as compared with the reference shaft axis line LS1. The real loft angle is decreased in the fifth shaft axis line LM1 as compared with the reference shaft axis line LS1.

[0315] FIG. 38 is a perspective view of a head 320 having an adjusting mechanism M14. FIG. 39 is an exploded perspective view of the head 320. FIG. 40 is a cross sectional view of the head 320.

[0316] The head 320 has a front member 322 and a back member 324. As shown in FIGS. 39 and 40, the back member 324 has an engagement protruding part 326. The engagement protruding part 326 has an engaging groove 328 and an inclined surface 330 (see an enlarged part of FIG. 40). The engagement protruding part 326 is formed in each of crown part and a sole part of the head 320 (see FIG. 40). On the other hand, the front member 322 has an inner extending part 332. The inner extending part 332 is fitted into a groove 328 of the engagement protruding part 326. The front member 322 is connected to the back member 324 by engagement between the engagement protruding part 326 and the inner extending part 332. In the connected state, the outer surface of the front member 322 is almost smoothly continuous with the outer surface of the back member 324.

[0317] The front member 322 is detachably mounted to the back member 324. In the case of mounting, the engagement protruding part 326 of the back member 324 is press fitted into an opening part of the front member 322. In the press fitting, a tip of the inner extending part 332 can slide on a surface of the inclined surface 330. The sliding can facilitate the press fitting. The crown part and sole part of the back member 324 are compressed toward the inner side of the head in the case of press fitting if needed.

[0318] In the case of removal, the crown part and sole part of the back member 324 are compressed toward the inner side of the head, to release engagement between the engaging groove 328 and the inner extending part 332. The front member 322 can be removed from the back member 324 by the release. The adjusting mechanism M14 can change the back member 324.

[0319] Plastic deformation of the back member 324 is required for mounting/demounting. In respect of facilitating the mounting/demounting, a material of the back member 324 may be fiber-reinforced plastic.

[0320] For example, a position of a center of gravity is changed by changing the back member 324. For example, a head volume is changed by changing the back member 324.

[0321] Examples of adjustments of the specifications by the adjusting mechanism M14 include the following adjustments:

[0322] (adjustment 14a) a head shape is changed, and a position of a center of gravity of a head is not substantially varied;

[0323] (adjustment 14b) a head volume is changed, and a position of a center of gravity of a head is not substantially varied;

[0324] (adjustment 14c) a position of a center of gravity is changed, and a head shape is not varied;

[0325] (adjustment 14d) a moment of inertia is changed, and a head shape is not varied; and

[0326] (adjustment 14e) two or more selected from a head shape, a head volume, a position of a center of gravity of a head, and a moment of inertia are changed.

[0327] It is preferable that a head weight is not varied in the adjusting mechanism M14 in respect of maintaining a swing-weight.

[0328] Although the adjusting mechanism M14 is applied to the wood type golf club, the adjusting mechanism M14 may be used also for other type golf clubs (iron type, utility type, and putter type golf clubs or the like).

[0329] FIG. 41 is a plan view of a head 340 having an adjusting mechanism M15. FIG. 42 is a cross sectional view taken along line F42-F42 of FIG. 41. FIG. 43 is a bottom view of the head 340. The head 340 has a front member 342, a back member 344, and a spacer 346. A crown part of the front member 342 is rotatably joined to a crown part of the back member 344. A hinge 348 is used for the joining.

[0330] The spacer 346 is interposed between the front member 342 and the back member 344. The spacer 346 is located in the head 340. However, a bottom surface of the spacer 346 is exposed to the outside. The bottom surface of the spacer 346 constitutes a part of a sole surface of the head 340.

[0331] The hinge 348 allows rotation of the front member 342 to the back member 344. The rotation can adjust a real loft angle. On the other hand, when the head 340 is used, the rotation is fixed. The fixation is achieved by a screw member 350. The screw member 350 passes through the spacer 346, and connects the front member 342 to the back member 344.

[0332] A groove 352 opened downward and a protruding part 354 extending downward are formed in an edge of a lower end of the front member 342 (a lower end of a face part). Similarly, a groove 352 opened downward and a protruding part 354 extending downward are formed in an edge of a front end of a sole part of the back member 344. On the other hand, a groove 356 opened upward and a protruding part 358 extending upward are formed in a front edge of a lower surface of the spacer 346. Similarly, a groove 356 opened upward and a protruding part 358 extending upward are formed in a back edge of the lower surface of the spacer 346.

[0333] As shown in an enlarged part of FIG. 42, the protruding part 354 is fitted into the groove 356 in the back edge of the lower surface of the spacer 346, and the protruding part 358 is fitted into the groove 352. The protruding part 354 is fitted into the groove 356 also in the front edge of the lower surface of the spacer 346, and the protruding part 358 is fitted into the groove 352. Fixation of the spacer 346 is achieved by these fittings.

[0334] A real loft angle can be varied by a thickness and shape of the spacer 346. The real loft angle can be adjusted by changing the spacer 346.

[Specification]

[0335] In the present invention, the specification capable of being adjusted is not restricted. Examples of the specification include a loft angle, a lie angle, a face angle, a face area, a position of a center of gravity of a head, a swingweight, a club length, a position of a center of gravity of a club, a frequency of the club, a club weight, a head shape, a head volume, a head weight, a flex of a shaft (shaft hardness), a flex point of a shaft,

a torque of the shaft, flexural rigidity distribution of the shaft, torsional rigidity distribution of the shaft, a shaft weight, weight distribution of the shaft, a position of a center of gravity of the shaft, a length of the shaft, a grip outer diameter, a grip weight, a position of a center of gravity of a grip, a grip length, a specification of a face groove, a face progression, a moment of inertia of the head, a moment of inertia of the club, a coefficient of restitution of the head to a ball, and a friction coefficient of the head to the ball.

[0336] In the present invention, at least two specifications can be adjusted independently of each other. More preferably, all the specifications capable of being adjusted can be adjusted independently of each other.

[0337] The specification includes a specification according to the head, a specification according to the shaft, a specification according to the grip, and a specification according to the whole club.

[0338] Examples of the specification according to the head include a loft angle, a lie angle, a face angle, a face area, a position of a center of gravity of a head, a head shape, a head volume, a head weight, a face progression, a moment of inertia of the head, a coefficient of restitution of the head to a ball, and a friction coefficient of the head to the ball. Examples of the position of the center of gravity of the head include a distance of a center of gravity (a distance between a shaft axis line and a center of gravity of the head), a depth of the center of gravity, and a sweet spot height besides an actual (three-dimensional) position of a center of gravity of the head.

[0339] Examples of the specification according to the shaft in the specifications include a flex of a shaft, a flex point of a shaft, a torque of the shaft, flexural rigidity distribution of the shaft, torsional rigidity distribution of the shaft, a shaft weight, weight distribution of the shaft, a position of a center of gravity of the shaft, and a length of the shaft.

[0340] Examples of the specification according to the grip in the specifications include a grip outer diameter, a grip weight, a position of a center of gravity of a grip, and a grip length.

[0341] Examples of the specification according to the whole club in the specifications include a swingweight, a club length, a position of a center of gravity of a club, a frequency of the club, a club weight, and a moment of inertia of the club.

[0342] An adjustment range of the specification is not restricted. In respect of a degree of freedom of adjustment, the adjustment range is preferably wider. In this respect, the adjustment range of the loft angle is preferably equal to or greater than 2 degrees, preferably equal to or greater than 3 degrees, and still more preferably equal to or greater than 4 degrees. The adjustment range of the face angle is preferably equal to or greater than 2 degrees, more preferably equal to or greater than 3 degrees, and still more preferably equal to or greater than 4 degrees. The adjustment range of the lie angle is preferably equal to or greater than 1 degree, more preferably equal to or greater than 2 degrees, and still more preferably equal to or greater than 3 degrees. The adjustment range of the distance of a center of gravity is preferably equal to or greater than 5 mm, more preferably equal to or greater than 10 mm, and still more preferably equal to or greater than 15 mm. The adjustment range of the club length is preferably equal to or greater than 1 inch, more preferably equal to or greater than 1.5 inches, and still more preferably equal to or greater than 2 inches. The adjustment range of the head volume is preferably equal to or greater than 10 cc, more preferably equal to or

greater than 20 cc, and still more preferably equal to or greater than 30 cc. The adjustment range of the grip outer diameter is preferably equal to or greater than 0.5 mm, more preferably equal to or greater than 1 mm, and still more preferably equal to or greater than 1.5 mm. The adjustment range of the swingweight is preferably equal to or greater than 1 point, more preferably equal to or greater than 2 points, and still more preferably equal to or greater than 3 points.

[0343] In respect of improving the degree of freedom of adjustment, an adjustment range in a specific specification is preferably equal to or greater than a range corresponding to two-number clubs. The range corresponding to two-number clubs is as follows. The specific specification is one or more selected from a loft angle, a lie angle, a club length, and a club weight.

[Range Corresponding to Two-number Clubs]

[0344] Loft angle: 6 degrees

[0345] Lie angle: 1 degree

[0346] Club length: 1 inch

[0347] Club weight: 14 g

[Adjusting Mechanism]

[0348] The golf club of the present invention has one or more adjusting mechanisms. The adjusting mechanism is not restricted. The adjusting mechanism can adjust the specification. One adjusting mechanism can adjust one or more specifications. One adjusting mechanism may be able to adjust two or more specifications. Two or more specifications adjusted by one adjusting mechanism may be adjusted so as to be interlocked with each other, and may be independently adjusted without being interlocked with each other.

[0349] Preferably, the golf club has a plurality of adjusting mechanisms. Preferably, two or more specifications can be adjusted independently of each other by the plurality of adjusting mechanisms.

[0350] Preferably, the adjusting mechanism can adjust the specification according to the head without changing the whole head. Preferably, the adjusting mechanism can adjust the specification according to the grip without changing the whole grip. Preferably, the adjusting mechanism can adjust the specification according to the shaft without changing the whole shaft.

[0351] Examples of the adjusting mechanism include the adjusting mechanism M1, the adjusting mechanism M2, the adjusting mechanism M3, the adjusting mechanism M4, the adjusting mechanism M5, the adjusting mechanism M6, the adjusting mechanism M7, the adjusting mechanism M8, the adjusting mechanism M9, the adjusting mechanism M10, the adjusting mechanism M11, the adjusting mechanism M12, the adjusting mechanism M13, the adjusting mechanism M14, and the adjusting mechanism M15. The adjusting mechanisms described in the above-mentioned Patent Documents can be also applied to the present invention.

[0352] Examples of the golf club provided with a plurality of adjusting mechanisms include a golf club provided with two or more adjusting mechanisms selected from the adjusting mechanism M1, the adjusting mechanism M2, the adjusting mechanism M3, the adjusting mechanism M4, the adjusting mechanism M5, the adjusting mechanism M6, the adjusting mechanism M7, the adjusting mechanism M8, the adjusting mechanism M9, the adjusting mechanism M10, the adjusting mechanism M11, the adjusting mechanism M12,

the adjusting mechanism M13, the adjusting mechanism M14, and the adjusting mechanism M15.

[0353] The adjusting mechanisms described in the embodiment can be independent from each other. That is, when the plurality of adjusting mechanisms is provided in a single golf club, the plurality of adjusting mechanisms can function without being interlocked with each other. The independence between the adjusting mechanisms improves the degree of freedom of adjustment.

[0354] Two or more adjusting mechanisms selected from the above-mentioned adjusting mechanisms M1 to M15 can be set in a single golf club. The two or more adjusting mechanisms can be set in the single golf club within the technical level of a person skilled in the art except that it is particularly difficult to provide the two or more adjusting mechanisms.

[0355] The head may have a plurality of adjusting mechanisms. In this case, the degree of freedom of adjustment of the specification according to the head is improved. The shaft may have a plurality of adjusting mechanisms. In this case, a degree of freedom of adjustment of the specification according to the shaft is improved. The grip may have a plurality of adjusting mechanisms. In this case, a degree of freedom of adjustment of the specification according to the grip is improved.

[0356] When a plurality of adjusting mechanisms independent of each other is provided, the specification adjusted by one adjusting mechanism and the specification adjusted by other adjusting mechanism can be adjusted independently of each other. The independence between the specifications improves the degree of freedom of adjustability.

[0357] Even if the number of the adjusting mechanisms is 1, the plurality of specifications may be adjusted independently of each other. For example, the face angle and the loft angle can be independently adjusted in the adjusting mechanism M1. That is, in setting a direction of the face surface of the front member 4, the loft angle can be also varied without varying the face angle, and the face angle can be also varied without varying the loft angle. In addition, the loft angle and the face angle can be also varied independently of each other.

[0358] Preferably, the plurality of adjusting mechanisms is provided. In respect of the degree of freedom of adjustability When two or more adjusting mechanisms are provided, at least two of the adjusting mechanisms can be preferably adjusted independently of each other. For example, in the case of a golf club having three adjusting mechanisms, a first adjusting mechanism and a second adjusting mechanism can be preferably adjusted independently of each other, and the first adjusting mechanism, the second adjusting mechanism, and a third adjusting mechanism can be preferably adjusted independently of each other. That is, when the two or more adjusting mechanisms are provided, all the adjusting mechanisms can be most preferably adjusted independently of each other.

[0359] In the embodiment shown in FIG. 17 of the above-mentioned US 2006/0293115, the loft angle, the lie angle, and the face angle are varied in relation to each other due to the circumferential position of the sleeve. In this case, the three specifications cannot be adjusted independently of each other. The non-independence reduces the degree of freedom of adjustability. The present invention can solve the problem.

[0360] A material of the head (or the head body) is not restricted. Preferable examples of the material include a titanium alloy, stainless steel, an aluminium alloy, a magnesium alloy, carbon fiber reinforced plastic (CFRP), and a combination thereof. A manufacturing method of the head is not restricted, and examples thereof include forging, casting,

pressing, and a combination thereof. The head may be made of a plurality of combined materials. A structure of the head body is not restricted.

[0361] A material of the shaft is not restricted. Examples of the material of the shaft include carbon fiber reinforced plastic (CFRP) and a metal. A so-called carbon shaft and steel shaft can be suitably used. A structure of the shaft is not restricted.

[0362] A material of the sleeve is not restricted. Preferable examples of the material include a titanium alloy, stainless steel, an aluminium alloy, a magnesium alloy, and a resin. It is preferable that the resin has excellent mechanical strength. For example, the resin is preferably a resin referred to as an engineering plastic or a super-engineering plastic. As described above, the engaging member may be integrally formed with the head body. In respect of a balance between strength and lightweight, for example, the aluminium alloy and the titanium alloy are more suitable.

[0363] A material of the engaging member is not restricted. Preferable examples of the material include a titanium alloy, stainless steel, an aluminium alloy, a magnesium alloy, and a resin. It is preferable that the resin has excellent mechanical strength. For example, the resin is preferably a resin referred to as an engineering plastic or a super-engineering plastic. As described above, the engaging member may be integrally formed with the head body.

[0364] A material of the connecting member (screw) is not restricted. Preferable examples of the material include a titanium alloy, stainless steel, an aluminium alloy, and a magnesium alloy.

[0365] A material of the sleeve supporting member 80 is not restricted. Preferable examples of the material include a titanium alloy, stainless steel, an aluminium alloy, and a magnesium alloy besides the above-mentioned resin.

[0366] The specifications can be measured by known measuring devices. Examples of the measuring devices for the loft angle, the lie angle, and the face angle include a golf club head gauge manufactured by Sheng Feng Iron Enterprise Co. Some typical specifications may be described in a product catalog.

[0367] A combination of the specifications capable of being adjusted is not restricted. The number of the specifications capable of being adjusted is not restricted. The number is preferably equal to or greater than 3, and more preferably equal to or greater than 4.

[0368] A golf club A having the adjusting mechanism capable of adjusting the loft angle and the adjusting mechanism capable of adjusting the distance of a center of gravity is effective in a situation where a mistake of pulling a ball using a short iron is apt to occur, for example. In this case, the mistake can be resolved by increasing the loft angle and lengthening the distance of a center of gravity. The golf club A is effective in a situation where a mistake of opening a face of the short iron is apt to occur, for example. In this case, the mistake can be resolved by increasing the loft angle and shortening the distance of a center of gravity. In a condition where a wind is strong and a ball is apt to be pulled, adjustment for decreasing the loft angle and increasing the distance of a center of gravity is effective.

[0369] A golf club B having the adjusting mechanism capable of adjusting the loft angle and the adjusting mechanism capable of adjusting the club length is effective in increasing a flight distance. An example of effective adjustment in this case is adjustment for lengthening the club length to increase the head speed and increasing the loft angle to increase a launch angle. The golf club B is effective in improving controllability. An example of effective adjust-

ment in this case is adjustment for shortening the club length to decrease the flight distance and increasing the loft angle to increase the launch angle. In this case, a ball having a high trajectory to tend to stop at a fall spot can be achieved. Since adjustment for decreasing the loft angle and lengthening the club length can achieve a low launch angle and improvement in the head speed, the adjustment is effective in improving the total flight distance including a run. Since adjustment decreasing the loft angle and shortening the club length can achieve a low launch angle and decrease in the head speed, the adjustment is effective when the run is desired to be increased by a low hit ball.

[0370] A golf club C having the adjusting mechanism capable of adjusting the loft angle and the adjusting mechanism capable of adjusting the swingweight is effective in improving controllability. As an example of effective adjustment in this case, the swingweight is increased to stabilize a swing, and the loft angle is increased to increase the launch angle. Alternatively, the swingweight is decreased to increase the head speed, and the loft angle is increased to increase the launch angle. In this case, a ball having a high trajectory to tend to stop at a fall spot can be achieved. Since adjustment for decreasing the loft angle and increasing the swing balance can achieve a low launch angle and a stable (slow) swing, the adjustment is effective in obtaining a low trajectory having excellent directivity. Since adjustment for decreasing the loft angle and decreasing the swing balance can achieve a low launch angle and improvement in a head speed, it is effective in increasing a run by a low trajectory to increase the total flight distance.

[0371] An impact force caused by hitting concentrates on the hosel part. Strength is required for the hosel part. Since a weight of the hosel part is increased when the adjusting mechanism is located in the hosel part, a degree of freedom of design of the center of gravity of the head is reduced. It is preferable that the hosel part has a light weight. In respect of strength of the hosel part and reduction in a weight of the hosel part, the following constitution (a) is preferable; the following constitution (b) is more preferable; and the following constitution (c) is still more preferable:

[0372] (a) the adjusting mechanism (1) or the adjusting mechanism (2) is located at a place other than the hosel part;

[0373] (b) the adjusting mechanism (1) and the adjusting mechanism (2) are located at places other than the hosel part; and

[0374] (c) all the adjusting mechanisms are located at places other than the hosel part.

[0375] The adjusting mechanisms M3, M4, M7, and M13 are located in the hosel part in the embodiments. The adjusting mechanisms M1, M2, M5, M6, M8, M9, M10, M11, M12, M14, and M15 are located at places other than the hosel part.

[0376] Examples in which the adjusting mechanism located at a place other than the hosel part is combined with the adjusting mechanism located in the hosel part include examples 2 to 11 to be described later. Examples in which the adjusting mechanisms located at places other than the hosel part are combined with each other include examples 1 and 12 to 28 to be described later.

[0377] Examples of the constitution (a) include the following constitutions (a1) to (a5):

[0378] (a1) the adjusting mechanism (1) or the adjusting mechanism (2) is located in the grip;

[0379] (a2) the adjusting mechanism (1) or the adjusting mechanism (2) is located in the shaft;

[0380] (a3) the adjusting mechanism (1) or the adjusting mechanism (2) is located in the joined part between the shaft and the grip;

[0381] (a4) the adjusting mechanism (1) or the adjusting mechanism (2) is located in the sole of the head; and

[0382] (a5) the adjusting mechanism (1) or the adjusting mechanism (2) is located in the head other than the hosel part.

[0383] In respect of adjusting a mounting angle of the shaft to the head, the other of the adjusting mechanism (1) or the adjusting mechanism (2) may be located in the hosel part in each of the constitutions (a1), (a2), (a3), (a4), and (a5).

[0384] Examples of the constitution (b) include the following constitutions (b1) to (b8):

[0385] (b1) the adjusting mechanism (1) and the adjusting mechanism (2) are located in the grip;

[0386] (b2) the adjusting mechanism (1) and the adjusting mechanism (2) are located in the shaft;

[0387] (b3) the adjusting mechanism (1) and the adjusting mechanism (2) are located in the head other than the hosel part;

[0388] (b4) the adjusting mechanism (1) and the adjusting mechanism (2) are located in the sole of the head;

[0389] (b5) the adjusting mechanism (1) is located in the shaft, and the adjusting mechanism (2) is located in the grip;

[0390] (b6) the adjusting mechanism (1) is located in the shaft, and the adjusting mechanism (2) is located in the head other than the hosel part;

[0391] (b7) the adjusting mechanism (1) is located in the grip, and the adjusting mechanism (2) is located in the head other than the hosel part; and

[0392] (b8) the adjusting mechanism (1) is located in the grip, and the adjusting mechanism (2) is located in the sole of the head.

[0393] The adjusting mechanism M1 is located in the head other than the hosel part. The adjusting mechanism M2 is located in the head other than the hosel part. The adjusting mechanism M3 is located in the hosel part. The adjusting mechanism M4 is located in the hosel part. The adjusting mechanism M5 is located in the head other than the hosel part, and is located in the sole of the head. The adjusting mechanism M6 is located in the grip, and is located in the shaft. The adjusting mechanism M7 is located in the hosel part. The adjusting mechanism M8 is located in the head other than the hosel part. The adjusting mechanism M9 is located in the grip. The adjusting mechanism M10 is located in the grip. The adjusting mechanism M11 is located in the head other than the hosel part. The adjusting mechanism M12 is located in the head other than the hosel part. The adjusting mechanism M13 is located in the hosel part. The adjusting mechanism M14 is located in the head other than the hosel part. The adjusting mechanism M15 is located in the head other than the hosel part.

[0394] When the two adjusting mechanisms interfere with each other, the mechanism becomes complicated. The complicated mechanism is apt to cause a trouble. The complicated mechanism may require high dimensional accuracy. The high dimensional accuracy reduces productivity. In these respects, it is preferable that the adjusting mechanism (1) and the adjusting mechanism (2) do not interfere with each other. The meaning of the term “interfere” is as follows. When at least one member constituting an adjusting mechanism A involves in an adjusting mechanism B, the adjusting mechanisms A and B are defined to interfere with each other. When at least one member constituting the adjusting mechanism B involves in the adjusting mechanism A, the adjusting mechanisms A and B are defined to interfere with each other. One example of the interference is a case where a screw for fixing the adjusting mechanism A contributes also to fixation of the adjusting mechanism B, for example.

[0395] The specification of the shaft can be adjusted by changing the shaft. However, a cost of the shaft is high. Golf players request desired adjustment of other specifications without changing the shaft preferred by the golf players themselves. In these respects, it is preferable that the adjusting mechanism (1) and the adjusting mechanism (2) involve no shaft change. It is more preferable that all the adjusting mechanisms involve no shaft change.

[0396] On the other hand, a sleeve is preferably used in a golf club having a changeable shaft. The sleeve is used in the adjusting mechanisms M4 and M7, for example. As shown in the adjusting mechanism M4, the sleeve is typically bonded to the shaft. The shaft is detachably mounted to the head by using the sleeve, to facilitate the change of the shaft. A large impact force from hitting acts on the sleeve. In respect of ensuring fixation of the sleeve, it is preferable that the sleeve is supported by surface contact in the whole circumferential direction (360 degrees). The sleeve is supported by the surface contact in the whole circumferential direction in the adjusting mechanism M4 and the adjusting mechanism M7. Of these, in the adjusting mechanism M4, the sleeve supporting member 80 is brought into surface contact with the sleeve 76 in the whole circumferential direction.

[0397] In a golf club set having the plurality of the golf clubs described above, advantages of the clubs are synergistically combined, and thereby the golf club set having excellent adjustability can be achieved.

[0398] As exemplified above, the golf club having the two or more specifications capable of being adjusted independently enables adjustments corresponding to situations such as course setting, weather, and a condition of a player. A combination of specifications other than the above description enables adjustments corresponding to various situations.

EXAMPLES

[0399] Hereinafter, the effects of the present invention will be clarified by examples. However, the present invention should not be interpreted in a limited way based on the description of the examples. The following adjusting mechanisms are the same as those described in the above-mentioned embodiment unless particularly described.

Example 1

[0400] A head having the adjusting mechanism M1 (face angle adjusting mechanism) and the adjusting mechanism M5 (a head-center-of-gravity position adjusting mechanism) was produced. A front member 4 and back member 6 of the head were produced by a lost-wax precision casting using a titanium alloy (Ti-6Al-4V). A material of a connecting member 8 (screw) was a titanium alloy (Ti-6Al-4V). A screw hole into which a weight body 104 (screw) of the adjusting mechanism M5 was screwed was formed in a sole of the back member 6, and was produced by NC processing. A shaft (carbon shaft) and a grip were mounted to the head, to obtain a golf club according to example 1. The golf club was a number three wood golf club.

Example 2

[0401] A golf club having the adjusting mechanism M1 (face angle adjusting mechanism), the adjusting mechanism M4 (lie angle adjusting mechanism), the adjusting mechanism M5 (a head-center-of-gravity position adjusting mechanism), and the adjusting mechanism M6 (swingweight adjusting mechanism) was produced. The adjusting mechanism M4 was added to a hosel part of the back member of the example 1, and a grip with the adjusting mechanism M5

shown in FIG. 17 was mounted in place of the grip of the example 1. A material of a sleeve 76 was an aluminium alloy. A material of a sleeve supporting member 80 was an aluminium alloy. A golf club of example 2 was obtained in the same manner as in the example 1 as for the rest.

Comparative Example 1

[0402] A head of comparative example 1 was obtained in the same manner as in the example 1 except that the head did not have all the adjusting mechanisms. The head was obtained by welding a front member 4 to a back member 6. The same shaft and grip as those of the example 1 were mounted to the head, to obtain a golf club according to the comparative example 1.

Comparative Example 2

[0403] The same structure as that of the above-mentioned adjusting mechanism M7 (see FIG. 20) was formed in the back member 6 of the example 1. The same front member as that of the example 1 was welded to the back member, to obtain a head. The screw groove of the inner surface of the sleeve Sv in the adjusting mechanism M7 was removed, to form a circumferential surface. The sleeve Sv was bonded to the tip part of the same shaft as that of the example 1. That is, the shaft was directly bonded to the inner surface of the sleeve Sv without using the screw cylinder 135. A shaft insertion hole was inclined to a hosel hole 142 as in the above-mentioned sleeve Sv1 (to see FIG. 22). The inclination angle $\theta 1$ (see FIG. 22) was set to 1.0 degree. A material of the sleeve Sv was an aluminium alloy. A material of an engaging member 140 was a titanium alloy (Ti-6Al-4V). Furthermore, the same grip as that of the example 1 was mounted, to obtain a golf club according to comparative example 2. In the golf club, the shaft can be detachably mounted to the head by a screw mechanism. In the golf club, a loft angle, a lie angle, and a face angle are varied in relation to each other by a relative position relation in a circumferential direction between the sleeve Sv and the hosel hole.

[0404] An evaluation test was performed by tester's actual hitting using these clubs. The tester had a driver head speed of about 40 m/s, and was a slicer (the tester was apt to slice a ball). Specifications and evaluation results of the examples and comparative examples are shown in the following Table 1.

TABLE 1

Specifications and evaluation results of examples and comparative examples					
	Comparative example 1	Comparative example 2-1	Comparative example 2-2	Example 1	Example 2
Loft angle (°)	16.5	17.5	15.5	16.5	17.5
Face angle (°)	3	5	1	5	5
Lie angle (°)	58.5	58	59	58.5	59.5
Distance of center of gravity (mm)	35	35	35	33	33
Club length (inch)	42.5	42.5	42.5	42.5	42.5
Balance	D1	D1	D1	D1	D0
Ball initial speed (m/s)	53	52.5	53	54	53
Launch angle (°)	20	23	17	20	23
Backspin amount (rpm)	3200	3500	2800	3000	3300

TABLE 1-continued

Specifications and evaluation results of examples and comparative examples					
	Compar- ative example 1	Compar- ative example 2-1	Compar- ative example 2-2	Exam- ple 1	Exam- ple 2
Side spin amount (rpm)	1500	1000	2000	500	200
Flight distance (yard)	170	176	165	184	190
Directivity (yard)	+25	+10	+40	+5	0

[0405] In “directivity” in Table 1 and each of the following Tables, “+” means that the direction is deviated to the right side from the target direction, and “-” means that the direction is deviated to the left side from the target direction. In “side spin” in Table 1 and each of the following Tables, a positive value means slice rotation, and a negative value means hook rotation.

[0406] The example 1 can be adjusted to the specification of the comparative example 1 shown in Table 1. The example 1 was adjusted to the specification shown in Table 1, and an evaluation test thereof was performed.

[0407] The example 2 can be adjusted to the specification of the comparative example 1 shown in Table 1. The example 2 was adjusted to the specification shown in Table 1, and an evaluation test thereof was performed.

[0408] A club having a state of comparative example 2-1 was produced using the comparative example 2, and an evaluation test thereof was performed. Next, a club having a state of comparative example 2-2 was produced by varying a relative position relation in a circumferential direction between a sleeve Sv (shaft) and a hosel hole, and an evaluation test thereof was performed.

[0409] As shown in Table 1, since a loft angle, a lie angle, and a face angle are varied in relation to each other in the comparative example 2, the adjustment was insufficient. Therefore, the slice was insufficiently resolved, and the flight distance was also relatively short. The examples 1 and 2 had excellent adjustability, and provided good results in resolution of slice and a flight distance.

Example 3

[0410] A head having the adjusting mechanism M1 (face angle adjusting mechanism) and the adjusting mechanism M4 (lie angle adjusting mechanism) was produced. A front member 4 and back member 6 of the head were produced by a lost-wax precision casting using a titanium alloy (Ti-6Al-4V). The adjusting mechanism M4 was provided in a hosel part of the back member 6. A shaft (carbon shaft) and a grip were mounted to the head, to obtain a golf club according to example 3. The golf club was a number three wood golf club.

Comparative Example 3

[0411] A head of comparative example 3 was obtained in the same manner as in the comparative example 1 except that the specification was changed to the specification of Table 2.

The same shaft and grip as those of the example 1 were mounted to the head, to obtain a golf club according to comparative example 3.

Comparative Example 4

[0412] A head of comparative example 4 was obtained in the same manner as in the comparative example 2 except that the specification was changed to the specification of Table 2. In the golf club, a shaft is detachably mounted to a head by a screw mechanism. In the golf club, a loft angle, a lie angle, and a face angle are varied in relation to each other by a relative position relation in a circumferential direction between a sleeve Sv and a hosel hole.

[0413] An evaluation test was performed by tester’s actual hitting using these clubs. The tester had a driver head speed of about 40 m/s, and was a slicer (the tester was apt to slice a ball). Specifications and evaluation results of the examples and comparative examples are shown in the following Table 2.

TABLE 2

Specifications and evaluation results of examples and comparative examples					
	Compar- ative example 3	Compar- ative example 4-1	Compar- ative example 4-2	Exam- ple 3-1	Exam- ple 3-2
Loft angle (°)	16.5	17.5	15.5	16.5	16.5
Face angle (°)	3	5	1	5	6
Lie angle (°)	58.5	58	59	59	59
Distance of center of gravity (mm)	30	30	30	30	30
Club length (inch)	42	42	42	42	42
Balance	D1	D1	D1	D1	D1
Ball initial speed (m/s)	53	52.5	53	54	54
Launch angle (°)	20	23	17	20	20
Backspin amount (rpm)	3200	3500	3000	3000	3000
Side spin amount (rpm)	1500	1000	2000	500	200
Flight distance (yard)	170	160	165	184	190
Directivity (yard)	+25	+10	+40	+5	0
Variable mechanism				Face angle Lie angle	Face angle Lie angle

[0414] The golf club of the example 3 was adjusted to a specification of example 3-1 shown in Table 2 using the adjusting mechanism, and was evaluated. Furthermore, the golf club of the example 3 was adjusted to a specification of example 3-2 shown in Table 2 using the adjusting mechanism, and was evaluated.

[0415] A club having a state of comparative example 4-1 was produced using the comparative example 4, and an evaluation test thereof was performed. Next, a club having a state of comparative example 4-2 was produced by varying a relative position relation in a circumferential direction between a sleeve Sv (shaft) and a hosel hole, and an evaluation test thereof was performed.

[0416] As shown in Table 2, since a loft angle, a lie angle, and a face angle are varied in relation to each other in the comparative example 4, the adjustment was insufficient. Therefore, the slice was insufficiently resolved, and the flight

distance was also relatively short. The example 3 had excellent adjustability, and provided good results in resolution of slice and a flight distance.

Example 4

[0417] A head having the adjusting mechanism M1 (loft angle adjusting mechanism) and the adjusting mechanism M4 (lie angle adjusting mechanism) was produced. A front member 4 and back member 6 of the head were produced by a lost-wax precision casting using a titanium alloy (Ti-6Al-4V). The adjusting mechanism M4 was provided in a hosel part of the back member 6. A shaft (carbon shaft) and a grip were mounted to the head, to obtain a golf club according to example 4. The golf club was a number three wood golf club.

[0418] The example 4 was compared with the comparative examples 3 and 4. The specifications and evaluation results of the examples and comparative examples are shown in the following Table 3.

TABLE 3

Specifications and evaluation results of examples and comparative examples					
	Comparative example 3	Comparative example 4-1	Comparative example 4-2	Example 4-1	Example 4-2
Loft angle (°)	16.5	17.5	15.5	17	16
Face angle (°)	3	5	1	3	3
Lie angle (°)	58.5	58	59	59	59.5
Distance of center of gravity (mm)	30	30	30	30	30
Club length (inch)	42	42	42	42	42
Balance	D1	D1	D1	D1	D1
Ball initial speed (m/s)	53	52.5	53	54	54
Launch angle (°)	20	23	17	20	18
Backspin amount (rpm)	3200	3500	3000	3100	2800
Side spin amount (rpm)	1500	1000	2000	700	500
Flight distance (yard)	170	160	165	175	180
Directivity (yard)	+25	+10	+40	+8	+5
Variable mechanism				Loft angle	Loft angle
				Lie angle	Lie angle

[0419] The golf club of the example 4 was adjusted to a specification of example 4-1 shown in Table 3 using the adjusting mechanism, and was evaluated. Furthermore, the golf club of the example 4 was adjusted to a specification of example 4-2 shown in Table 3 using the adjusting mechanism, and was evaluated. The example 4 had excellent adjustability, and provided good results in resolution of slice and a flight distance.

Example 5

[0420] A head having the adjusting mechanism M1 (face angle adjusting mechanism), the adjusting mechanism M4 (lie angle adjusting mechanism), and the adjusting mechanism M5 (head-center-of-gravity position adjusting mechanism) was produced. A front member 4 and back member 6 of the head were produced by a lost-wax precision casting using a titanium alloy (Ti-6Al-4V). A screw hole of the adjusting

mechanism M5 was formed in a sole part of the back member 6. The screw hole was produced by NC processing. The adjusting mechanism M4 was provided in a hosel part of the back member 6. A shaft (carbon shaft) and a grip were mounted to the head, to obtain a golf club according to example 5. The golf club was a number three wood golf club.

[0421] The example 5 was compared with the comparative examples 3 and 4. The specifications and evaluation results of the examples and comparative examples are shown in the following Table 4.

TABLE 4

Specifications and evaluation results of examples and comparative examples					
	Comparative example 3	Comparative example 4-1	Comparative example 4-2	Example 5-1	Example 5-2
Loft angle (°)	16.5	17.5	15.5	16.5	16.5
Face angle (°)	3	5	1	5	6
Lie angle (°)	58.5	58	59	59	59
Distance of center of gravity (mm)	30	30	30	27	25
Club length (inch)	42	42	42	42	42
Balance	D1	D1	D1	D1	D1
Ball initial speed (m/s)	53	52.5	53	54	54
Launch angle (°)	20	23	17	20	20
Backspin amount (rpm)	3200	3500	3000	3000	3000
Side spin amount (rpm)	1500	1000	2000	500	200
Flight distance (yard)	170	160	165	188	195
Directivity (yard)	+25	+10	+40	+0	-5
Variable mechanism				Face angle	Face angle
				Lie angle	Lie angle
				Distance of center of gravity	Distance of center of gravity

[0422] The golf club of the example 5 was adjusted to a specification of example 5-1 shown in Table 4 using the adjusting mechanism, and was evaluated. Furthermore, the golf club of the example was adjusted to a specification of example 5-2 shown in Table 4 using the adjusting mechanism, and was evaluated. The example 5 had excellent adjustability, and provided good results in resolution of slice and a flight distance.

Example 6

[0423] A head having the adjusting mechanism M1 (loft angle adjusting mechanism), the adjusting mechanism M4 (lie angle adjusting mechanism), and the adjusting mechanism M5 (head-center-of-gravity position adjusting mechanism) was produced. A front member 4 and back member 6 of the head were produced by a lost-wax precision casting using a titanium alloy (Ti-6Al-4V). A screw hole of the adjusting mechanism M5 was formed in a sole part of the back member 6. The screw hole was produced by NC processing. The adjusting mechanism M4 was provided in a hosel part of the back member 6. A shaft (carbon shaft) and a grip were

mounted to the head, to obtain a golf club according to example 6. The golf club was a number three wood golf club.

[0424] The example 6 was compared with the comparative examples 3 and 4. The specifications and evaluation results of the examples and comparative examples are shown in the following Table 5.

TABLE 5

Specifications and evaluation results of examples and comparative examples					
	Comparative example 3	Comparative example 4-1	Comparative example 4-2	Example 6-1	Example 6-2
Loft angle (°)	16.5	17.5	15.5	17	16
Face angle (°)	3	5	1	3	3
Lie angle (°)	58.5	58	59	59	59.5
Distance of center of gravity (mm)	30	30	30	27	25
Club length (inch)	42	42	42	42	42
Balance	D1	D1	D1	D1	D1
Ball initial speed (m/s)	53	52.5	53	54	54
Launch angle (°)	20	23	17	20	18
Backspin amount (rpm)	3200	3500	3000	3100	2800
Side spin amount (rpm)	1500	1000	2000	700	500
Flight distance (yard)	170	160	165	175	180
Directivity (yard)	+25	+10	+40	+0	-5
Variable mechanism				Loft angle	Loft angle
				Lie angle	Lie angle
				Distance of center of gravity	Distance of center of gravity

[0425] The golf club of the example 6 can be adjusted to the specification of the comparative example 3. The golf club of the example 6 was adjusted to a specification of example 6-1 shown in Table 5 using the adjusting mechanism, and was evaluated. Furthermore, the golf club of the example 6 was adjusted to a specification of example 6-2 shown in Table 5 using the adjusting mechanism, and was evaluated. The example 6 had excellent adjustability, and provided good results in resolution of slice and a flight distance.

Example 7

[0426] A head having the adjusting mechanism M1 (face angle adjusting mechanism) and the adjusting mechanism M3 (club length adjusting mechanism) was produced. A front member 4 and back member 6 of the head were produced by a lost-wax precision casting using a titanium alloy (Ti-6Al-4V). The adjusting mechanism M3 was provided in a hosel part of the back member 6. A shaft (carbon shaft) and a grip were mounted to the head, to obtain a golf club according to example 7. The golf club was a number three wood golf club.

[0427] The example 7 was compared with the comparative examples 3 and 4. The specifications and evaluation results of the examples and comparative examples are shown in the following Table 6.

TABLE 6

Specifications and evaluation results of examples and comparative examples					
	Comparative example 3	Comparative example 4-1	Comparative example 4-2	Example 7-1	Example 7-2
Loft angle (°)	16.5	17.5	15.5	16.5	16.5
Face angle (°)	3	5	1	5	6
Lie angle (°)	58.5	58	59	58.5	58.5
Distance of center of gravity (mm)	30	30	30	30	30
Club length (inch)	42	42	42	41.5	43
Balance	D1	D1	D1	D4	D9
Ball initial speed (m/s)	53	52.5	53	52.5	54
Launch angle (°)	20	23	17	20	20
Backspin amount (rpm)	3200	3500	3000	2800	3000
Side spin amount (rpm)	1500	1000	2000	500	200
Flight distance (yard)	170	160	165	186	190
Directivity (yard)	+25	+10	+40	0	+5
Variable mechanism				Face angle	Face angle
				Club length	Club length

[0428] The golf club of the example 7 can be adjusted to the specification of the comparative example 3. The golf club of the example 7 was adjusted to a specification of example 7-1 shown in Table 6 using the adjusting mechanism, and was evaluated. Furthermore, the golf club of the example 7 was adjusted to a specification of example 7-2 shown in Table 6 using the adjusting mechanism, and was evaluated. The example 7 had excellent adjustability, and provided good results in resolution of slice and a flight distance.

Example 8

[0429] A head having the adjusting mechanism M1 (loft angle adjusting mechanism) and the adjusting mechanism M3 (club length adjusting mechanism) was produced. A front member 4 and back member 6 of the head were produced by a lost-wax precision casting using a titanium alloy (Ti-6Al-4V). The adjusting mechanism M3 was provided in a hosel part of the back member 6. A shaft (carbon shaft) and a grip were mounted to the head, to obtain a golf club according to example 8. The golf club was a number three wood golf club.

[0430] The example 8 was compared with the comparative examples 3 and 4. The specifications and evaluation results of the examples and comparative examples are shown in the following Table 7.

TABLE 7

Specifications and evaluation results of examples and comparative examples					
	Comparative example 3	Comparative example 4-1	Comparative example 4-2	Example 8-1	Example 8-2
Loft angle (°)	16.5	17.5	15.5	17	15.5
Face angle (°)	3	5	1	3	3

TABLE 7-continued

Specifications and evaluation results of examples and comparative examples					
	Compar- ative example 3	Compar- ative example 4-1	Compar- ative example 4-2	Exam- ple 8-1	Exam- ple 8-2
Lie angle (°)	58.5	58	59	58.5	58.5
Distance of center of gravity (mm)	30	30	30	30	30
Club length (inch)	42	42	42	41.5	41.5
Balance	D1	D1	D1	D4	D9
Ball initial speed (m/s)	53	52.5	53	52	52
Launch angle (°)	20	23	17	22	18
Backspin amount (rpm)	3200	3500	3000	3200	2800
Side spin amount (rpm)	1500	1000	2000	700	500
Flight distance (yard)	170	160	165	172	175
Directivity (yard)	+25	+10	+40	+0	+0
Variable mechanism				Loft angle Club length	Loft angle Club length

[0431] The golf club of the example 8 can be adjusted to the specification of the comparative example 3. The golf club of the example 8 was adjusted to a specification of example 8-1 shown in Table 7 using the adjusting mechanism, and was evaluated. Furthermore, the golf club of the example 8 was adjusted to a specification of example 8-2 shown in Table 7 using the adjusting mechanism, and was evaluated. Also in the test, the example 8 had excellent adjustability, and provided good results in resolution of slice and a flight distance.

Example 9

[0432] A club having the adjusting mechanism M1 (face angle adjusting mechanism), the adjusting mechanism M3 (club length adjusting mechanism), the adjusting mechanism M5 (head-center-of-gravity distance adjusting mechanism), and the adjusting mechanism M6 (swingweight adjusting mechanism) was produced. A front member 4 and back member 6 of the head were produced by a lost-wax precision casting using a titanium alloy (Ti-6Al-4V). The adjusting mechanism M3 was provided in a hosel part of the back member 6. A screw hole of the adjusting mechanism M5 was formed in a sole part of the back member 6. A shaft grip assembly having the adjusting mechanism M6 was mounted to the head, to obtain a golf club according to example 9. The golf club was a number three wood golf club.

[0433] The example 9 was compared with the comparative examples 3 and 4. The specifications and evaluation results of the examples and comparative examples are shown in the following Table 8.

TABLE 8

Specifications and evaluation results of examples and comparative examples					
	Compar- ative example 3	Compar- ative example 4-1	Compar- ative example 4-2	Exam- ple 9-1	Exam- ple 9-2
Loft angle (°)	16.5	17.5	15.5	16.5	16.5
Face angle (°)	3	5	1	5	6
Lie angle (°)	58.5	58	59	59	59
Distance of center of gravity (mm)	30	30	30	27	25
Club length (inch)	42	42	42	41.5	43
Balance	D1	D1	D1	D1	D1
Ball initial speed (m/s)	53	52.5	53	52.5	54
Launch angle (°)	20	23	17	20	20
Backspin amount (rpm)	3200	3500	3000	2800	3000
Side spin amount (rpm)	1500	1000	2000	300	100
Flight distance (yard)	170	160	165	190	192
Directivity (yard)	+25	+10	+40	-5	+0
Variable mechanism				Face angle Club length Balance Dis- tance of cen- ter of gravity	Face angle Club length Balance Dis- tance of cen- ter of gravity

[0434] The golf club of the example 9 can be adjusted to the specification of the comparative example 3. The golf club of the example 9 was adjusted to a specification of example 9-1 shown in Table 8 using the adjusting mechanism, and was evaluated. Furthermore, the golf club of the example 9 was adjusted to a specification of example 9-2 shown in Table 8 using the adjusting mechanism, and was evaluated. Also in the test, the example 9 had excellent adjustability, and provided good results in resolution of slice and a flight distance.

Example 10

[0435] A club having the adjusting mechanism M1 (loft angle adjusting mechanism), the adjusting mechanism M3 (club length adjusting mechanism), the adjusting mechanism M5 (head-center-of-gravity distance adjusting mechanism), and the adjusting mechanism M6 (swingweight adjusting mechanism) was produced. A front member 4 and back member 6 of the head were produced by a lost-wax precision casting using a titanium alloy (Ti-6Al-4V). The adjusting mechanism M3 was provided in a hosel part of the back member 6. A screw hole of the adjusting mechanism M5 was formed in a sole part of the back member 6. A shaft grip assembly having the adjusting mechanism M6 was mounted to the head, to obtain a golf club according to example 10. The golf club was a number three wood golf club.

[0436] The example 10 was compared with the comparative examples 3 and 4. The specifications and evaluation results of the examples and comparative examples are shown in the following Table 9.

TABLE 9

Specifications and evaluation results of examples and comparative examples					
	Compar- ative example 3	Compar- ative example 4-1	Compar- ative example 4-2	Exam- ple 10-1	Exam- ple 10-2
Loft angle (°)	16.5	17.5	15.5	17	15.5
Face angle (°)	3	5	1	3	3
Lie angle (°)	58.5	58	59	58.5	58.5
Distance of center of gravity (mm)	30	30	30	27	25
Club length (inch)	42	42	42	41.5	41.5
Balance	D1	D1	D1	D1	D1
Ball initial speed (m/s)	53	52.5	53	53	53
Launch angle (°)	20	23	17	22	18
Backspin amount (rpm)	3200	3500	3000	3200	2800
Side spin amount (rpm)	1500	1000	2000	700	500
Flight distance (yard)	170	160	165	175	178
Directivity (yard)	+25	+10	+40	-5	+0
Variable mechanism				Loft angle Club length Balance Dis- tance of cen- ter of gravity	Loft angle Club length Balance Dis- tance of cen- ter of gravity

[0437] The golf club of the example 10 can be adjusted to the specification of the comparative example 3. The golf club of the example 10 was adjusted to a specification of example 10-1 shown in Table 9 using the adjusting mechanism, and was evaluated. Furthermore, the golf club of the example 10 was adjusted to a specification of example 10-2 shown in Table 9 using the adjusting mechanism, and was evaluated. The example 10 had excellent adjustability, and provided good results in resolution of slice and a flight distance.

Example 11

[0438] A golf club provided with the adjusting mechanism M7 and the adjusting mechanism M8 was produced.

[0439] The adjusting mechanism M7 was provided with two sleeves Sv having the inclination angle $\theta 1$ of 0 degree. Positions of shaft insertion holes 150 were made different between the two sleeves Sv. In the first sleeve Sv, an axis line of the shaft insertion hole 150 was coaxial with a central axis line of a sleeve outer surface. On the other hand, in the second sleeve Sv, the axis line of the shaft insertion hole deviated from the central axis line of the sleeve outer surface. That is, in the second sleeve Sv, the shaft insertion hole was eccentric.

[0440] The adjusting mechanism M8 was provided with two changing back members E8 having different positions of centers of gravity.

[0441] In the golf club according to the example 11, a face progression could be changed by changing the sleeve Sv. A lie angle, a face angle, and a loft angle were not varied by changing the sleeve Sv. Furthermore, in the golf club, a position of a center of gravity of a head could be changed by changing the changing back members E8. In the golf club, the

face progression and the position of the center of gravity of the head could be adjusted independently of each other.

Example 12

[0442] A golf club provided with the adjusting mechanism M1 and the adjusting mechanism M9 was produced.

[0443] The adjusting mechanism M1 was provided with two changing front members E4 which are different only in the loft angles.

[0444] The adjusting mechanism M9 was provided with two outer side grip members 196 having different thicknesses.

[0445] In the golf club according to the example 12, a loft angle could be changed by changing the changing front member E4. A face angle was not varied by changing the changing front member E4. Furthermore, in the golf club, a thickness of a grip could be changed by changing the outer side grip member 196. In the golf club, the loft angle and the thickness of the grip could be adjusted independently of each other.

Example 13

[0446] A golf club provided with the adjusting mechanism M1 and the adjusting mechanism M10 was produced.

[0447] The adjusting mechanism M1 was provided with two changing front members E4 which are different only in the face angles.

[0448] The adjusting mechanism M10 was provided with one extending member 252b.

[0449] In the golf club according to the example 13, a face angle could be changed by changing the changing front member E4. A loft angle was not varied by changing the changing front member E4. Furthermore, in the golf club, a club length could be changed by mounting/demounting the extending member 252b. The face angle and the club length could be adjusted independently of each other.

Example 14

[0450] A golf club provided with the adjusting mechanism M1 and the adjusting mechanism M11 was produced. An exploded perspective view of a head according to example 14 is the same as that of the head 268 shown in FIGS. 33 and 34.

[0451] In the example 14, a front member can be changed, and an adjusting intermediate member can be also changed. A face angle and a loft angle can be adjusted by changing only the front member. The face angle and the loft angle can be adjusted by changing only the adjusting intermediate member. Furthermore, various adjustments are enabled by combining the front members with the adjusting intermediate members.

Example 15

[0452] A golf club provided with the adjusting mechanism M1 and the adjusting mechanism M6 was produced.

[0453] The adjusting mechanism M1 was provided with two changing front members E4 which are different only in the face angles (see FIG. 3).

[0454] The adjusting mechanism M6 was provided with a plurality of weight bodies Wg having different weights in relation to each other (see FIG. 17).

[0455] In the golf club according to the example 15, a face angle could be changed by changing the changing front member E4. Furthermore, in the golf club, a swingweight could be changed by changing and mounting/demounting the weight

body Wg. The face angle and the swingweight could be adjusted independently of each other.

Example 16

[0456] A golf club provided with the adjusting mechanism M1 and the adjusting mechanism M8 was produced.

[0457] A head according to the example 16 was the same as the above-mentioned head 170 (see FIGS. 24 and 25).

[0458] In the example 16, a plurality of front members 172 shown in FIG. 24 was prepared as the adjusting mechanism M1. The plurality of front members 172 had different face angles in relation to each other. Furthermore, in the example 16, a plurality of back members 174 having different volumes in relation to each other was prepared as the adjusting mechanism M8.

[0459] In the golf club according to the example 16, a face angle could be changed by changing the front member 172. Furthermore, in the golf club, a head volume (a depth of a center of gravity and a moment of inertia of the head) could be changed by changing the back member 174. The face angle and the head volume (the depth of a center of gravity and the moment of inertia of the head) could be adjusted independently of each other.

Example 17

[0460] A golf club provided with the adjusting mechanism M1 and the adjusting mechanism M10 was produced.

[0461] The adjusting mechanism M1 was provided with two front members E4 which are different only in the face angles (see FIG. 3).

[0462] The adjusting mechanism M10 was provided with two extending members 252b having an identical shape in relation to each other (see FIG. 31).

[0463] In the golf club according to the example 17, a face angle could be changed by changing the changing front member E4. Furthermore, in the golf club, a club length (swingweight) could be changed by the number of the mounted extending members 252b. The face angle and the club length (swingweight) could be adjusted independently of each other.

Example 18

[0464] A golf club provided with the adjusting mechanism M5 and the adjusting mechanism M6 was produced.

[0465] The adjusting mechanism M5 was provided with one weight body 104 (see FIG. 14).

[0466] The adjusting mechanism M6 was provided with a plurality of weight bodies Wg having different weights in relation to each other (see FIG. 17).

[0467] In the golf club according to the example 18, a position of a center of gravity of a head could be changed by changing a position of the weight body 104. Furthermore, in the golf club, a swingweight could be changed by changing and mounting/demounting the weight body Wg. The position of the center of gravity of the head and the swingweight could be adjusted independently of each other.

Example 19

[0468] A golf club provided with the adjusting mechanism M5 and the adjusting mechanism M8 was produced.

[0469] A basic structure of a head according to the example 19 was set as shown in FIG. 24. Furthermore, a plurality of disposing holes Wh (see FIG. 15) was formed in a front member 172 (see FIG. 24) of the head. That is, the adjusting

mechanism M5 was provided in the front member 172. The adjusting mechanism M5 may be provided in the back member 174 (see FIG. 24). That is, a plurality of disposing holes Wh (see FIG. 15) may be formed in the back member 174.

[0470] The adjusting mechanism M5 was provided with one weight body 104 (see FIG. 14).

[0471] The adjusting mechanism M8 was provided with a plurality of back member 174 having different volumes (see FIG. 24).

[0472] In the golf club according to the example 19, a position of a center of gravity of the head could be changed by changing a position of the weight body 104. Furthermore, in the golf club, a head volume could be changed by changing the back member 174. The position of the center of gravity of the head and the head volume could be adjusted independently of each other.

[0473] On the other hand, the position of the center of gravity of the head was also varied by the adjusting mechanisms M5, and was also varied by the adjusting mechanisms M8. Therefore, the position of the center of gravity of the head could be variously adjusted. That is, a high degree of freedom was achieved in adjustment of the position of the center of gravity of the head.

Example 20

[0474] A golf club provided with the adjusting mechanism M5 and the adjusting mechanism M9 was produced.

[0475] The adjusting mechanism M5 was provided with one weight body 104 (see FIG. 14).

[0476] The adjusting mechanism M9 was provided with a plurality of outer side grip members 196 having different thicknesses (see FIGS. 27 and 28).

[0477] In the golf club according to the example 20, a position of a center of gravity of a head could be changed by changing a position of the weight body 104. Furthermore, in the golf club, a thickness of a grip could be changed by changing the outer side grip member 196. In the golf club, the position of the center of gravity of the head and the thickness of the grip could be adjusted independently of each other.

Example 21

[0478] A golf club provided with the adjusting mechanism M5 and the adjusting mechanism M10 was produced.

[0479] The adjusting mechanism M5 was provided with one weight body 104 (see FIG. 14).

[0480] The adjusting mechanism M10 was provided with two extending members 252b having an identical shape in relation to each other (see FIG. 31).

[0481] In the golf club according to the example 21, a position of a center of gravity of a head could be changed by changing a position of the weight body 104. Furthermore, in the golf club, a club length (grip length and swingweight) could be changed by the number of the mounted extending members 252b. The position of the center of gravity of the head and the club length (grip length and swingweight) were adjusted independently of each other.

Example 22

[0482] A golf club provided with the adjusting mechanism M6 and the adjusting mechanism M8 was produced.

[0483] The adjusting mechanism M6 was provided with a plurality of weight bodies Wg having different weights in relation to each other (see FIG. 17).

[0484] The adjusting mechanism M8 was provided with a plurality of back members 174 having different shapes (see FIGS. 24 and 25).

[0485] In the golf club according to the example 22, a swingweight was changed by mounting/demounting and changing the weight body Wg. Furthermore, in the golf club, a head shape could be changed by changing the back member 174. The swingweight and the head shape were adjusted independently of each other.

Example 23

[0486] A golf club provided with the adjusting mechanism M6 and the adjusting mechanism M9 was produced.

[0487] The adjusting mechanism M6 was provided with a plurality of weight bodies Wg having different weights in relation to each other (see FIG. 17).

[0488] The adjusting mechanism M9 was provided with a plurality of outer side grip members 196 having different thicknesses (see FIGS. 27 and 28).

[0489] In the golf club according to the example 23, a swingweight was changed by mounting/demounting and changing the weight body Wg. Furthermore, in the golf club, a grip outer diameter was changed by changing the outer side grip member 196. The swingweight and the grip outer diameter were adjusted independently of each other.

Example 24

[0490] A golf club provided with the adjusting mechanism M6 and the adjusting mechanism M10 was produced.

[0491] FIG. 36 is an exploded view of a grip part of the golf club according to the example 24. The golf club has the above-mentioned grip 252 (see FIG. 31). Furthermore, the golf club has two weight bodies Wg.

[0492] A first weight body Wg1 has a head part 300 and a body part 302. The head part 300 is a disk-shaped. The body part 302 is a male screw. The head part 300 is coaxial with the body part 302. A second weight body Wg2 has a head part 300 and a body part 306. The body part 306 is a male screw. The head part 300 is coaxial with the body part 306. An axial length of the body part 302 is different from that of the body part 306. The difference causes a weight difference between the weight body Wg1 and the weight body Wg2.

[0493] The body parts 302 and 306 of the weight body Wg conforms to a screw hole sc4 of the extending member 252b. The body parts 302 and 306 can be screwed into the screw hole sc4.

[0494] The adjusting mechanism M10 in the example 24 is the same as that of the embodiment of FIG. 30. On the other hand, the adjusting mechanism M6 in the example 24 is different from that of the embodiment of FIG. 17. The adjusting mechanism M6 includes the weight body Wg and the extending member 252b as shown in FIG. 36. A swingweight can be adjusted by mounting any of the weight bodies Wg to the extending member 252b. The swingweight can be adjusted by presence or absence of the mounted weight body Wg.

[0495] In the golf club according to the example 24, the swingweight was changed by mounting/demounting and changing the weight body Wg. Furthermore, in the golf club, the swingweight and a club length were changed by the number of the mounted extending members 252b. In the example 24, the club length can be adjusted. In the example 24, the

swingweight could be variously adjusted by a combinations of the extending member 252b and the weight body Wg.

Example 25

[0496] A golf club provided with the adjusting mechanism M8 and the adjusting mechanism M9 was produced.

[0497] The adjusting mechanism M8 was provided with two back members 174 having different positions of centers of gravity (see FIGS. 24 and 25).

[0498] The adjusting mechanism M9 was provided with a plurality of outer side grip members 196 having different thicknesses (see FIGS. 27 and 28).

[0499] A position of a center of gravity of a head was changed by changing the back member 174 in the golf club according to the example 25. Furthermore, in the golf club, a grip outer diameter was changed by changing the outer side grip member 196. The position of the center of gravity of the head and the grip outer diameter were adjusted independently of each other.

Example 26

[0500] A golf club provided with the adjusting mechanism M8 and the adjusting mechanism M10 was produced.

[0501] The adjusting mechanism M8 was provided with two back members 174 having different positions of centers of gravity (see FIGS. 24 and 25).

[0502] The adjusting mechanism M10 was provided with two extending members 252b having an identical shape in relation to each other (see FIG. 31).

[0503] In the golf club according to the example 26, a position of a center of gravity of a head was changed by changing the back member 174. Furthermore, in the golf club, a swingweight and a club length were changed by the number of the mounted extending members 252b. The position of the center of gravity of the head and the swingweight (club length) were adjusted independently of each other.

Example 27

[0504] A golf club provided with the adjusting mechanism M6 and the adjusting mechanism M12 was produced.

[0505] The adjusting mechanism M6 was provided with a plurality of weight bodies Wg having different weights in relation to each other (see FIG. 17).

[0506] The adjusting mechanism M12 was provided with a plurality of front members 282 having different loft angles in relation to each other (see FIG. 35).

[0507] In the golf club according to the example 27, a swingweight was changed by changing the weight body Wg. Furthermore, in the golf club, a loft angle was changed by changing the front member 282. The swingweight and the loft angle were adjusted independently of each other.

Example 28

[0508] A golf club provided with the adjusting mechanism M10 and the adjusting mechanism M12 was produced.

[0509] The adjusting mechanism M10 was provided with two extending members 252b having an identical shape in relation to each other (see FIG. 31).

[0510] The adjusting mechanism M12 was provided with a plurality of front members 282 having different loft angles in relation to each other (see FIG. 35).

[0511] In the golf club according to the example 28, a club length (swingweight) was changed by the number of the

mounted extending members **252b**. Furthermore, in the golf club, a loft angle was changed by changing the front member **282**. The club length (swingweight) and the loft angle were adjusted independently of each other.

[0512] The combination of the adjusting mechanisms is not restricted to the combinations in these examples. The number of the combinations of the adjusting mechanisms is not also restricted. For example, any two selected from the adjusting mechanisms M1 to M12 can be combined. Any three selected from the adjusting mechanisms M1 to M12 can be combined.

[0513] The invention described above can be applied to all golf clubs such as a wood type, utility type, hybrid type, iron type, and putter type golf clubs.

[0514] The description hereinabove is merely for an illustrative example, and various modifications can be made in the scope not to depart from the principles of the present invention.

What is claimed is:

1. A golf club comprising at least one adjusting mechanism, wherein at least two specifications can be adjusted independently of each other.

2. The golf club according to claim 1, wherein a head, a shaft, a grip, or a joined part therebetween has an adjusting mechanism (1);

the head, the shaft, the grip, or the joined part has further other adjusting mechanism (2); and

the adjusting mechanism (1) and the adjusting mechanism (2) can work independently of each other.

3. The golf club according to claim 2, wherein the adjusting mechanism (1) or the adjusting mechanism (2) is located at a place other than a hosel part.

4. The golf club according to claim 2, wherein the adjusting mechanism (1) and the adjusting mechanism (2) are located at places other than a hosel part.

5. The golf club according to claim 1, wherein all the adjusting mechanisms are located at places other than a hosel part.

6. The golf club according to claim 1, wherein the two or more specifications selected from a loft angle, a lie angle, a face angle, a face area, a position of a center of gravity of a head, a swingweight, a club length, a position of a center of gravity of a club, a frequency of the club, a club weight, ahead shape, a head volume, a head weight, a flex of a shaft, a flex point of a shaft, a torque of the shaft, flexural rigidity distribution of the shaft, torsional rigidity distribution of the shaft, a shaft weight, weight distribution of the shaft, a position of a center of gravity of the shaft, a length of the shaft, a grip outer diameter, a grip weight, a position of a center of gravity of a grip, a grip length, a specification of a face groove, a face progression, a moment of inertia of the head, a moment of inertia of the club, a coefficient of restitution of the head to a ball, and a friction coefficient of the head to the ball can be adjusted independently of each other.

7. The golf club according to claim 1, wherein the plurality of specifications include one or more specific specifications selected from a loft angle, a lie angle, a club length, and a club weight; and an adjustment range is equal to or greater than a width corresponding to two-number clubs in all the specific specifications.

8. The golf club according to claim 1, wherein the golf club includes a sleeve changing mechanism as the adjusting mechanism.

9. The golf club according to claim 1, wherein the golf club has a first adjusting mechanism, a second adjusting mechanism, and a third adjusting mechanism, and the three adjusting mechanisms can work independently of each other.

10. The golf club according to claim 1, wherein all the specifications capable of being adjusted can be adjusted independently of each other.

11. A golf club set comprising a plurality of golf clubs according to claim 1.

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