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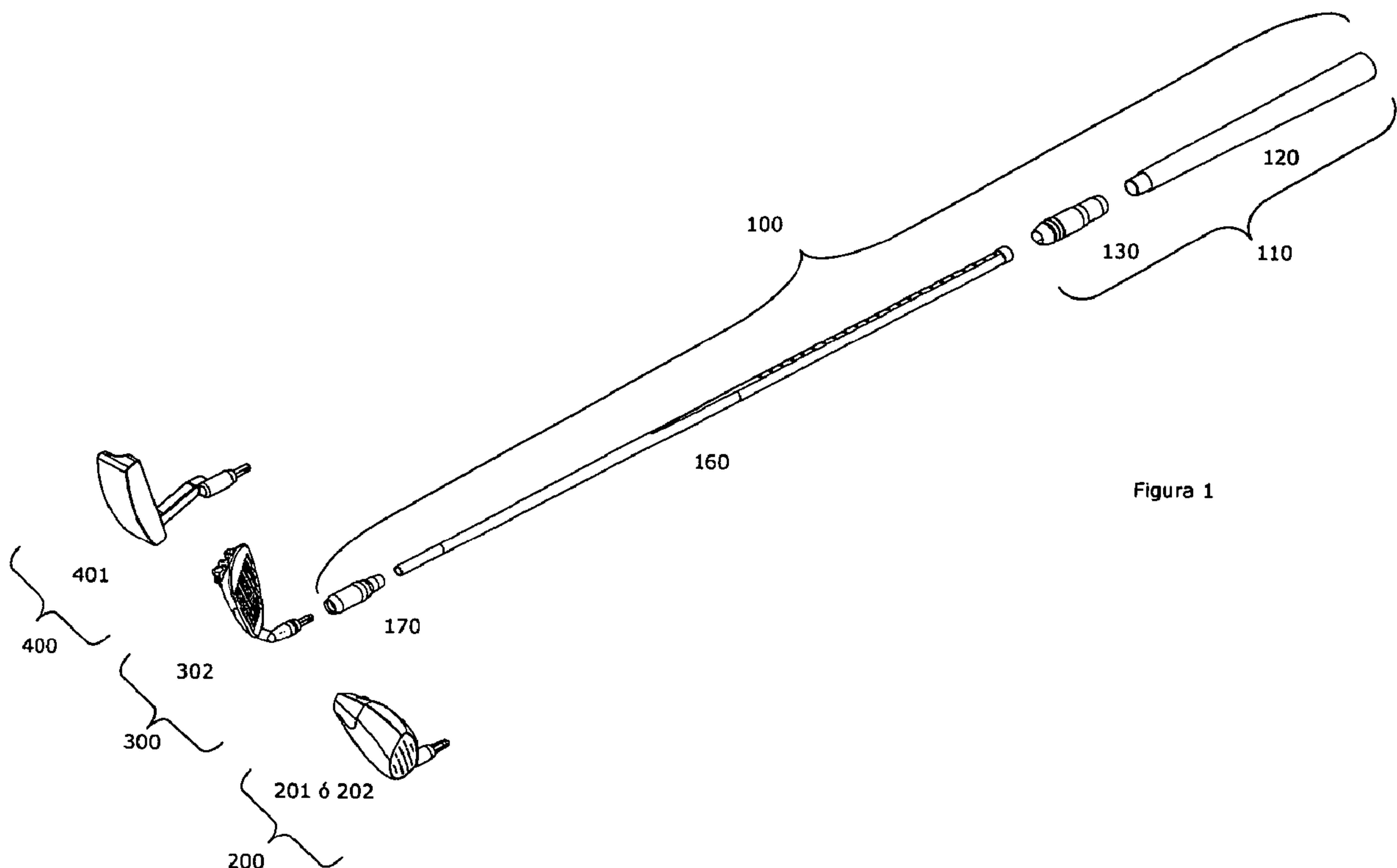
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(54) Title: COMPACT, CONFIGURABLE GOLF CLUB SET



(57) **Abrégé/Abstract:**

Compact set of golf clubs that can be configured during play at the player's discretion, prior to each striking of the ball, which comprises: a rod 100 of a length that can be adjusted in discrete length positions 165 by a telescopic handle 110; the rod 100 of adjustable length including a head 170 interchange mechanism; an interchangeable head 200, 300, 400 on the rod 100 of adjustable length, with options of fixed-loft heads 201, 301, 401; such as adjustable loft heads 202, 302 incorporating an adjustable loft mechanism 500a, 500b and a sole 504, the geometry 545 of which maintains the adjustable loft heads 202, 302 horizontal to the ground; the fixed loft or adjustable loft interchangeable head covers: wood heads 200: #1 wood 210, fairway woods 220, and hybrids; iron heads 300: #1 irons to #9 310, 320, and wedges 330; and/or putter head 400.

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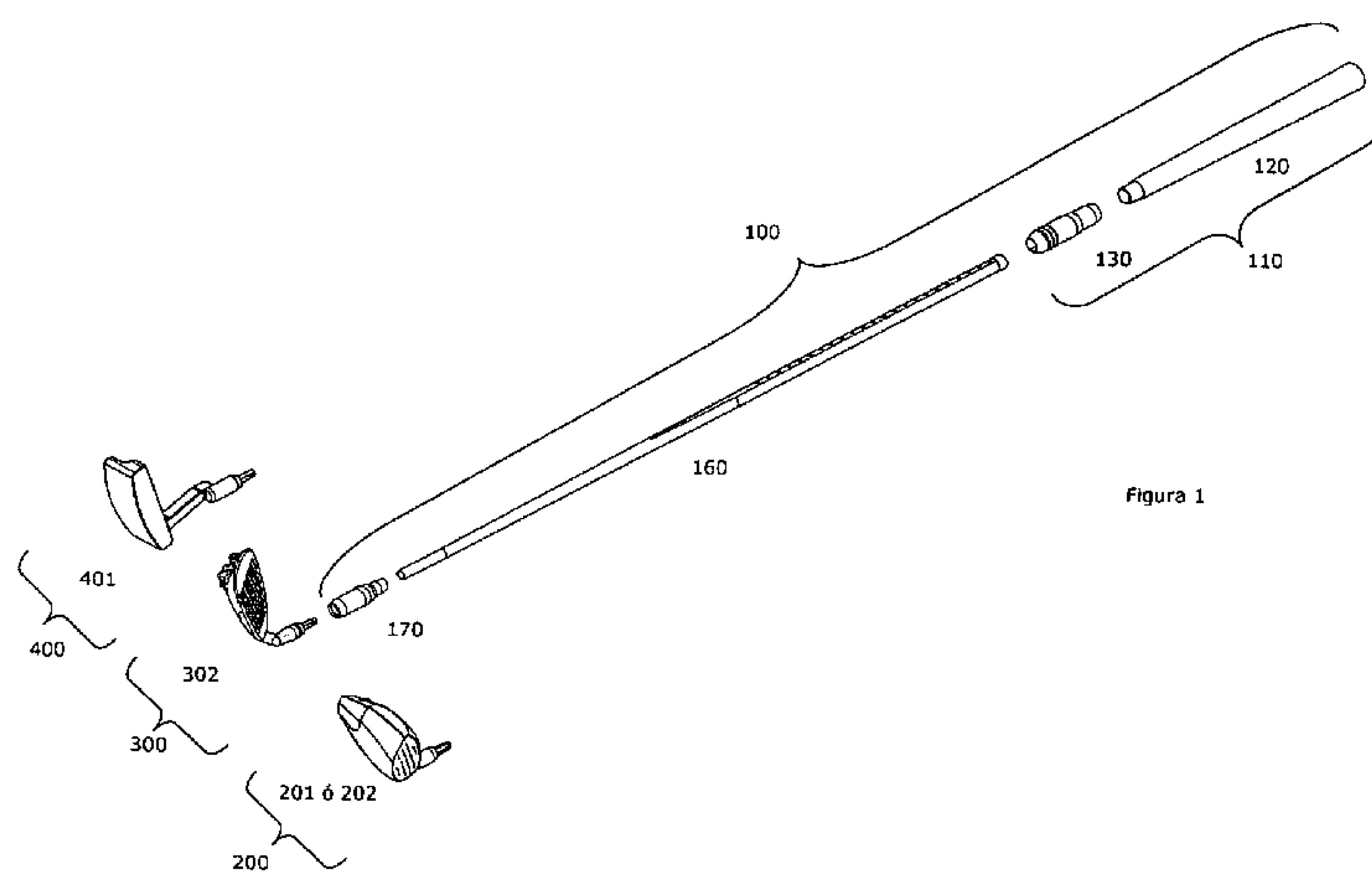
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(54) Title: COMPACT SET OF CONFIGURABLE GOLF CLUBS

(54) Título : CONJUNTO COMPACTO DE PALOS DE GOLF CONFIGURABLES



(57) Abstract: Compact set of golf clubs that can be configured during play at the player's discretion, prior to each striking of the ball, which comprises: a rod 100 of a length that can be adjusted in discrete length positions 165 by a telescopic handle 110; the rod 100 of adjustable length including a head 170 interchange mechanism; an interchangeable head 200, 300, 400 on the rod 100 of adjustable length, with options of fixed-loft heads 201, 301, 401; such as adjustable loft heads 202, 302 incorporating an adjustable loft mechanism 500a, 500b and a sole 504, the geometry 545 of which maintains the adjustable loft heads 202, 302 horizontal to the ground; the fixed loft or adjustable loft interchangeable head covers: wood heads 200: #1 wood 210, fairway woods 220, and hybrids; iron heads 300: #1 irons to #9 310, 320, and wedges 330; and/or putter head 400.

(57) Resumen:

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Conjunto compacto de palos de golf configurables durante el juego a discreción del jugador previo a cada golpe, comprende: una vara de largo ajustable 100 en posiciones de largo discretas 165 por un mango telescópico 110; la vara de largo ajustable 100 incluyendo mecanismo de intercambio de cabezas 170; una cabeza intercambiable 200, 300, 400 en la vara de largo ajustable 100, con opciones de cabezas de loft fijo 201, 301, 401; como cabezas de loft ajustables 202, 302 incorporando un mecanismo loft ajustable 500a, 500b y una suela 504 cuya geometría 545 mantiene las cabezas de loft ajustables 202, 302 horizontal al suelo; la cabeza intercambiable de loft fijo o de loft ajustables, cubre: cabezas maderas 200: madera #1 210, maderas fairway 220, e híbridos; cabezas fierros 300: fierros #1 a #9 310, 320 y wedges 330; y/o cabeza putter 400.

COMPACT, CONFIGURABLE GOLF CLUB SET

TECHNICAL FIELD

Field of application is a compact, configurable golf club set. The club set in this invention
5 allows for adjustment of basic club characteristics, enabling players to adjust clubs to
their strokes by varying the shaft length, interchanging heads on said shaft and/or
modifying the head loft angle. As with any standard club set, the compact set in this
invention comprehensively encompasses shafts, woods, irons and putter.

10 BACKGROUND ART

In traditional golf clubs, heads and shafts are fixed. As such, the wide variety of shots
used during a game requires a wide variety of shafts and heads. In golf clubs, a defining
head characteristic is the loft angle or angle at which the ball is hit: acute angles for
short, precise distances, right angles for longer distances. As in the case of heads, shaft
15 length and flexibility vary with distance of shot: short, stiff shafts for short distances,
longer, more flexible shafts for longer distances.

Woods and hybrids are designed for tee-off (designated area from which players take
their first shot) or fairway (zone extending from the tee to the putting green) strokes. Loft
20 angles normally vary from 8° to 28°. Depending on player style, they can assemble a set
of some five heads of this type in the bag. Woods are classified as 1-wood or driver with
8° to 13° loft angles, 2-wood with 12° to 15° loft angles, and all the way to 7-wood with

25° to 28° loft angles. Although woods rise all the way to 15-wood, few players use them. Two-woods and up are also known as fairway woods. Hybrids have the appearance of wood with a lower profile or head height, with angles similar to 5- or 7-wood. Some hybrids have more acute angles, such as the equivalent to a 5-iron with about 28°. The length of a 1-wood club, based on an adult of average height, ranges from 43 to 45 inches (109 to 114 cm). Length decreases progressively one half to one inch (1.27 to 2.54 cm) as club numbers rise to 7-wood, with an approximate length of 41 inches (104 cm).

Irons and wedges (irons of very acute loft angles) are intended for mid-distance and approach shots. In most of these, loft angle varies from 15° to 62° and, depending on player preference, they make up a selection of about nine clubs in the bag. Irons range from 1 to 9. Number 1 is equivalent to loft angles of 15° to 18°, increasing gradually through number 9, equivalent to loft angles of 45° to 48°. Wedges include pitch wedge (47° to 53°), gap wedge (50° to 54°), sand wedge (54° to 58°) and lob wedge (58° to 62°). The length of a 1-iron club, based on an adult of average height, varies at about 40 inches (102 cm). Length decreases progressively by a half-inch (1.27 cm) as club numbers rise to 9-iron at some 36 inches (91 cm). Wedge shaft lengths are about 35 inches (89 cm).

Putters are used for putting green strokes intended to put the ball in the hole. There is a large variety of heads, with loft angles from 2° to 5°. Players choose the putter best

suited to their game and put a single club of this type in the bag. While lengths vary widely, the most conventional and therefore most often used stands at about 35 inches (89 cm).

Golf rules allow for a maximum of 14 clubs in the bag.

5

Other relevant criteria to be considered by players include shaft flexibility and dynamic or swing weight, equivalent to the concept of club moment of inertia. Moment of inertia is determined by shaft length and head weight.

10 All of these elements make up the range of features to be considered by players when choosing an ideal set of clubs, a concept that varies from player to player.

The novelty in this innovation lies in the combination of related functionalities in a golf device featuring a compact, configurable format emulating the performance of a
15 complete standard club set.

The state of the art on configurable or adjustable clubs includes attempts that do not address issues in a comprehensive manner and whose technical elements do not consider the aspects of the game addressed by conventional or standard club sets.

20

The literature on patents and applications totally or partially addressing the scope of this invention is extensive. Our prior art review focuses on patents that have attempted to

address issues in a comprehensive manner and on mechanisms most closely resembling this invention.

The problem underlying the previous patents cited here are that proposed designs have

5 failed to achieve one or more of the following conditions:

a) They do not allow for shaft length adjustment and therefore do not reduce the number of shafts, or else they do not adjust the shaft length for various shot distances, US PAT. 4,253,666.

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b) They do not provide a range of heads suitable for most shots. As noted, modern golf requires a series of head types: woods, hybrids, irons, wedges and putters; US PAT. 4,253,666, US PAT. 2,091,794.

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c) They do not provide a head loft angle adjustment mechanism. This forces the use of numerous heads, decreasing the advantages of this type of set over a standard set, US PAT. 6,547,673, US PAT. 4,253,666.

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d) Head loft angle adjustment mechanisms that do not address the sole adjustment required to attain proper horizontal rest of head on the ground for the various adjusted loft angles, US PAT. 5,083,779, US PAT. 2,091,794.

e) Adjustment mechanisms of limited scope whose advantages over a conventional set are marginal. These include adjustable sets requiring a large number of components or parts, similar to the requirements of a standard club set, US PAT. 6,547,673. Or conversely, adjustment mechanisms that reduce the number of components but do not cover the full range of play in a standard club set, US PAT. 5,083,779, US PAT. 4,253,666, US PAT. 2,091,794.

f) Coupling or adjustment mechanisms with an important potential for fracture and/or misadjustment and mechanisms whose basic design includes high-stress areas. All mechanisms in woods, hybrids, irons or wedges, whether in the shaft or head, are subject to high dynamic stress as shots are played. Materials fatigue in high-stress areas will most certainly increase with stroke repetition, especially considering that with a compact or reduced set all shots are played with fewer clubs and/or heads. As such, clubs and/or heads and associated mechanisms take a greater number of shots per round than standard set clubs. Inappropriate adjustment increases dynamic load and the potential for connection or adjustment mechanism failure, US PAT. 6,547,673, US PAT. 5,083,779, US PAT. 4,253,666, US PAT. 2,091,794.

g) Configuration mechanisms that do not allow for easy or rapid handling prior to a shot. Examples include screw-on shaft-head connectors, US PAT. 7,207,897.

Toothed pieces for setting loft angle with discrete positions that do not necessarily set the positions or angles desired by player. In addition, many such schemes need excessive manipulation requiring release, position setting and locking schemes, US PAT. 5,083,779, US PAT. 2,091,794.

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Connection mechanisms whose basic design concept does not allow for tight coupling, a key issue considering that such couplings are to be performed by players on the course prior to shot play. The results are connection mechanisms that are not easily adjusted and give the feeling of playing with loose pieces, US PAT. 6,547,673, US PAT.

10 5,083,779, US PAT. 4,253,666, US PAT. 2,091,794.

The basic design concept of mechanisms in this invention include adjustments and/or couplings that can be quickly performed and provide inter-piece tolerances based on compression of pieces of robust basic trigonometry. All mechanisms seek to balance
15 aesthetics and weight and avoid high-stress areas leaving pieces susceptible to early fracture or deterioration due to materials fatigue.

Proper adjustment consists of choosing the right head and loft angle and a shaft length consistent with the selected head. Such adjustments should be easily done by any
20 player prior to shot play, within the allotted timeframe. The result should be a solidly assembled club equivalent to a standard club.

SUMMARY OF INVENTION**TECHNICAL PROBLEM**

In traditional golf clubs, heads and shafts are fixed. As such, the wide range of shots used during a game requires a wide variety of shafts and heads. This forces players to
5 carry a club set of considerable weight and volume.

As the game takes places over several hours and distances of more than 10 km for an 18-hole course, carrying a full complement of golf clubs requires significant effort.

10 This is also an issue when transporting bags in a vehicle. Club houses help, but this remains a problem when playing at more than one golf course, especially if more than one family member practices the sport. Another aspect of the problem are players who travel frequently on business. Such players have only the option of lugging their equipment or using rentals. The first option is particularly inconvenient when flying, while
15 the second is often less than a pleasant experience as equipment may not fit the player or be deteriorated by use.

An additional point in the problem resulting from the use of traditional fixed heads and shafts is that available equipment often comes in standard lengths and loft angles. As
20 the purpose of the game is to complete a round using the fewest strokes possible, equipment is key, especially how well clubs can accommodate player strokes. However, players have different trunks, arm lengths, etc. Especially difficult is the case of growing

children. Significant numbers of children practice the sport but must play with clubs that do not match their build or must be replaced or modified as they grow.

As noted in the Background Art, the state of the art on configurable or adjustable clubs includes attempts that do not address the problem in a comprehensive manner and whose technical elements do not consider the aspects of the game addressed by conventional or standard club sets. Partial solutions addressing various adjustment elements exhibit the technical deficiencies noted in the Background Art, resulting in most players still preferring fixed-configuration standard club sets.

Proper adjustment consists of choosing the right head and loft angle and a shaft length consistent with the selected head. Such adjustments should be easily done by any player, whether a child, adult or senior, prior to shot play and within the allotted timeframe. Lastly, the required club needs solid adjustment mechanisms not subject to premature fracture or wear. This is especially important when considering that all shots in a game could be played using one or two clubs.

SOLUTION TO PROBLEM

The novelty in this innovation lies in the combination of related functionalities in a golf device featuring a compact, configurable format emulating the performance of a complete standard club set.

The first functionality is that, as with a conventional club set, the compact, configurable set in this invention can include wood drivers, fairway woods, hybrids and irons, totally or partially encompassing 1 to 9, wedges and putters.

- 5 The second functionality is that each of these head types can vary their loft angle by means of a mechanism such that the full range of loft angles is adequately covered. This does not prevent extending beyond the conventional head loft angle range or defining heads with more targeted loft angle ranges. The latter requires a larger number of heads in the compact set, but it has the advantage that head behavior more closely resembles
- 10 conventional head behavior, for example in terms of weight and therefore moment of inertia or swingweight behavior. The adjustable loft works by means of a mechanism attached to the rear area of the head and joined to a modified hosel. It has the shape of a triangle one of whose sides can be manually adjusted by means of a screw.
- 15 The second functionality means that the game can be played using a reduced number of heads that can be interchanged, preferably on one or a reduced number of shafts.

The above leads to the third functionality in this invention. As the proposition is to play the game using one or a reduced number of shafts, these heads and shafts contain an

20 interchange mechanism that can be easily and comfortably used by players to assemble a club prior to a stroke. A single shaft is to be preferred, but a player wishing to use a shaft for woods and another for irons would find no restriction for including two shafts instead of one in the compact set. In such a case, both shafts would include a head

interchange mechanism. The head interchange mechanism consists of a guide pin attached to the hosel which is then coupled to a pair of concentric cylinders on one end of the shaft and which contain balls that lock the mechanism by lodging in the recesses of said guide pin. The mechanism is operated by the player using his fingers to move
5 the outermost cylinder.

A fourth functionality is that since the proposition is to play the game using one or a reduced number of shafts, their length must be adjustable per the selected head and loft angle. The shaft length adjustment mechanism consists of a shaft with surface recesses
10 housing a sliding handle, which in turn houses a pair of concentric cylinders on one end of said handle and which contain balls that lock the mechanism by lodging in the recesses of said shaft. The mechanism is operated by the player using his fingers to move the outermost cylinder.

15 A fifth functionality is that since the head loft angle changes, the head should preferably contain a modified sole so as to ensure correct lie (horizontal head rest on ground) for the range of loft angles defined for this head.

A sixth functionality is that head interchange mechanism allows for the use of any
20 commercially available head with a standard hosel. This permits using the adjustable compact set with conventional, commercially available heads of the player's choosing; for example putter and/or 1-wood or driver type heads. The hosel is construed to be the socket or neck in the head of a golf club into which a shaft is inserted.

ADVANTAGEOUS EFFECTS OF INVENTION

All issues described in the preceding chapter are addressed and solved in this invention and constitute its advantage. Chief among these issues are:

- 5 Despite significantly reducing volume and weight, the adjustable compact set behaves in a manner that is at least equivalent to a conventional club set.

At player discretion, the compact set can be used with commercially available fixed heads. This is especially useful for 1-wood heads and putters, as players tend to be
10 loyal to certain models, notably putters.

Assembling an adjustable club is simple and requires at most three steps: (a) choose a head and shaft and connect them; (b) adjust loft angle, assuming an adjustable loft head, and (c) adjust shaft length. These mechanisms are easily operated by players
15 using their fingers.

Once adjustments are made, connectors are designed to remain firmly coupled during shot play, giving players the sensation of a solid club and stroke.

20 With this new device players can, during game play, adjust the device to their build and style of play, opening up the possibility of more precise shots. This is one of the key objectives of the game of golf: greater precision means fewer strokes are needed to complete a round.

The device also helps golfers improve their game, as it allows for numerous variations for a given shot. Players can choose the combination best suited in terms of precision and/or distance and the device stays with them as their game evolves.

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The adjustable set presents a clear advantage for children, since as a configurable device, it adapts to their physical development.

The set significantly reduces standard club set volume and weight by $\frac{1}{5}$ and $\frac{1}{3}$ respectively, providing the benefits below:

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A much more pleasant game experience, as players can play a round with one or two clubs and avoid carrying a heavy, voluminous bag for several hours over great distances: 10 km on average for 18 holes.

This may be especially relevant to the older players who represent such a significant portion of the player population.

15

The adjustable compact set requires significantly less space and can be easily carried by car or airplane, which is especially convenient if more than one family member practices the sport. Carrying a standard club set to distant destinations is often not feasible due to space or cost considerations. The only options are storing a standard club set at each golf course frequented or resorting to rentals or loans. These examples do not apply to the adjustable compact set, which holds the significant advantage of

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allowing players to always use the same device at all locations, since as noted, space or cost considerations would no longer be a concern.

BRIEF DESCRIPTION OF DRAWINGS

5 This disclosure is to be read based on the detailed description and drawings briefly described below.

Figure 1 shows a compact, configurable golf club set, including adjustable-length shaft 100 and three types of interchangeable heads: putter 400, irons 300 and woods 200.

10 Each of said heads can be of fixed or adjustable loft

Figure 2 shows a compact, configurable golf club set with supported head types as an alternative set of parts making up a pair of configurable clubs, where said parts include two adjustable-length shafts 100; a stiffer one for iron and putter heads and a more flexible one for wood heads. Six interchangeable heads, including an interchangeable putter head 400, three interchangeable iron heads 300 encompassing from long irons 310 to short and mid-irons 320, 330 and two interchangeable wood heads 200 covering 1-wood or driver 210 and fairway woods 220. Each of said heads can be of fixed or adjustable loft.

20

Figure 3 shows shaft 160 described by its three sections: (a) head interchange section 161, which for the effects of this patent is the section supporting head interchange mechanism 170; (b) conical transition section 162 between head interchange section

161 and adjustable-length section 163; and (c) the said adjustable-length section 163 or else a section of the shaft where telescoping mechanism 130 of shaft 160 is slid and/or attached.

- 5 Figure 4 shows shaft butt section 166 representing a close-up cross-section of the end of adjustable-length section 163, shaft dents 165 for attaching telescoping mechanism 130, and a detailed view of shaft butt end 167 lodged at the end of shaft 160.

Figure 5 shows telescoping handle 110 with telescoping mechanism 130 attached by
10 means of a cylinder forming handle core 122 with grip 121 over it.

Figure 6 shows telescoping mechanism 130 attached to handle core 122 and coupled to adjustable-length section 163.

- 15 Figure 7 shows an exploded view of telescoping mechanism 130 and parts forming said mechanism.

Figure 8 shows a cross-section of telescoping mechanism in locked position 131 with ball lock elements 138 inserted into shaft dents 165 of adjustable-length section 163.

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Figure 9 shows a cross-section of telescoping mechanism in unlocked position 132 with ball lock elements 138 released by means of unlock recesses 135 on the inner surface of external telescoping cylinder 134.

Figure 10 shows a general view of head interchange mechanism 170 attached to shaft 160. Pin lock 173 is shown inserted into said mechanism.

- 5 Figure 11 shows an exploded view of head interchange mechanism 170 and parts forming said mechanism.

Figure 12 shows a cross-section of head interchange mechanism in coupled position 171 with pin lock 173 inserted and locking balls 183 secured in pin lock dents 175.

10

Figure 13 shows a cross-section of head interchange mechanism in uncoupled position 172 with pin lock 173 released and locking balls 183 released by means of decoupling recesses 188 on the inner surface of external interchange cylinder 187.

- 15 Figure 14 shows interchangeable fixed-loft putter head 401 with pin lock 173 aligned for insertion in standard hosel 199. Figure to the right shows pin lock 173 inserted and attached to standard hosel 199 of said putter head.

- Figure 15 shows interchangeable fixed loft iron head 301 with pin lock 173 aligned for
20 insertion in standard hosel 199. Figure to the right shows pin lock 173 inserted and attached to standard hosel 199 of said iron head.

Figure 16 shows interchangeable fixed-loft wood head 201 with pin lock 173 aligned for insertion in standard hosel 199. Figure to the right shows pin lock 173 inserted and attached to standard hosel 199 of said wood head.

- 5 Figure 17 shows a bottom view of sole 504 for adjustable-loft iron head 302, with three lines along sole 552 defining the bottom volume section of said head and which as a result generate the surface of modified sole geometry 545.

- 10 Figure 18 shows an A-A section of less acute loft angle end 550, 548. For an adjustable-loft iron head 302, with less acute loft angle end 548, for the range of loft angles defined for said head, and attaching the head to the horizontal 551, and which therefore defines in respect of ground 549 the line along sole 552 defining the scan section of modified sole geometry 545, closer to the lower vertex of club head face 506.

- 15 Figure 19 shows an A-A section of intermediate loft angle 550, 547. For an adjustable-loft iron head 302, with intermediate loft angle 547, for the range of loft angles defined for said head, and attaching the head to the horizontal 551, and which therefore defines in respect of ground 549 the line along sole 552 defining the intermediate scan section of modified sole geometry 545.

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Figure 20 shows an A-A section of more acute loft angle end 550, 548. For an adjustable-loft iron head 302, with more acute loft angle end 548, for the range of loft angles defined for said head, and attaching the head to the horizontal 551, and which

therefore defines in respect of ground 549 the line along sole 552 defining the scan section of modified sole geometry 545, more distant relative to the lower vertex of club head face 506.

- 5 Figure 21 shows the adjustable loft mechanism, iron head version, side view 500a. The side view highlights a triangle with vertices 511a, 512a, 513a and legs or rods 514a, 515a. By adjusting the size of one of said rods, first connecting rod 514a allows modification of said triangle and as such modification of loft angle 509a.
- 10 Figure 22 shows an adjustable-loft iron head, front view 302. Showing on heel side 508a is hosel section 533a in male hosel protrusion 535a version, compatible with head interchange mechanism 170.

Figure 23 shows the adjustable loft mechanism, iron head version, exploded view of
15 screw 516a and its supports or bearings, including bearing nut cylinder 526a and bearing cylinder 524a. The latter matches third vertex pivot 513a and is supported by a pair of third vertex pivot brackets 541a extending from joined connecting rod 540a.

Figure 24 shows the adjustable loft mechanism, iron head version, rear view 500a. Note
20 hosel loft axis 532a supported by three pivot brackets 529a, 530a and hosel loft axis 532a attached to joined connecting rod 540a and how this connects to screw 516a by means of bearing cylinder 524a. Screw 516a is screwed into bearing nut cylinder 526a

supported by a pair of first vertex pivot brackets 531a extending from the top of rear of face 502a.

Figure 25 shows the adjustable loft mechanism, iron head version, general exploded view 500a. Showing are two alternatives for hosel loft axis 532a with variants in hosel section 533a, the first as female hosel protrusion 534a and the second as male hosel protrusion 535a compatible with head interchange mechanism 170. Hosel loft axis 532a shows a section displacing its axis by means of offset section 536a. Hosel loft axis 532a, in particular loft axis section 537a, is supported by three pivot brackets 529a, 530a extending from the bottom of the rear of face 502a. Said loft axis section 537a is attached by means of male shape 538a to joined connecting rod 540a. They lock into position by means of parallel eccentric pin 539a.

Figure 26 shows the adjustable loft mechanism, wood head version, side view 500b. The side view shows a triangle with vertices 511b, 512b, 513b and legs or rods 514b, 515b. By adjusting the size of one of said rods, first connecting rod 514b allows modification of said triangle and as such modification of loft angle 509b.

Figure 27 shows an adjustable-loft wood head, front view 202. Showing on heel side 508b is hosel section 533b in male hosel protrusion 535b version compatible with head interchange mechanism 170.

Figure 28 shows the adjustable loft mechanism, wood head version, exploded view of screw 516b and its supports or bearings, including bearing cylinder 524b and bearing nut cylinder 526b. The latter matches third vertex pivot 513b and is supported by a pair of third vertex pivot brackets 541b extending from joined connecting rod 540b.

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Figure 29 shows the adjustable loft mechanism, wood head version, rear view 500b. Note hosel loft axis 532b supported by three pivot brackets 529b, 530b and said hosel loft axis 532b attached to joined connecting rod 540b, and how the latter connects to screw 516b by means of bearing cylinder 524b. Screw 516b is screwed in bearing nut cylinder 526b supported by a pair of third vertex pivot brackets 541b.

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Figure 30 shows the adjustable loft mechanism, wood head version, general exploded view 500b. Showing are two alternatives for hosel loft axis 532b, with variants in hosel section 533b, the first as female hosel protrusion 534b and the second as male hosel protrusion 535b, compatible with head interchange mechanism 170. Hosel loft axis 532b, in particular loft axis section 537b, is supported by three pivot brackets 529b, 530b extending from bottom and back of head. Said loft axis section 537b is attached by means of male shape 538b to joined connecting rod 540b. They lock into position by means of parallel eccentric pin 539b.

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DESCRIPTION OF EMBODIMENTS

The compact golf club set configurable at player discretion prior to shot play shown in figures 1-2. In preferred mode, it comprises at least adjustable-length shaft 100 in multiple discrete length positions 165, enabled by telescoping handle 110 as shown on figures 3-5. Said adjustable-length shaft 100 includes head interchange mechanism 170 enabling connection of at least interchangeable head 200, 300, 400. Said interchangeable head has options for:

a) interchangeable fixed-loft heads 201, 301, 401, shown in detail in figures 14-16;

b) adjustable loft interchangeable heads 202, 302 with adjustable loft mechanism 500a, 500b and sole 504 whose geometry 545 keeps said adjustable loft heads 202, 302 horizontal on the ground for each adjusted loft angle 509a, 509b. The preferred adjustable loft mechanism is shown in figures 21-25 for irons and 26-30 for woods.

In this invention, interchangeable head means both fixed and adjustable loft types and/or combinations thereof:

a) wood heads 200: 1-wood or driver 210, fairway 2-woods hereinafter 220, and hybrids;

b) iron heads 300: 1- to 9-irons 310, 320 and wedges 330: pitch, gap, sand and lob wedges;

c) putter heads 400.

EXAMPLES

The compact golf club set configurable during game play allows for numerous combinations to be defined by manufacturer and player preference. Examples 1-2 show two possible configurations in detail.

5

EXAMPLE 1

Example 1 in figure 1 shows a compact set comprising a shaft and three heads:

Adjustable-length shaft 100;

Interchangeable fixed loft 401 putter head 400;

10 Interchangeable adjustable loft 302 iron head 300 that can be built for 5- to 9-irons to sand wedge loft angles; and

Interchangeable wood head 200 that may be of fixed-loft angle 201 or an alternative to adjustable loft 202 that can be built for loft angles ranging from 1- to 7-wood heads.

15 This example illustrates a highly compact four-piece set of interest to players wishing to significantly reduce weight and volume over a standard 14-club set and bag.

Players wishing to closely match a complete 14-club set need only increase the number of elements in their compact, configurable golf club set. As would a pro, players need to choose the elements to be used in the course. Example 2 covers this case.

20

EXAMPLE 2

Example 2 in figure 2 illustrates an eight-piece set consisting of two shafts and six heads: a putter head, two adjustable-loft iron heads, an adjustable-loft wedge head, a fixed-loft wood driver and an adjustable-loft fairway wood, as follows:

- 5 Two adjustable-length shafts 100, including a more flexible shaft allowing interchangeable wood heads 200 to cover longer distances, and a stiffer shaft for interchangeable iron heads 300 and interchangeable putter heads 400;
- A fixed-loft putter head 401;
- An adjustable-loft iron head 302 that could be developed to cover average weight and
- 10 loft angles for 4- to 6-iron head set 310;
- An adjustable-loft iron head 302 that could be developed to cover average weight and loft angles for 7- to 9-iron head set 320;
- An adjustable-loft iron head 302 that could be developed to cover average weight and loft angles for pitch wedge to lob wedge set 330;
- 15 A fixed-loft wood head 201 equivalent to 1-wood or driver head 210; and
- An adjustable-loft wood head 202 that could be developed to cover average weight and loft angles for 3- to 7-fairway woods head set 220.

Weight is part and parcel of head design and construction criteria. Heavier heads

20 generate greater moment of inertia or swingweight. For the sake of simplicity during game play, one way to vary the moment of inertia in this invention is to replace different weight heads on the shaft. Another way is to modify shaft length. This invention

suggests that adjustable loft heads be designed with a weight near the average for the range of heads whose loft is to be emulated.

EXAMPLES 1-2, DETAILED ELEMENT DESCRIPTION

5 Below is a detailed description of the parts and pieces comprising the compact, configurable golf club set and on which examples 1-2 are based, as follows:

- (a) Description of adjustable-length shaft;
- (b) Description of interchangeable heads with adjustable loft mechanism, with details
10 on the corresponding sole;
- (c) Description of head interchange mechanism, including use of interchangeable fixed-loft heads with the compact set;
- (d) Details on the telescoping mechanism; and
- (e) Description of the use of the compact, configurable golf club set.

15

Adjustable-Length Shaft.

Adjustable-length shaft 100 is described below. Length of said shaft can be adjusted in multiple discrete positions 165 by means of telescoping handle 110. Said shaft includes head interchange mechanism 170. As shown on figures 3-5, adjustable-length shaft 100
20 consists of the following elements:

- a) Shaft 160, in turn comprising the following sections:
 - a.1) Head interchange section 161, comprising during-play head interchange mechanism 170 located at the head connector end;

a.2) Adjustable-length section 163 defined by a constant cross-section which defines adjustment surface 168 and whose end comprises shaft butt section 166 used to attach shaft butt end 167;

5 a.3) Transition section 162 connecting head interchange section 161 to adjustable-length section 163.

b) Telescoping handle 110, in turn comprising:

b.1) Handle core 122, comprising a hollow, circular section tube such that its internal diameter matches the external diameter of shaft butt end 167 attached to the shaft butt section of shaft 166;

10 b.2) Attached to one end of handle core 122 is an interference locking/unlocking telescoping mechanism 130, where the locking function consists of at least one lock element 138 tightly entering one of multiple discrete length positions 165 on the surface of adjustable-length section 163;

15 b.3) Also attached to handle core 122 is a rubber, leather or cork grip 121 by which player holds telescoping handle 110 and thus adjustable-length shaft 100.

Adjustable Loft Mechanism.

Described below are interchangeable heads 200, 300 with adjustable loft mechanism 500a, 500b. The preferred adjustable-loft iron head 302 version is described in figures 20 21-25. The preferred adjustable-loft wood head 202 version is described in figures 26-30, and the preferred version of the sole of an adjustable loft head is described in figures 17-20.

The compact, configurable golf club set in figures 1-2 also calls for interchangeable heads 200, 300 with adjustable loft mechanism 500a, 500b in figures 21-25 and 26-30, which comprise:

- a) A club head face 506, 506a, 506b whose back supports adjustable loft mechanism 500, 500a, 500b during game play.
- b) Hosel loft axis 532a, 532b, comprising:
 - b.1) Hosel section 533a, 533b connecting to adjustable-length shaft 100. This is either female hosel protrusion 534a, 534b or male hosel protrusion 535a, 535b. The latter is compatible with head interchange mechanism 170;
 - b.2) Loft axis section 537a, 537b holding adjustable loft mechanism 500a, 500b;
 - b.3) Offset section 536a connecting loft axis section 537a, 537b to hosel section 533a, 533b on heel side 508a, 508b, a term defined as the horizontal end of club head face 506a, 506b closest to shaft 160.
- c) Modified sole geometry 545, with a scan section defined by at least three sections 550 where each contains a line along sole 552 cutting across the head volume. Each line is defined when the head rests horizontally 551 on the ground 549 in front of the ball, in position to contact club head face 506, for at least three adjusted loft angles, one intermediate loft angle 547 and two loft angle ends 548 corresponding to loft angles for the range of heads corresponding to the adjustable head. Modified sole geometry 545 is described in figures 17-20.

For adjustable loft mechanism head 500 with a standard sole, the steeper the loft angle 547, 548, the greater the deviation relative to the horizontal 551 defined by ground 549.

The modified sole geometry 545, figure 17, allows horizontally supporting the head on the ground as head loft angle is increased with adjustable loft mechanism 500. Drawing successive soles, figures 18-20, for successive loft angles 547, 548, where soles 504 keep the club head face 506 parallel to the horizontal 551 relative to ground 549, yields
5 modified sole geometry 545. While said adjustable loft mechanism 500 allows for continuous loft angles, to compensate for or adjust the geometry of sole 504 this invention proposes at least three angles: loft angle ends 548 or the adjustable loft mechanism design limits, and an intermediate loft angle 547. Other configurations can be interpolated and applied on the sole face by means of a scan section, thus providing
10 a continuous surface approaching the full range of angles defined in said adjustable loft mechanism 500. In this invention, this sole configuration is referred to as modified sole geometry 545.

The above adjustable loft mechanism 500a, 500b shown on figures 21 and 26
15 comprises three vertices forming a triangular configuration joined to an adjustable loft mechanism head. Changing vertex angles and/or triangle side length modifies head loft angle 509a, 509b. The preferred configuration is shown as two adjustable vertices or pivots and a vertex joined to loft axis section 537a, 537b. The latter transfers the adjustable angle from the head to the shaft and thus allows loft angle adjustment 509a,
20 509b. The first vertex pivot 511a, 511b is joined to the head body. The second vertex is fixed 512a, 512b, matching and joined to loft axis section 537a, 537b. The third vertex pivot 513a, 513b is the intersection of first connecting rod 514a, 514b extending from the first vertex pivot 511a, 511b and second connecting rod 515a, 515b extending from

second joint vertex 512a, 512b. As such, second connecting rod 515a, 515b is joined to loft axis section 537a, 537b. The length of one of the said rods may be modified by changing the relative angle between club head face 506a, 506b and loft axis section 537a, 537b, thereby changing loft angle 509a, 509b.

- 5 In a preferred mode, adjustable loft mechanism 500a, 500b involves modifying rod length, as shown on figures 23 and 28, by means of screw 516a, 516b whose orientation matches the axis of one of said rods. One end of screw 516a, 516b rotates on its axis without axial movement, held by a bearing 524a, 524b matching one of the pivot vertices. The opposite side of screw 516a, 516b rotates on its axis and moves
10 axially in bearing nut 526a, 526b, matching the pivot vertex opposite.

Adjustable loft mechanism 500a, 500b comprises a rear head area. For adjustable-loft iron heads 302, the said area may comprise the rear of face 502a and/or the face frame and/or sole 504a. In the preferred mode, the said iron head area comprises the rear of face 502a and part of sole 504a, as shown on figures 24-25. In another mode for
15 adjustable-loft wood head 202, the rear head area may comprise the face frame 503b and/or sole 504b and/or shell 505b. The rear of face is not suggested in this mode as it is preferable for the face to perform elastically during impact with the ball. In the preferred mode, the said wood heads area comprises the face frame 503b and principally the inner surface of sole 504b, as shown on figures 29-30.

20

One end of screw 516a, 516b comprises a smooth cylindrical section 517a, 517b rotating in radial bore 525a, 525b perforated on the surface of bearing cylinder 524a, 524b. The other end comprises a threaded section 518a, 518b screwed into female

threaded radial bore 527a, 527b in bearing nut cylinder 526a, 526b, as shown in figures 23 and 28.

Bearing cylinder 524a, 524b is a pivot vertex whose axis is perpendicular to the axis of screw 516a, 516b and parallel to the normal defining the plane containing adjustable loft mechanism 500a, 500b, with screw 516a, 516b prevented from axial movement.

In a preferred mode, screw 516a, 516b is attached to bearing cylinder 524a, 524b by means of washer 522a, 522b, nut 523a, 523b and thread 521a, 521b at the end of smooth cylindrical section 517a, 517b. Other attachment modes could include rivets, pins, snap rings, etc.

Bearing nut cylinder 526a, 526b is another consecutive pivot vertex whose axis is perpendicular to the axis of screw 516a, 516b and also parallel to the normal defining the plane containing adjustable loft mechanism 500a, 500b. At the same time, the normal defining the plane containing adjustable loft mechanism 500a, 500b is parallel to loft axis section 537a, 537b.

Joined connecting rod 540a, 540b is a fixed-length link matching second connecting rod 515a, 515b.

For an adjustable-loft iron head 302, the preferred configuration comprises bearing nut cylinder 526a as first vertex pivot 511a and is connected to the rear head area. Bearing

cylinder 524a corresponds to third vertex pivot 513a and is connected to joined connecting rod 540a and, by means of the opposite end of said rod, is attached to loft axis section 537a at second joint vertex 512a. In this case, the rear head area corresponds to the rear of face 502a, as shown on figures 21 and 24-25.

5

For an adjustable-loft wood head 202, the preferred configuration is that bearing cylinder 524b corresponds to first vertex pivot 511b and is connected to the rear head area.

Bearing nut cylinder 526b corresponds to third vertex pivot 513b and is connected to joined connecting rod 540b, which corresponds to second connecting rod 515b, and by

10 means of the opposite end of said rod, is attached to loft axis section 537b at the second joint vertex 512b. In this case, the rear head area corresponds to head sole 504b, as shown on figures 26 and 29-30.

For both configurations, screw 516a, 516b comprises a concentric joint dial 519a, 519b

15 players can rotate with their fingers, as shown on figures 23 and 28.

For adjustable-loft wood heads 202, dial 519b is at the top of screw 516b and above the first vertex pivot 511b. Said dial 519b shows through shell 505b, with a perforation in shell 554b as the preferred solution, as shown on figures 26 and 30.

20

For any head type in the above preferred modes, as shown on figures 24, 25 and 29-30, adjustable loft mechanism 500a, 500b rotates in loft axis section 537a, 537b on three

concentric pivot brackets whose axis is parallel to the horizontal of the head and stands in the rear head area. These are:

- a) The first pivot bracket, i.e., loft axis pivot bracket 529a, 529b, near heel side 508a, 508b.
- 5 b) A second pair of pivot brackets, i.e., second vertex pivot brackets 530a, 530b, near toe side 507a, 507b, hold second joint vertex 512a, 512b and second connecting rod 515a, 515b joined to loft axis section 537a, 537b, guiding their rotation. Toe side 507a, 507b is understood as the horizontal end of club head face 506a, 506b farthest from the shaft.
- 10 c) The pair of second vertex pivot brackets 530a, 530b and loft axis pivot bracket 529a, 529b, and therefore loft axis section 537a, 537b, stand preferably at the bottom of the head, near sole 504a, 504b, in order to keep a low center of gravity.

An additional pair of first vertex pivot brackets 531a, 531b hold first vertex pivot 511a, 511b and are joined to the rear head area.

15

In joined connecting rod 540a, 540b, a pair of third vertex pivot brackets 541a, 541b hold third vertex pivot 513a, 513b in any configuration, including bearing cylinder 524a or bearing nut cylinder 526b. The first preferred configuration is for adjustable-loft iron heads 302 and the second for adjustable-loft wood heads 202.

20

Still in the preferred mode as shown on figures 25 and 30, adjustable loft mechanism 500a, 500b comprises that joined connecting rod 540a, 540b is attached to loft axis section 537a, 537b, going through the latter in a male shape 538a, 538b and at right

angles to the axis of said joined connecting rod 540a, 540b through the end matching second joint vertex 512a, 512b. Relative rotation is avoided by means of a cotter pin comprising an eccentric pin 539a, 539b parallel to loft axis section 537a, 537b, sharing the radial perimeter of said guide pin 539a, 539b between loft axis section 537a, 537b and joined connecting rod 540a, 540b. Said guide pin 539a, 539b is confined to the width of joined connecting rod 540a, 540b and between second vertex pivot brackets 530a, 530b. Axial movement can also be avoided through split pins or interference locks, albeit the final method will be determined by the financially viable manufacturing process.

Loft axis section 537a, 537b avoids axial head movement by means of snap ring 544a, 544b attached to loft axis section 537a, 537b and supported on the inner face of loft axis pivot bracket 529a, 529b. Loft axis section 537a, 537b also abuts second vertex pivot bracket 530a, 530b, closest to toe side 507a, 507b.

In the preferred mode, adjustable loft mechanism 500b comprises, for adjustable-loft wood heads 202 on the outer surface of face frame 503b on heel side 508b, a heel concavity 553b partially housing hosel section 533b. Heel concavity 553b has the required play to allow movement of hosel section 533b, allowing for loft angles for the range of heads corresponding to the adjustable head, as shown on figures 29-30.

Head Interchange Mechanism.

Head interchange mechanism 170, figures 10-11, comprises pin lock 173, internal interchange cylinder 177 and external interchange cylinder 186, all sliding against each other. Internal interchange cylinder 177 houses pin lock 173. Internal interchange
5 cylinder 177 is joined to shaft head interchange section 161. Internal interchange cylinder 177 and external interchange cylinder 186 can be of various concave and/or convex geometries, such as hexagons.

Pin lock 173 is permanently installed in hollow cylindrical protrusion 198 of standard
10 hosel 199 and is thus joined to fixed loft head 201, 301, 401. In other words, said pin lock can be configured to be properly installed in any commercially-available fixed-loft angle head to turn it into an interchangeable head. Players can choose an existing commercial fixed-loft head 201, 301, 401 with a standard hosel 199 and use pin lock 173 instead, affixed the same way as a standard commercial shaft, i.e., using
15 adhesives, as shown on figures 14-16.

Pin lock 173 may also be permanently installed in female hosel protrusion 534a, 534b of hosel section 533a, 533b and thus joined to adjustable loft heads 202, 302, as shown on figures 25 and 30. Optionally, pin lock 173 may be replaced by male hosel protrusion
20 535a, 535b compatible with head interchange mechanism 170, formed during manufacture of hosel loft axis 532a, 532b and equivalent to pin lock male protrusion 174 rising from hosel section 533a, 533b or standard hosel 199, as shown on figures 25 and 30.

Pin lock male protrusion 174 rising from hosel section 533a, 533b or standard hosel 199 has torque-resistant geometry. The geometry of the inner surface of internal interchange cylinder 178 matches the geometry of the outer surface of pin lock male protrusion 174.

5

Internal interchange cylinder 177 houses in surface radial bores 182 at least one lock element 183.

Pin lock male protrusion 174 includes on its surface at least one pin lock dent 175 housing lock elements 183.

10

In coupled position 171, figure 12, lock elements 183 slide radially to be confined in pin lock dents 175, said radial bores 182, and the inner surface of external interchange cylinder 187.

15

In uncoupled position 172, figure 13, player slides external interchange cylinder 186 through decoupling recesses 188 on the inner surface of external interchange cylinder 187, allowing lock elements 183 to radially slide, releasing them from pin lock dents 175.

Pin lock male protrusion 174 disposes a smaller end section that is inserted into internal interchange cylinder 177 and expands into hosel section 533a, 533b or standard hosel 199. Said pin lock male protrusion 174 is a concave or convex polygon with at least a distinctive geometry enabling unique assembly orientation. Pin lock hosel protrusion 176

20

inserted into hosel section 533a, 533b or standard hosel 199 has a hollow cylindrical geometry of such size as to allow attachment by traditional methods of a standard shaft to hosel section 533a, 533b or standard hosel 199.

- 5 Pin lock 173 provides in pin lock hosel protrusion 176 inserted into hosel section 533a, 533b or standard hosel 199 the ability to use traditional attachment methods analogous or equivalent to those of the standard shaft replaced by pin lock 173, including contact cement, cured epoxy resin, locking sleeves, compression cones, interference locks, expansion joints, axial clamping screws, side clamping screws, bolted or riveted joints
10 and/or any technical equivalent.

In the preferred configuration, the convex polygon section comprising pin lock male protrusion 174 is defined as hexagonal. At least one hexagonal face has a distinctive geometry enabling a unique assembly position. Lock elements 183 are balls. Locking
15 ball(s) 183 are emplaced in one or more conical, equidistant radial bores 182 in an area corresponding to a hexagonal section of the inner surface of internal interchange cylinder 178. Pin lock dents 175 are recessed semispheres of a diameter at their widest point not exceeding that of locking balls 183. Pin lock dents 175 are emplaced in hexagonal pin lock 173 and match the position of said radial bores 182 and thus of
20 locking balls 183 when head interchange mechanism 170 is in coupled position 171; see figure 12.

Pin lock dents 175 provide a configuration alternative comprising an area whose geometry is a revolving circular section whose axis of rotation matches the pin lock axis and its widest section is of a size not exceeding that of locking balls 183.

Internal interchange cylinder 177 houses on outer surface 179 coupling spring 184, which when extended pushes external interchange cylinder 186 into coupled position 171; see figure 12. The depressed coupling spring 184 pushes external interchange cylinder 186 into uncoupled position 172; see figure 13. Player motion on external interchange cylinder 186 and thus on coupling spring 184 may be axial, torsion, or a combination thereof.

10

Head interchange mechanism 170 may optionally include decoupling spring 185 at the bottom of internal interchange cylinder 177 which remains depressed against the tip of pin lock male protrusion 174 when in coupled position 171, figure 12.

Head interchange mechanism 170 may include guide pin 181 traveling on guide slot 180, limiting travel of external interchange cylinder 186. Said guide pin 181 is joined to and passes through external interchange cylinder 186. Said guide slot 180 of the width of guide pin 181 proceeds in lengthwise recess parallel to the axis and over the outer surface of internal interchange cylinder 177.

For examples 1-2 above, pin locks 173 are incorporated into commercially available fixed-loft angle heads: putter 401 and 1-wood or driver 201. As the internal size of standard hosel 199 may vary depending on commercial head type, appropriate pin lock sizes will have to be provided. For adjustable loft heads 202, 302, especially in hosel

section 533a, 533b the option is male hosel protrusion 535a, 535b. Protrusions in versions pin lock male protrusion 174 and male hosel protrusion 535a, 535b, which is inserted into head interchange mechanism 170, always have the same size and thus allow interchanging fixed and adjustable loft heads on adjustable-length shaft 100 with
5 head interchange mechanism 170.

There is no limitation to defining the external diameter inserted into standard hosel 199, figures 14-16. At present, internal hosel diameters for fixed-loft iron heads 301 and different internal diameters for fixed-loft wood heads 201 are common. Both diameters
10 can be provided for, which generates at least two types of pin lock 173. For fixed-loft putter heads 401 there is a wider range of standard hosels 199, in terms of size and configurations, which can be either male or female. In addition, some configurations require a pin lock 173 with offset. As such, the preferred pin lock configuration accommodating commercial fixed-loft putter heads 401 must be specifically designed for
15 said head. However, such specific design only comprises pin lock hosel protrusion 176 to be inserted into standard hosel 199. In the preferred configuration, the size of pin lock male protrusion 174 inserted into head interchange mechanism 170 remains unchanged, allowing head interchange on a single or reduced number of adjustable-length shafts 100.

20

Telescoping Mechanism.

Telescoping mechanism 130, figures 6-7, comprises internal telescoping cylinder 136 and external telescoping cylinder 133 sliding against each other. Internal telescoping

cylinder 136 slides over adjustable-length section 163 and is joined to handle core 122 and thereby to handle 120. One or more lock radial bores 137 on the surface of internal telescoping cylinder 136 house at least one lock element 138. Internal telescoping cylinder 136 and external telescoping cylinder 133 can be of various concave and/or
5 convex geometries, such as hexagons.

Discrete length positions 165 are developed by means of at least one shaft dent 165 on adjustment surface 168. Said dents house lock elements 138. The said adjustment surface has torque-resistant geometry.

10

In locked position 131, figure 8, lock element(s) 138 slide radially until confined in shaft dents 165, in the said lock radial bores 137, and in the inner surface of external telescoping cylinder 134.

15 In unlocked position 132, figure 9, player slides external telescoping cylinder 133 through unlock recesses 135 on the inner surface of external telescoping cylinder 134, allowing lock element(s) 138 to radially slide, releasing them from shaft dents 165.

Adjustment surface 168 includes a series of surface shaft dents 165 built as a
20 continuous surface relative to surface of shaft 160. In other words, said dents do not cause abrupt discontinuity of surface material as they are not holes in the shaft.

If shaft 160 is built in composite material, shaft dents 165 of adjustment surface 168 include that the entire area around shaft dents 165, as well as the area comprising shaft dents 165, do not break fiber continuity. If shaft 160 is built in polycrystalline material such as steel, the entire area around shaft dents 165, as well as the area comprising
5 shaft dents 165, do not break crystalline structure continuity.

A possible configuration is a shaft 160 of mixed materials. The body of shaft 160, in all sections, is built in composite material. However, to achieve increased hardness in the finish of outer adjustment surface 168, this section is built using a thin sheet of material
10 harder than the composite, such as steel, attached to the inner composite material layers. In fact, a preferred configuration has the said harder sheet covering only the outer surface part containing the sequence of shaft dents 165, figure 4.

Adjustment surface 168 includes at least one discontinuity as a guide slot for
15 telescoping mechanism 130. Such discontinuity has torque-resistant geometry. In particular, the guide slot may be at least a flat surface 164 or U- or V-shaped relative to the shaft surface. The inner surface of internal telescoping cylinder 139 matches said adjustment surface 168.

20 In the preferred configuration, adjustment surface 168 has a circular section and another section made up of two opposing, 180° flat surfaces 164, figure 4. The flat surfaces house shaft dents 165. Dents may be recessed semispheres in opposing, 180°-pairs

located on the opposing flat surfaces. As such, lock elements 138 are spheres whose radius matches said dents.

In a preferred configuration, said opposing flat surfaces 164, figure 4, housing shaft
5 dents 165 may on their outer surface and thus on their surface finish be built in individual sheets of thin polycrystalline material such as steel and affixed to the composite body of shaft 160. Construction of said sheets of crystalline structure material includes shaft dents 165.

10 Internal telescoping cylinder 136 houses on its outer surface lock spring 142, which when extended pushes external telescoping cylinder 133 into locked position 131, figure 8. When depressed, lock spring 142 pushes external telescoping cylinder 133 into unlocked position 132, figure 9. Player motion on external telescoping cylinder 133 and thus on spring 142 may be axial, torsion, or a combination thereof.

15

Internal telescoping cylinder 136 includes position radial bore 144 containing position ball pointer 140 partially entering shaft dents 165. The ball is radially pressed against the shaft by means of ring-type spring 141 covering said ball 140 and the outer surface of said internal telescoping cylinder 136.

20

Internal telescoping cylinder 136 includes travel stopper 143 for external telescoping cylinder 133. Said stopper is a small tab at the start of the outer surface of internal

telescoping cylinder 136 that clicks into unlock recess 135 on the inner surface of external telescoping cylinder 134 and sets the limits of travel.

5 Shaft butt section 166 comprises shaft butt end 167, figure 4, which guides and constrains maximum length of telescoping handle 110.

Using the compact, configurable golf club set.

Prior to shot play, player selects an interchangeable head 200, 300, 400 and adjustable-length shaft 100; the latter when the compact club set includes more than one shaft, as
10 described in example 2, figure 2. Steps to assemble the desired club are:

First: Player connects selected interchangeable head 200, 300, 400 to adjustable-length shaft 100 by means of head interchange mechanism 170. This may require disconnecting a head previously coupled to selected shaft. Said mechanism allows for
15 replacing said heads by sliding external interchange cylinder 186 from coupled position 171, figure 12, to uncoupled position 172, figure 13.

Second: For an adjustable-loft head 202, 302, player can regulate loft angle 509a, 509b by turning dial 519a, 519b in adjustable loft mechanism 500a, 500b.

20

Third: Player extends or retracts adjustable-length shaft 100 by means of telescoping mechanism 130 in telescoping handle 110. Using his fingers, player moves external telescoping cylinder 133 from locked position 131, figure 8, to unlocked position 132,

figure 9. Player slides said handle over adjustable-length section 163 to the desired position and locks the handle to the shaft.

Fourth: Player checks club configuration and horizontal rest of attached head by placing
5 the sole on the ground in striking position in front of the ball.

The order of steps two and three above is interchangeable.

CITATION LIST

10 The literature on patents and applications totally or partially addressing the scope of this invention is extensive. Our prior art review focuses on patents that have attempted to address issues in a comprehensive manner and on mechanisms most closely resembling this invention.

PATENT LITERATURE

US 7,207,897 Golf Club Head and Shaft Connector and Method

US 6,547,673 Interchangeable Golf Club Head and Adjustable Handle System

US 5,083,779 Universal Golf Club Construction

US 4,253,666 Personal Golf Set For Par-3 Course

20 US 2,091,794 Golf Club

Below is a detailed review of said patents containing a brief description, a summary, a comparison to this invention, and a review of interference and inventive level of this invention relative to said patents.

5 US patent 7,207,897 Golf Club Head and Shaft Connector and Method.

The invention disclosed in US patent 7,207,897 proposes a connection mechanism enabling shaft and head interchange. The said patent discloses a device and method of assembly of a device allowing head interchange during club configuration. Use during game play is not intended.

10

Summary of US Patent 7,207,897.

Claims in US patent 7,207,897 specifically comprise a connector to be used in club assembly containing a shaft, a head including an adapter and a connector comprising:

A shaft and first interchangeable connector assembly;

15 A head assembly with a second interchangeable connector, sized to safely connect to the head adapter. The second connector includes a stop flange, extending radially outward to delimit the head adapter portion;

First threads are formed in the first interchangeable connector and second threads in the second interchangeable connector, with first and second threads compatible for

20 connecting the shaft and head assembly.

Comparison of US Patent 7,207,897 and this invention.

US patent 7,207,897 addresses a technical issue limited to a head interchange mechanism operated prior to game play. It is not designed for use prior to each shot during game play.

5 Screw-on connectors pose the difficulty of having to concentrically align axes.

If US patent 7,207,897 seeks to couple the said device during game play, it will result in an excessive delay incompatible with USGA rules 6 and 7.

In contrast, in the matter strictly related to connecting shaft and head, this invention does not use screw-on connectors since play may cause inadvertent release of the head

10 and thus lead to delays.

Non-interference between US Patent 7,207,897 and this invention.

US patent 7,207,897 does not interfere with this invention as US patent 7,207,897 is a particular solution concerning only shaft and head interchange. As to said mechanism,

15 US patent 7,207,897 provides a solution using screw-on connectors.

Inventive level of this invention with respect to US Patent 7,207,897.

From elements disclosed in US patent 7,207,897, a knowledgeable individual cannot deduce the components addressing connection of shaft to head that are disclosed in this

20 invention. A condition of this invention is to allow for interchangeability during game play and not just during club configuration.

US 6,547,673 Interchangeable Golf Club Head and Adjustable Handle System.

US patent 6,547,673 describes a method for converting commercially available parts into an interchangeable golf club system. The system consists of two elements: the first is intended to be affixed to a standard head adapter to replace a standard shaft, while
5 the second is an insert to be affixed to the bottom of the shaft.

The head and shaft inserts form a quick connector joining shaft and head. Any golf club can be emulated by using different heads representing the full range of woods, irons and putter type heads, each with a preinstalled head insert.

In addition, the invention describes a device to adjust shaft length by means of a pin
10 installed at the top of the shaft which cooperates with a number of slots arranged in a telescoping sleeve that slides over the shaft.

While the invention in US patent 6,547,673 is an approach to the technical issue in this invention, the elements detailed in this invention provide a solution that significantly reduces the number of heads by allowing for variable loft angles, a characteristic not
15 included in US patent 6,547,673.

Summary of US Patent 6,547,673.

In US patent 6,547,673, the means of attachment used to obtain the claimed quick connector encompass a head insert with means for defining an axial slot extending
20 axially along a portion of said head insert; and additional means for defining a circumferential slot extending circumferentially from the said axial slot and through which said head is connected to a shaft by sliding a shaft insert pin along said axial slot and rotating said shaft insert to move said pin along said circumferential slot. Said shaft

insert further comprises a spring-loaded catch projecting radially outward from said shaft insert and means for defining a hole in said head insert for receiving a spring-action catch to selective non-rotatably lock said shaft insert to said head insert.

5 Comparison of US Patent 6,547,673 and this invention.

US patent 6,547,673 is only based on interchange of standard heads and shaft length variation, and adds no additional configuration characteristics such as loft angle variation. In order to emulate a conventional 14-club set, players must carry 14 heads in their reduced set. As such, only the number of shafts is reduced. Given partial reduction,
10 desired advantages are also partial and thus the comparative advantages of this proposal are limited.

US patent 6,547,673 claims a telescoping adjustment not discussed in detail except for the contents of the description and what can be surmised from accompanying figures. The described telescoping mechanisms are not recommended for manufacture. Slots in
15 a telescoping tubular unit built from composite material lead to discontinuity in the mechanical properties of the shaft. Disrupting the fibers carrying mechanical loads and the high stress generated by slot-type geometries increase loads to unacceptable levels for such materials. This is also true of conventional materials such as steel.

The shaft has no locking mechanism keeping said shaft in the selected length position,
20 and the way in which the pin locks into the slot hardly provides a secure connection capable of withstanding the impacts to which the shaft is subject during game play.

The quick connector claimed in US patent 6,547,673 comprises a pin sliding through a slot and affixed to avoid rotation by a pin that remains in position by means of a spring or elastic force. As such, during game play there is the risk for turning forces on the connector to exceed the elastic force of the catch, allowing rotation of the mechanism and attendant head release. Due to this, the quick connector claimed in US patent 6,547,673 poses an operating risk that may lead to an accident.

Non-Interference between US Patent 6,547,673 and this invention.

This invention and US patent 6,547,673 disclose characteristics making them evidently different. US patent 6,547,673 has weak telescoping and head interchange mechanisms and no loft angle mechanism. This invention is more dependable, as it uses mechanisms more reliably supporting the high mechanical loads the practice of golf imposes on mechanical components.

Inventive level of this invention with respect to US Patent 6,547,673.

This invention discloses additional elements with respect to US patent 6,547,673, such as loft angle adjustment, which cannot be inferred from the cited prior art as regards implementation and reliability.

US 5,083,779 Universal Golf Club Construction.

The invention disclosed in US patent 5,083,779 describes adjusting shaft length, loft angle, lie angle, weight, and impact face to produce various golf club configurations.

Summary of US Patent 5,083,779.

US patent 5,083,779 claims a universal golf club comprising a shaft with top and bottom ends; an adjustable handle operationally associated with the top of the shaft; a head rotatably joined to the said element operationally affixed with respect to a first horizontal axis where the head comprises: a main body and a member with the impact face rotatably connected to said main body through a second horizontal axis extending through said main body and which is disposed generally perpendicular to the said first horizontal axis.

10 Comparison of US Patent 5,083,779 and this invention.

US patent 5,083,779 disposes a fixed head, which therefore does not allow adjusting for stroke type. For example, tee-offs with wood heads, shots onto the green with iron-type heads or hole shots with putter-type heads.

By disposing a head permanently joined to the shaft during game play, US patent 15 5,083,779 implies that players, when adjusting shaft length, must also adjust the lie angle. As such, shaft adjustment involves two operations. This slows down the adjustment process and contravenes the spirit of the game, which values continuity between strokes.

The loft angle and lie angle mechanism is based on a toothed coupling. This requires 20 decoupling, adjustment and coupling; in other words, three steps to change positions. A slow adjustment process contravenes the principle of continuity between strokes, USGA rules 6 and 7.

The toothed scheme has discrete positions that do not necessarily set the positions or angles desired by player for shot play.

Shaft adjustment by means of a pin results in a mechanism requiring tolerances incompatible with proper handling and with the feeling of a solid union, giving players the
5 feel of a "loose" device.

Finally, weight adjustment by means of inserts in the back of the head is a slow, cumbersome operation that is impracticable between strokes.

Non-Interference between US Patent 5,083,779 and this invention.

10 In conclusion, US patent 5,083,779 does not interfere with the innovation in this application as it does not consider all adjustment types described in this invention. Moreover, this invention addresses the technical issue by means of mechanisms that cannot be directly derived from the elements disclosed in US patent 5,083,779.

15 Inventive level of this invention with respect to US Patent 5,083,779.

With respect to US patent 5,083,779, the basic design of this invention allows for unfettered head interchange, allowing for long shots by means of interchangeable woods, approach shots by means of interchangeable irons, or hole shots by means of an interchangeable putter.

20 In addition, this invention includes mechanisms whose basic design concept allows for extremely fast adjustment and/or coupling, very tight tolerances that avoid the "loose" feeling, and imitating a conventional club game for each adjusted position in the compact golf club set.

US 4,253,666 Personal Golf Set For Par-3 Course.

The invention in US patent 4,253,666 describes a golf club set consisting of a series of three heads to be assembled on a single two-section shaft. US patent 4,253,666
5 includes a detailed description of a bag for transporting the said pieces.

Summary of US Patent 4,253,666.

Although this patent is oriented to describing the means of carrying a club set, in the document the means of attachment to obtain the quick connector encompass heads that
10 substitute the hosel for pin locks with a pair of snap fin springs securing an axial connection and preventing rotation. Said pin locks are inserted into the shaft, which includes slots for insertion of connecting fin springs and attachment of head to shaft.

US patent 4,253,666 claims three head types: iron type for mid-distances, iron type for short distances, and a putter.

15 Claims also describe a shaft comprising two parts that are assembled using a version of the same axial connection mechanism comprising in one part fin springs that are inserted into slots on the other part of the shaft, thereby axially and rotationally attaching the two shaft parts.

20 Comparison of US Patent 4,253,666 and this invention.

US patent 4,253,666 is only based on head interchange, in principle limited to three heads. It does not offer shaft length variation and adds no additional configuration characteristics such as loft angle variation. Given these restrictions, US patent

4,253,666 restricts its scope to a limited range of strokes. For example, it excludes woods strokes and notes that it is intended for a par-3 course.

Mechanisms consisting of a pair of axial attachment fin springs are not recommended for composite materials, as slots in the tubular unit cause discontinuity in the mechanical properties of the shaft. Disrupting the fibers carrying mechanical loads plus the high stress generated by slot-type geometries increase loads to unacceptable levels for such materials. This is also true of conventional materials such as steel, as fin springs must absorb important torque stresses generated in the fin base during club impact against the ball, shortening device life.

As US patent 4,253,666 reduces the functionality of a standard club set, its advantages are limited.

Non-Interference between US Patent 4,253,666 and this invention.

This invention and US patent 4,253,666 disclose characteristics that make them different. US patent 4,253,666 is limited to including three heads, offers no shaft length adjustment mechanisms, and includes no head loft angle adjustment mechanisms. US patent 4,253,666 bases its connection mechanisms on fin springs concentrating stresses on their base, thus limiting the type of construction materials that may be used and device life.

Inventive level of this invention with respect to US Patent 4,253,666.

This invention discloses additional elements over US patent 4,253,666, such as telescoping shaft adjustment and head loft angle adjustment which cannot be deduced from the cited prior art as regards implementation and reliability.

- 5 Mechanisms shown in this invention are rapidly adjusted, easily manipulated and above all sturdy, avoiding concentration of the important torque stresses generated by a stroke.

US Patent 2,091,794 Golf Club.

- 10 US patent 2,091,794 describes a pivoting head joined to an axis including a toothed wheel on its end. A guide pin with a fixed toothed ending releases the toothed wheel and thus sets or enables regulating the head angle. The guide pin is part of a screw projecting from the inside of the shaft. Turning the screw from the shaft draws the guide pin closer to or away from the toothed wheel. A hollow pin lock houses the described mechanisms.

- 15 US patent 2,091,794 describes a telescoping adjustment operating by means of a concentric tubular connection between shaft and handle.

Summary of US Patent 2,091,794.

- 20 In its principal claim, US patent 2,091,794 literally describes a golf club comprising a head having a hollow stem and a blade and means for pivoting the blade about an axis parallel to the ground. Adjustment comprises a circular toothed member rigid with the blade and extending into the hollow shaft; a guide pin arranged inside the shaft having an angularly disposed toothed face adapted to be brought into engagement with said

toothed member; means arranged inside of the stem for urging the guide pin out of engagement with said toothed member; a shaft threadedly engaging the hollow member and adapted to force the guide pin into engagement with the toothed member against the urging action of said means when said shaft is screwed a predetermined distance
5 into the stem, said means urging the pin out of engagement with the toothed member when the shaft is unscrewed a predetermined distance to permit adjustment of the blade.

The head is described as a blade that can be hit on either face, enabling right- or left-hand use.

10 US patent 2,091,794 describes a telescoping adjustment not detailed in claims, except for the contents of the description and what can be surmised from accompanying figures. The telescoping adjustment operates by means of a concentric tubular connection between shaft and handle. The shaft has recessed radial dents at regular intervals. The handle includes a toothed area and on its end a lip shaped to enable
15 insertion into recessed dents. The lip is set or released by means of an internally threaded cylindrical piece that is screwed on the toothed handle area. To avoid handle rotation, the shaft has an axial recessed guide slot on its outer surface, while the handle has a recessed guide slot on its inner surface.

20 Comparison of US Patent 2,091,794 and this invention.

Claims in US patent 2,091,794 describe loft angle variation in an iron-type head, which intends to emulate the characteristics of all heads in a golf club set, including woods, irons, wedges, and putter.

The mechanism does not allow for head interchange, limiting player shots and potential.

This invention enables head interchange, which solves basic issues such as balancing moment of inertia between clubs of varying lengths using heads of varying weights,

5 adequate contact with the ground by means of soles designed with loft angle in mind, and more stable strokes through increased moment of inertia in wood and putter heads.

This invention allows for head interchange, which ensures that the issues described are left to player discretion prior to shot play.

The head adjustment mechanism described in US patent 2,091,794 is complex and thus
10 subject to failure. Adjustment relies on a toothed area with a very small interference surface. Golf pieces are subject to significant torque, which when transmitted to smaller pieces generates significant stress levels that may lead to fracture and shorten device life.

US patent 2,091,794 describes shaft length variation by means of a telescoping
15 adjustment based on screwing a part onto the end of the handle.

A solution of the same screw-set/unscrew-release type is also proposed for head angle adjustment.

US patent 2,091,794 involves adjusting the club prior to shot play through repeated actions implying unscrewing-releasing and screwing-setting into the desired angle
20 and/or length. For 72 strokes, this is an extremely laborious proposition.

Mechanisms in this invention are designed to minimize the impact of position adjustment. While loft angle does operate by means of a screw, the screw always sets the loft angle, which avoids all releasing-setting issues.

In this invention, shaft length is adjusted by sliding an external ring placed along the handle. The ring sets the position and shaft length by means of a spring, thus minimizing manipulation.

5

Non-Interference between US Patent 2,091,794 and this invention.

This invention and US patent 2,091,794 disclose completely different loft angle and shaft length adjustment mechanisms. This invention allows for head interchange, which is not considered in US patent 2,091,794.

10

Inventive level of this invention with respect to US Patent 2,091,794.

This invention discloses elements for the same purposes of US patent 2,091,794, such as telescoping shaft and head loft angle adjustment, albeit performed differently and with improved reliability. This invention also incorporates rapid coupling mechanisms

15 that can be used with any standard commercial head.

Mechanisms in this invention are rapidly adjusted, easily manipulated, and above all sturdy, avoiding concentration of the important torque stresses generated by a stroke.

CLAIMS

CLAIM 1. A compact golf club set configurable at player discretion prior to shot play, NOTED for comprising:

at least adjustable-length shaft 100 in multiple discrete length positions 165 enabled by telescoping handle 110; said adjustable-length shaft 100 includes head interchange mechanism 170;

at least interchangeable head 200, 300, 400 in adjustable-length shaft 100, with options for fixed loft heads 201, 301, 401 and adjustable loft heads 202, 302 incorporating adjustable loft mechanism 500a, 500b and sole 504 whose geometry 545 keeps said adjustable loft heads 202, 302 horizontal on the ground for each adjusted loft angle 509a, 509b;

interchangeable head means both fixed and adjustable loft types and/or combinations thereof:

a) wood heads 200: 1-wood or driver 210, fairway woods 220, and hybrids;

b) iron heads 300: 1- to 9-irons 310, 320 and wedges 330: pitch, gap, sand and lob wedges; and/or

c) putter head 400;

wherein the adjust loft is done by means of an adjustable loft mechanism 500a, 500b comprising:

a) first vertex pivot 511a, 511b joined to the head body;

b) second joint vertex 512a, 512b matching and joined to loft axis section 537a, 537b;

c) third vertex pivot 513a, 513b corresponds to the intersection of first connecting rod 514a, 514b extending from the first vertex pivot 511a, 511b and second connecting rod 515a, 515b extending from second joint vertex 512a, 512b;

d) second connecting rod 515a, 515b joined to loft axis section 537a, 537b; and

wherein the length of at least one of said rods may be modified by changing the relative angle between club head face 506a, 506b and loft axis section 537a, 537b, thereby changing loft angle 509a, 509b.

CLAIM 2. A compact, configurable golf club set per claim 1, NOTED for at least adjustable-length shaft 100 configurable in multiple discrete length positions 165 enabled by telescoping handle 110 and head interchange mechanism 170 comprising:

a) shaft 160, which in turn comprises:

a.1) head interchange section 161 comprising head interchange mechanism 170 located at the head connector end;

a.2) adjustable-length section 163 defined by a constant cross-section which defines adjustment surface 168 and whose end comprises shaft butt section 166 used to attach shaft butt end 167; and

a.3) transition section 162 connecting head interchange section 161 to adjustable-length section 163;

b) telescoping handle 110, in turn comprising:

b.1) handle core 122, comprising a hollow, circular section tube such that its internal diameter matches the external diameter of shaft butt end 167 attached to the shaft butt section of shaft 166;

b.2) attached to one end of handle core 122 is locking/unlocking telescoping mechanism 130, where the locking function consists of at least one lock element 138 tightly entering one of multiple discrete length positions 165 on the surface of adjustable-length section 163;

b.3) also attached to handle core 122 is a rubber, leather or cork grip 121 by which player holds telescoping handle 110 and thus adjustable-length shaft 100.

and at least an interchangeable head 200, 300, 400 with adjustable loft mechanism 500a, 500b comprising:

a') club head face 506, 506a, 506b whose back supports adjustable loft mechanism 500, 500a, 500b during game play.

b') hosel loft axis 532a, 532b, comprising:

b'.1) hosel section 533a, 533b connecting to adjustable-length shaft 100. this is either a female hosel protrusion 534a, 534b or male hosel protrusion 535a, 535b. the latter is compatible with head interchange mechanism 170;

b'.2) loft axis section 537a, 537b holding adjustable loft mechanism 500a, 500b;

b'.3) offset section 536a connecting loft axis section 537a to hosel section 533a on heel side 508a;

c') modified sole geometry 545, with a scan section defined by at least three sections 550 where each contains a line along sole 552 cutting across the head volume. each line is defined when the head rests horizontally 551 on the

ground 549 in front of the ball, in position to contact club head face 506, for at least three adjusted loft angles, one intermediate loft angle 547 and two loft angle ends 548, corresponding to loft angles for the range of heads corresponding to the adjustable head.

CLAIM 3. A compact, configurable golf club set per claim 1, NOTED for an adjustable loft mechanism 500a, 500b comprising that:

length of one of said rods can be modified by means of screw 516a, 516b whose orientation matches the axis of one of said rods;

one end of screw 516a, 516b rotates on its axis without axial movement, held by a bearing 524a, 524b matching one of the pivot vertices; and

the opposite side of screw 516a, 516b rotates on its axis and moves axially in bearing nut 526a, 526b, matching the pivot vertex opposite.

CLAIM 4. A compact, configurable golf club set per claim 3, NOTED for an adjustable loft mechanism 500a, 500b comprising:

a rear head area comprising the rear of face 502a and/or face frame 503b and/or sole 504a, 504b and/or shell 505b, the latter to accommodate adjustable-loft wood heads 202;

one end of screw 516a, 516b comprises a smooth cylindrical section 517a, 517b rotating in radial bore 525a, 525b perforated on the surface of bearing cylinder 524a, 524b;

the other end comprises a threaded section 518a, 518b screwed into female threaded radial bore 527a, 527b in bearing nut cylinder 526a, 526b;

bearing cylinder 524a, 524b is a pivot vertex whose axis is perpendicular to the axis of screw 516a, 516b and parallel to the normal defining the plane containing adjustable loft mechanism 500a, 500b, with screw 516a, 516b prevented from axial movement;

bearing nut cylinder 526a, 526b is another consecutive pivot vertex whose axis is perpendicular to the axis of screw 516a, 516b and also parallel to the normal defining the plane containing adjustable loft mechanism 500a, 500b;

the normal defining the plane containing adjustable loft mechanism 500a, 500b is parallel to loft axis section 537a, 537b; and

joined connecting rod 540a, 540b is a fixed-length link matching second connecting rod 515a, 515b.

CLAIM 5. A compact, configurable golf club set per claim 4, NOTED for an adjustable loft mechanism 500a, 500b comprising:

in a first configuration, bearing nut cylinder 526a corresponds to first vertex pivot 511a and is connected to the rear head area. bearing cylinder 524a corresponds to third vertex pivot 513a and is connected to joined connecting rod 540a and, by means of the opposite end of said rod, is attached to loft axis section 537a at second joint vertex 512a;

in a second configuration, bearing cylinder 524b corresponds to first vertex pivot 511b and is connected to the rear head area. bearing nut cylinder 526b corresponds to third vertex pivot 513b and is connected to joined connecting rod 540b, which corresponds to second connecting rod 515b, and by means of the opposite end of said rod, is attached to loft axis section 537b at the second joint vertex 512b;

screw 516a, 516b comprises a concentric joint dial 519a, 519b players can rotate with their fingers; and

for adjustable-loft wood heads 202, dial 519b is at the top of screw 516b and above the first vertex pivot 511b. said dial 519b shows through shell 505b, with a perforation in shell 554b as the preferred solution.

CLAIM 6. A compact, configurable golf club set per claim 4, NOTED for an adjustable loft mechanism 500a, 500b comprising that:

a) loft axis section 537a, 537b rotates on three concentric pivot brackets whose axis is parallel to the horizontal of the head and stands in the rear head area:

a.1) the first pivot bracket, i.e., loft axis pivot bracket 529a, 529b, is near heel side 508a, 508b;

a.2) a second pair of pivot brackets, i.e., second vertex pivot brackets 530a, 530b, near toe side 507a, 507b, hold the second joint vertex 512a, 512b and second connecting rod 515a, 515b joined to loft axis section 537a, 537b, guiding their rotation;

a.3) the pair of second vertex pivot brackets 530a, 530b and loft axis pivot bracket 529a, 529b, and therefore loft axis section 537a, 537b, stand preferably at the bottom of the head, near sole 504a, 504b;

b) an additional pair of first vertex pivot brackets 531a, 531b hold first vertex pivot 511a, 511b and are joined to the rear head area; and

c) in joined connecting rod 540a, 540b, a pair of third vertex pivot brackets 541a, 541b hold third vertex pivot 513a, 513b in any configuration, including bearing cylinder 524a or bearing nut cylinder 526b.

CLAIM 7. A compact, configurable golf club set per claim 6, NOTED for adjustable an loft mechanism 500a, 500b comprising that:

Joined connecting rod 540a, 540b is attached to loft axis section 537a, 537b by means of a male/female assembly;

Loft axis section 537a, 537b inserts into second joint vertex 512a, 512b an end of its axis in a male shape 538a, 538b, at right angles to joined connecting rod 540a, 540b. Relative rotation is avoided by means of a pin comprising an eccentric pin 539a, 539b parallel to loft axis section 537a, 537b, sharing the radial perimeter of said guide pin 539a, 539b between loft axis section 537a, 537b and joined connecting rod 540a, 540b. Said guide pin 539a, 539b is confined to the width of joined connecting rod 540a, 540b between second vertex pivot brackets 530a, 530b; and

Loft axis section 537a, 537b avoids axial head movement by means of snap ring 544a, 544b attached to loft axis section 537a, 537b and supported on the inner face of loft axis pivot bracket 529a, 529b. Loft axis section 537a, 537b also abuts second vertex pivot bracket 530a, 530b, closest to toe side 507a, 507b.

CLAIM 8. A compact, configurable golf club set per claim 2, NOTED for an adjustable loft mechanism 500b comprising, for adjustable-loft wood heads 202 on the outer surface of face frame 503b on heel side 508b, a heel concavity 553b partially housing hosel section 533b, allowing for loft angles of the range of heads corresponding to the adjustable head.

CLAIM 9. A compact, configurable golf club set per claim 2 , NOTED for a head interchange mechanism 170 comprising:

pin lock 173, internal interchange cylinder 177 and external interchange cylinder 186, all sliding against each other. internal interchange cylinder 177 houses pin lock 173. internal interchange cylinder 177 is joined to shaft head interchange section 161. internal interchange cylinder 177 and external interchange cylinder 186 can be of various concave and/or convex geometries, such as hexagons;

pin lock 173 is permanently installed in hollow cylindrical protrusion 198 of standard hosel 199 and is thus joined to fixed loft head 201, 301, 401. in other words, said pin lock can be configured to be properly installed in any commercially-available fixed-loft angle head to turn it into an interchangeable head. pin lock 173 may also be permanently installed in female hosel protrusion 534a, 534b of hosel section 533a, 533b and thus joined to adjustable loft heads 202, 302;

pin lock male protrusion 174 rising from hosel section 533a, 533b or standard hosel 199 has torque-resistant geometry. the geometry of the inner surface of internal interchange cylinder 178 matches the geometry of the outer surface of pin lock male protrusion 174;

internal interchange cylinder 177 houses in surface radial bores 182 at least one lock element 183;

pin lock male protrusion 174 includes on its surface at least one pin lock dent 175 housing lock elements 183;

in coupled position 171, lock elements 183 slide radially to be confined in pin lock dents 175, said radial bores 182, and the inner surface of external interchange cylinder 187; and

in uncoupled position 172, player slides external interchange cylinder 186 through decoupling recesses 188 on the inner surface of external interchange cylinder 187, allowing lock elements 183 to radially slide, releasing them from pin lock dents 175.

CLAIM 10. A compact, configurable golf club set per claim 9, NOTED for a pin lock male protrusion 174 disposing a smaller end section that is inserted into internal interchange cylinder 177 and expands into hosel section 533a, 533b or standard hosel 199. Said pin lock male protrusion 174 is a concave or convex polygon with at least a distinctive geometry enabling unique assembly orientation. Pin lock hosel protrusion 176 inserted into hosel section 533a, 533b or standard hosel 199 has a hollow cylindrical geometry of such size as to allow attachment by traditional methods of a standard shaft to hosel section 533a, 533b or standard hosel 199.

CLAIM 11. A compact, configurable golf club set per claim 10, NOTED for a pin lock 173 disposing in pin lock hosel protrusion 176 inserted into hosel section 533a, 533b or standard hosel 199 the ability to use traditional attachment methods analogous or equivalent to those of the standard shaft replaced by pin lock 173, including contact cement, cured epoxy resin, locking sleeves, compression cones, interference adjustment, expansion joints, axial

clamping screws, side clamping screws, bolted or riveted joints and/or any technical equivalent.

CLAIM 12. A compact, configurable golf club set per claim 9, NOTED for a head interchange mechanism 170 including hexagonal pin lock 173 comprising:

hexagonal pin lock male protrusion 174;

at least one hexagonal face has a distinctive geometry enabling a unique assembly position;

lock elements 183 are balls;

locking ball(s) 183 are emplaced in one or more conical, equidistant radial bores 182 in an area corresponding to a hexagonal section of the inner surface of internal interchange cylinder 178;

pin lock dents 175 are recessed semispheres of a diameter at their widest point not exceeding that of locking balls 183;

pin lock dents 175 are emplaced in hexagonal pin lock 173 and match the position of said radial bores 182 and thus of locking balls 183 when head interchange mechanism 170 is in the coupled position.

CLAIM 13. A compact, configurable golf club set per claim 12, NOTED for pin lock dents 175 providing a configuration alternative comprising an area whose geometry is a revolving circular section whose axis of rotation matches the pin lock axis and its widest section is of a size not exceeding that of locking balls 183.

CLAIM 14. A compact, configurable golf club set per claim 9, NOTED for an internal interchange cylinder 177 housing on outer surface 179 a coupling spring 184, which when extended pushes external interchange cylinder 186 into coupled position 171. The depressed coupling spring 184 pushes external interchange cylinder 186 into uncoupled position 172. Player motion on external interchange cylinder 186 and thus on coupling spring 184 may be axial, torsion, or a combination thereof.

CLAIM 15. A compact, configurable golf club set per claim 9, NOTED for head interchange mechanism 170 alternatively including decoupling spring 185 at the bottom of internal interchange cylinder 177, which remains depressed against the tip of pin lock male protrusion 174 when in coupled position 171.

CLAIM 16. A compact, configurable golf club set per claim 9, NOTED for pin lock 173 being alternatively replaced by male hosel protrusion 535a, 535b compatible with head interchange mechanism 170, formed during manufacture of hosel loft axis 532a, 532b and equivalent to pin lock male protrusion 174 of previously described pin lock 173 rising from hosel section 533a, 533b or standard hosel 199.

CLAIM 17. A compact, configurable golf club set per claim 9, NOTED for head interchange mechanism 170 alternatively including guide pin 181 traveling on guide slot 180, limiting travel of external interchange cylinder 186. Said guide pin 181 is joined to and passes through external interchange

cylinder 186. Said guide slot 180 of the width of guide pin 181 proceeds in lengthwise recess parallel to the axis and over the outer surface of internal interchange cylinder 177.

CLAIM 18. A compact, configurable golf club set per claim 2, NOTED for a telescoping mechanism 130 comprising:

internal telescoping cylinder 136 and external telescoping cylinder 133 sliding against each other. internal telescoping cylinder 136 slides over adjustable-length section 163 and is joined to handle core 122 and thereby to handle 120. one or more lock radial bores 137 on the surface of internal telescoping cylinder 136 house at least one lock element 138. internal telescoping cylinder 136 and external telescoping cylinder 133 can be of various concave and/or convex geometries, such as hexagons;

discrete length positions 165 are developed by means of at least one shaft dent 165 on adjustment surface 168. said dents house lock elements 138. the said adjustment surface has torque-resistant geometry;

in locked position 131, lock element(s) 138 slide radially until confined in shaft dents 165, in the said lock radial bores 137, and in the inner surface of external telescoping cylinder 134;

in unlocked position 132, player slides external telescoping cylinder 133 through unlock recesses 135 on the inner surface of external telescoping cylinder 134, allowing lock element(s) 138 to radially slide, releasing them from shaft dents 165.

CLAIM 19. A compact, configurable golf club set per claim 18, NOTED for an adjustment surface 168 including a series of surface shaft dents 165 built as a continuous surface relative to the surface of shaft 160. In other words, said dents do not cause abrupt discontinuity of surface material as they are not holes in the shaft and the adjustment surface 168 including at least one discontinuity as a guide slot for telescoping mechanism 130. Such discontinuity has torque-resistant geometry. In particular, the guide slot may be at least a flat surface 164 or U- or V-shaped relative to the shaft surface. The inner surface of internal telescoping cylinder 139 matches said adjustment surface 168.

CLAIM 20. A compact, configurable golf club set per claim 19, NOTED, if shaft 160 is built in composite material, for shaft dents 165 of the surface of adjustable-length section 163 including that the entire area around shaft dents 165, as well as the area comprising shaft dents 165, do not break fiber continuity. If shaft 160 is built in polycrystalline material such as steel, the entire area around shaft dents 165, as well as the area comprising shaft dents 165, do not break crystalline structure continuity.

CLAIM 21. A compact, configurable golf club set per claim 19, NOTED for an adjustment surface 168 having a circular section and another section made up of two opposing, 180° flat surfaces 164. The flat surfaces house shaft dents 165. Dents may be recessed semispheres in opposing, 180°-pairs located on the opposing flat surfaces. As such, lock elements 138 are spheres whose radius matches said dents and for a shaft 160 of mixed materials, where the body of shaft 160, in all sections, is built in composite material. However, the

outer surface of adjustment surface 168 is built using a thin sheet of material harder than the composite, such as steel, attached to the inner composite material layers. A variant has the said harder sheet covering only the outer surface part containing the sequence of shaft dents 165.

CLAIM 22. A compact, configurable golf club set per claim 21, NOTED for the fact that opposing flat surfaces 164 housing shaft dents 165 may on their outer surface and thus on their surface finish be built in individual sheets of thin polycrystalline material such as steel and affixed to the composite body of shaft 160. Construction of said sheets of crystalline structure material includes shaft dents 165.

CLAIM 23. A compact, configurable golf club set per claim 18, NOTED for an internal telescoping cylinder 136 housing on its outer surface lock spring 142, which when extended pushes external telescoping cylinder 133 into locked position 131. When depressed, lock spring 142 pushes external telescoping cylinder 133 into unlocked position 132. Player motion on external telescoping cylinder 133 and thus on spring 142 may be axial, torsion, or a combination thereof.

CLAIM 24. A compact, configurable golf club set per claim 18, NOTED for an internal telescoping cylinder 136 including position radial bore 144 containing position ball pointer 140 partially entering shaft dents 165. The ball is radially pressed against the shaft by means of ring-type spring 141 covering said ball 140 and the outer surface of said internal telescoping cylinder 136.

CLAIM 25. A compact, configurable golf club set per claim 18, NOTED for an internal telescoping cylinder 136 including travel stopper 143 for external telescoping cylinder 133. Said stopper is a small tab at the start of the outer surface of internal telescoping cylinder 136 that clicks into unlock recess 135 on the inner surface of external telescoping cylinder 134 and sets the limits of travel.

CLAIM 26. A compact, configurable golf club set per claim 2, NOTED for a shaft butt section 166 comprising shaft butt end 167, which guides and constrains maximum length of telescoping handle 110.

CLAIM 27. Method for assembly of a club in the compact, configurable golf club set of claim 1, based on interchangeable head 200, 300, 400 with fixed loft option 201, 301, 401, noted for comprising the following steps to be performed by player prior to shot play:

connect said fixed loft head 201, 301, 401 to adjustable-length shaft 100 by means of head interchange mechanism 170;

extend or retract adjustable-length shaft 100 by means of telescoping mechanism 130 in telescoping handle 110; and

verify club configuration and horizontal rest of attached head in striking position in front of the ball.

CLAIM 28. Method for assembly of the compact, configurable golf club set in claim 9, NOTED for the fact that the step of coupling interchangeable head 200, 300, 400 by means of head interchange mechanism 170 requires

players to shift external interchange cylinder 186 from coupled position 171 to uncoupled position 172.

CLAIM 29. Method for assembly of the compact, configurable golf club set in claim 7, NOTED for comprising the following steps to be performed by player prior to shot play:

connect said adjustable loft head 202, 302 to adjustable-length shaft 100 by means of head interchange mechanism 170;

adjust loft angle 509a, 509b of said adjustable loft head 202, 302;

extend or retract adjustable-length shaft 100 by means of telescoping mechanism 130 in telescoping handle 110; and

verify club configuration and horizontal rest of attached head by placing sole 504 on the ground in striking position in front of the ball.

and for the fact that the step of adjusting loft angle 509a, 509b requires players to turn dial 519a, 519b in adjustable loft mechanism 500a, 500b.

CLAIM 30. Method for assembly of the compact, configurable golf club set in claim 18, NOTED for the fact that the step of extending or retracting adjustable-length shaft 100 requires players to shift external telescoping cylinder 133 from locked position 131 to unlocked position 132, sliding telescoping handle 110 over adjustable-length section 163 to the desired position and releasing said external telescoping cylinder 133 so it returns to locked position 131.

CLAIM 31. Method for assembly of the compact, configurable golf club set in claim 29, NOTED for the fact that the step of extending or retracting adjustable-length shaft 100 requires players to shift external telescoping cylinder 133 from locked position 131 to unlocked position 132, sliding telescoping handle 110 over adjustable-length section 163 to the desired position and releasing said external telescoping cylinder 133 so it returns to locked position 131.

CLAIM 32. Method for assembly of the compact, configurable golf club set in claim 27, NOTED for the fact that the step of extending or retracting adjustable-length shaft 100 requires players to shift external telescoping cylinder 133 from locked position 131 to unlocked position 132, sliding telescoping handle 110 over adjustable-length section 163 to the desired position and releasing said external telescoping cylinder 133 so it returns to locked position 131.

CLAIM 33. Method for assembly of the compact, configurable golf club set in claim 29, NOTED for the fact that the step of coupling interchangeable head 200, 300, 400 by means of head interchange mechanism 170 requires players to shift external interchange cylinder 186 from coupled position 171 to uncoupled position 172.

CLAIM 34. Method for assembly of the compact, configurable golf club set in claim 27, NOTED for the fact that the step of coupling interchangeable head 200, 300, 400 by means of head interchange mechanism 170 requires

players to shift external interchange cylinder 186 from coupled position 171 to uncoupled position 172.

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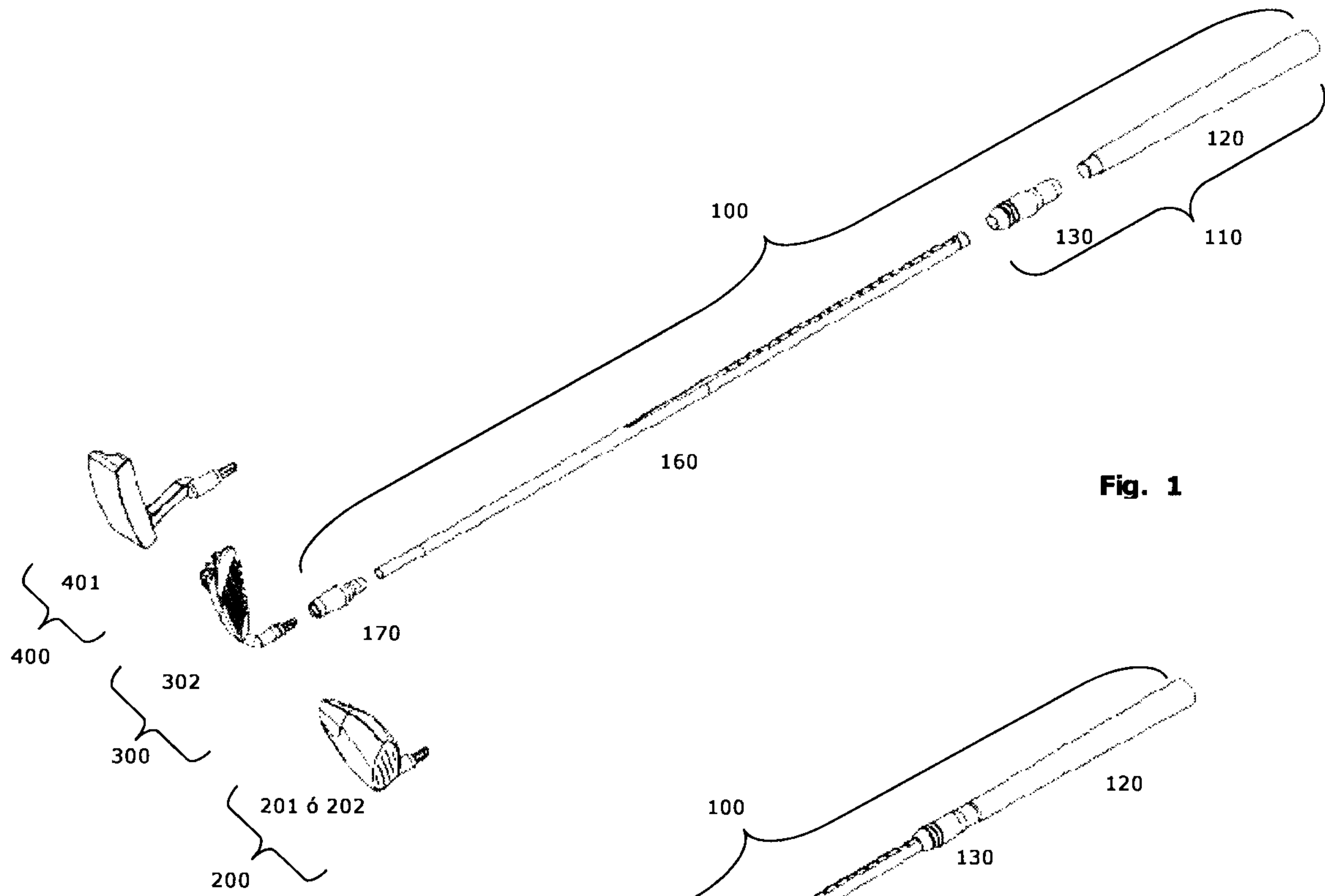


Fig. 1

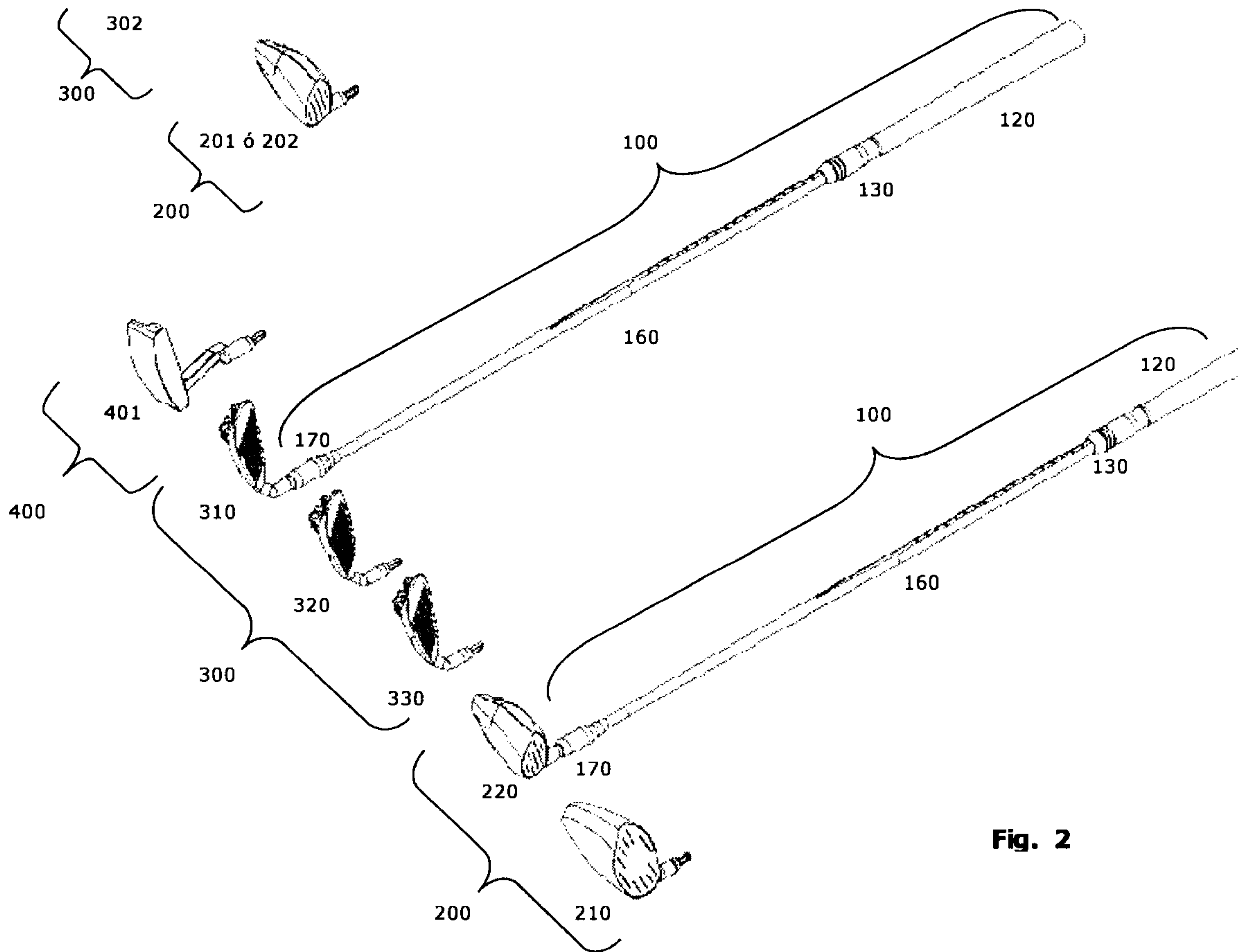
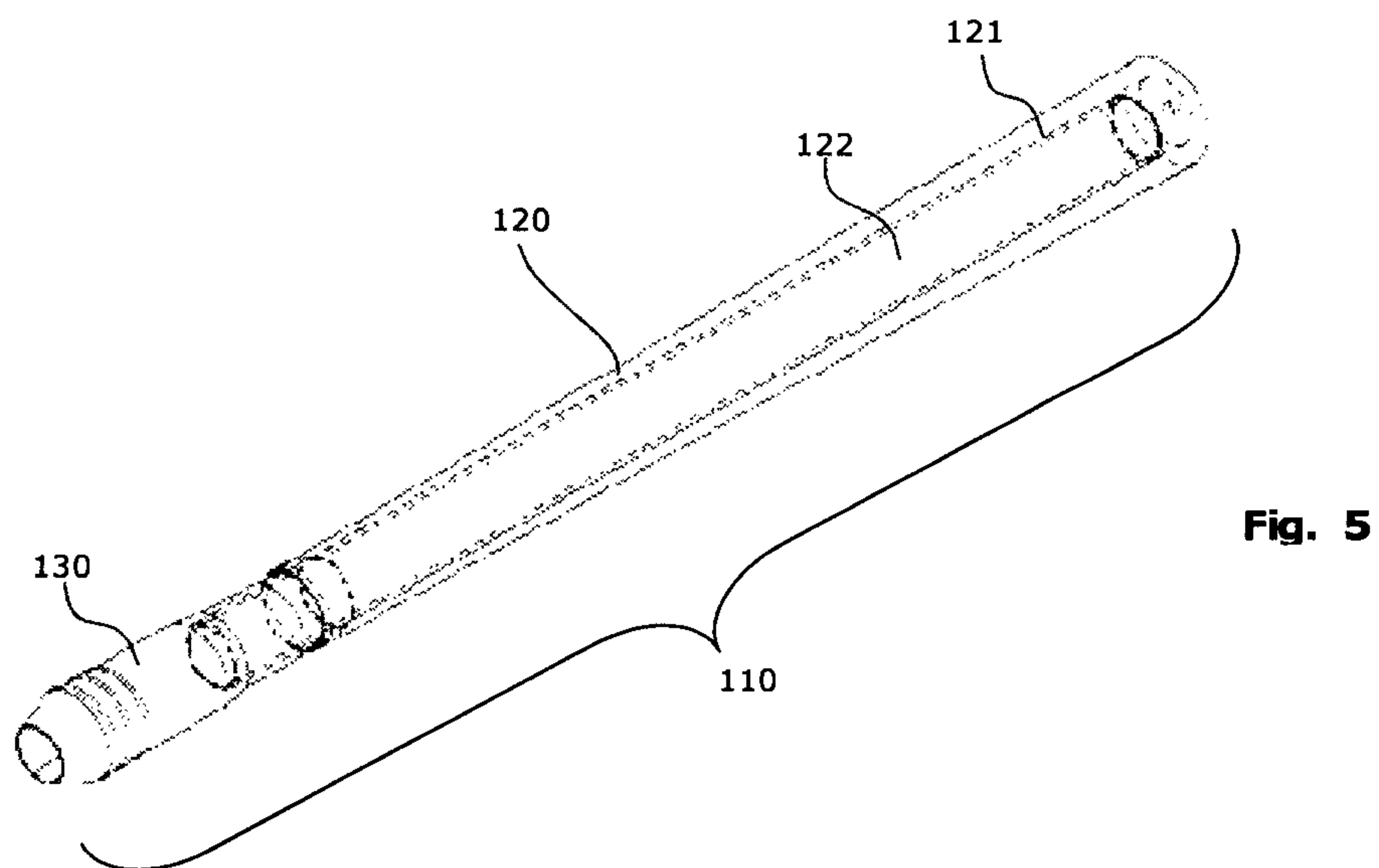
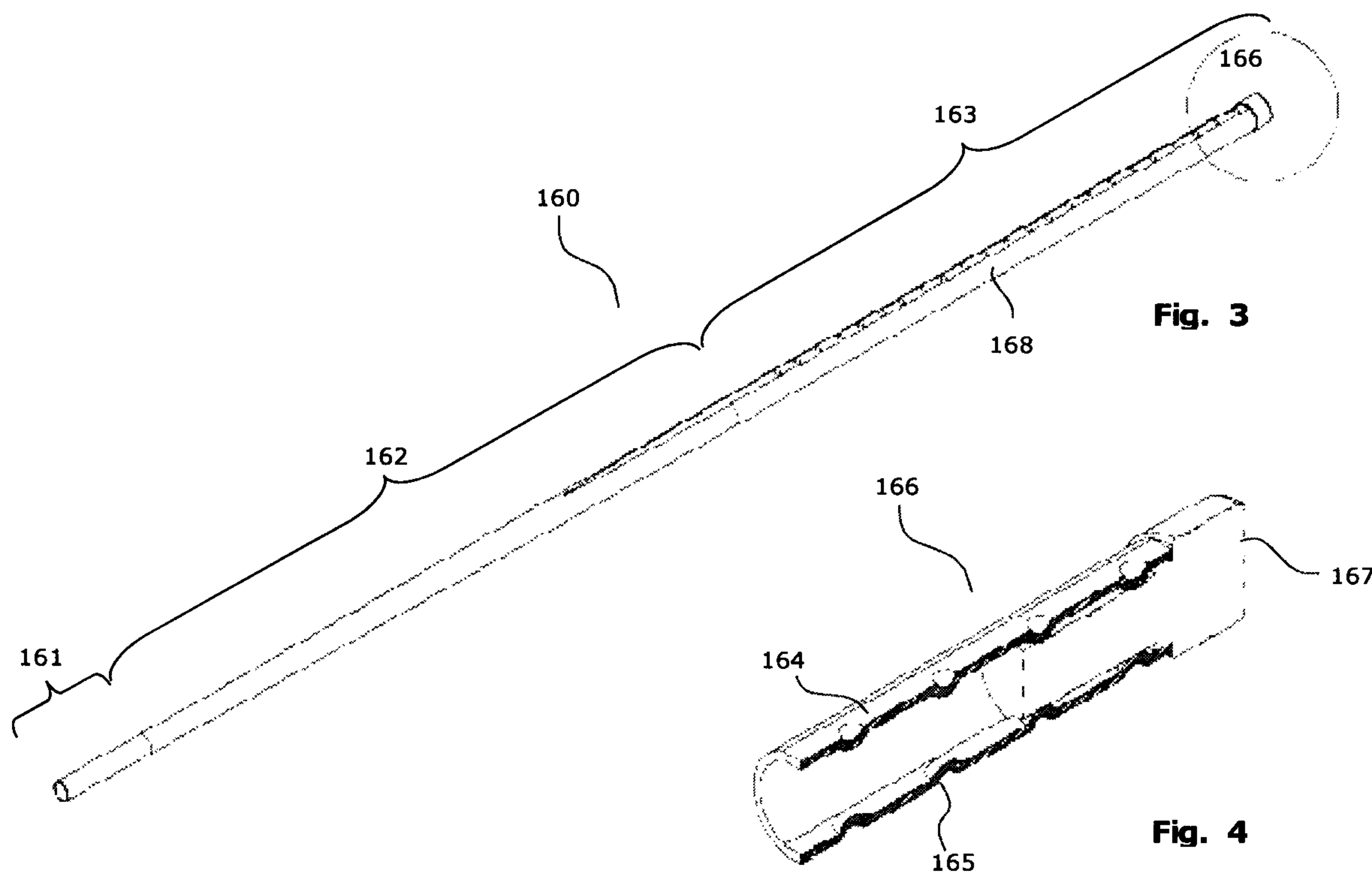


Fig. 2

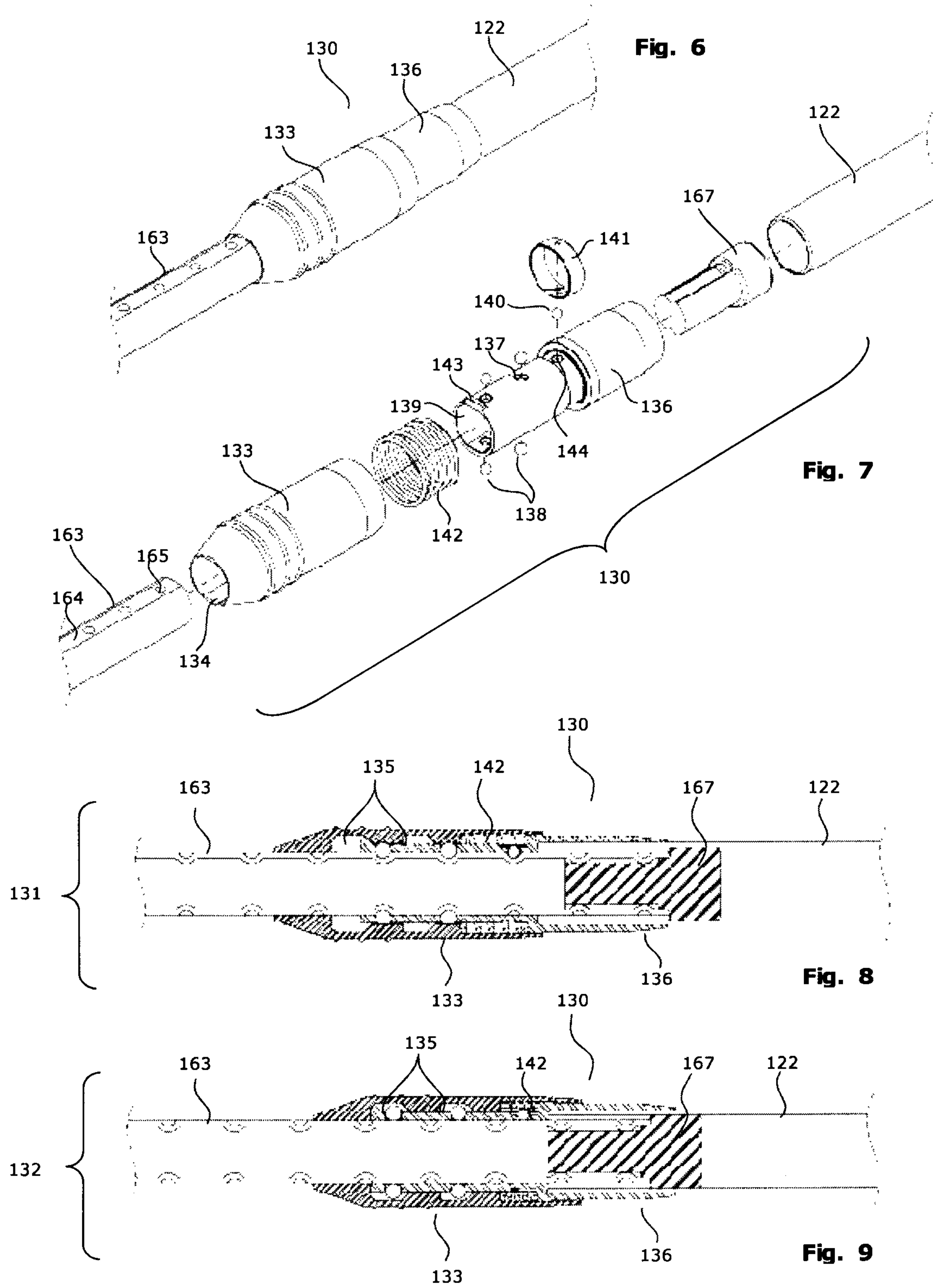
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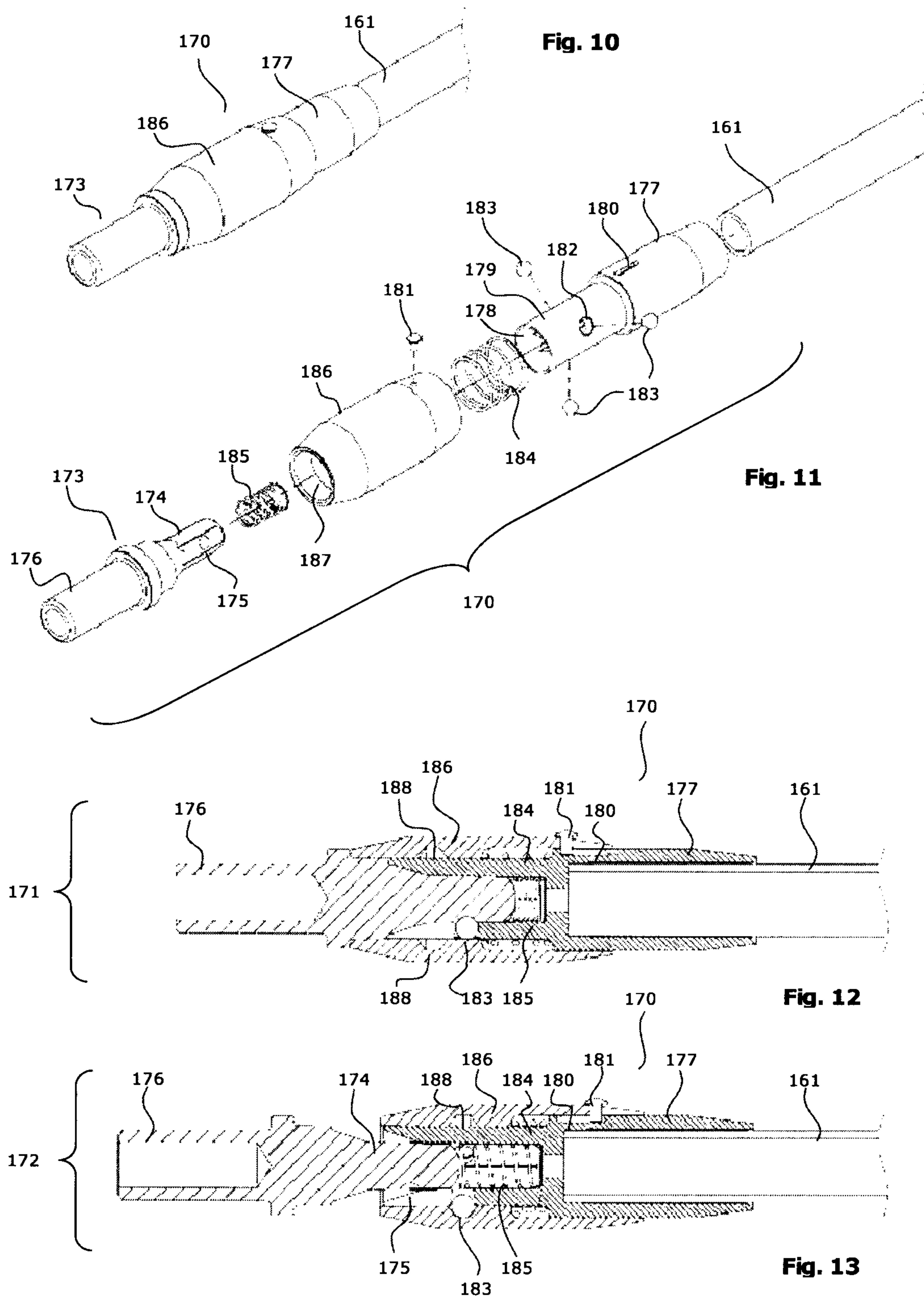
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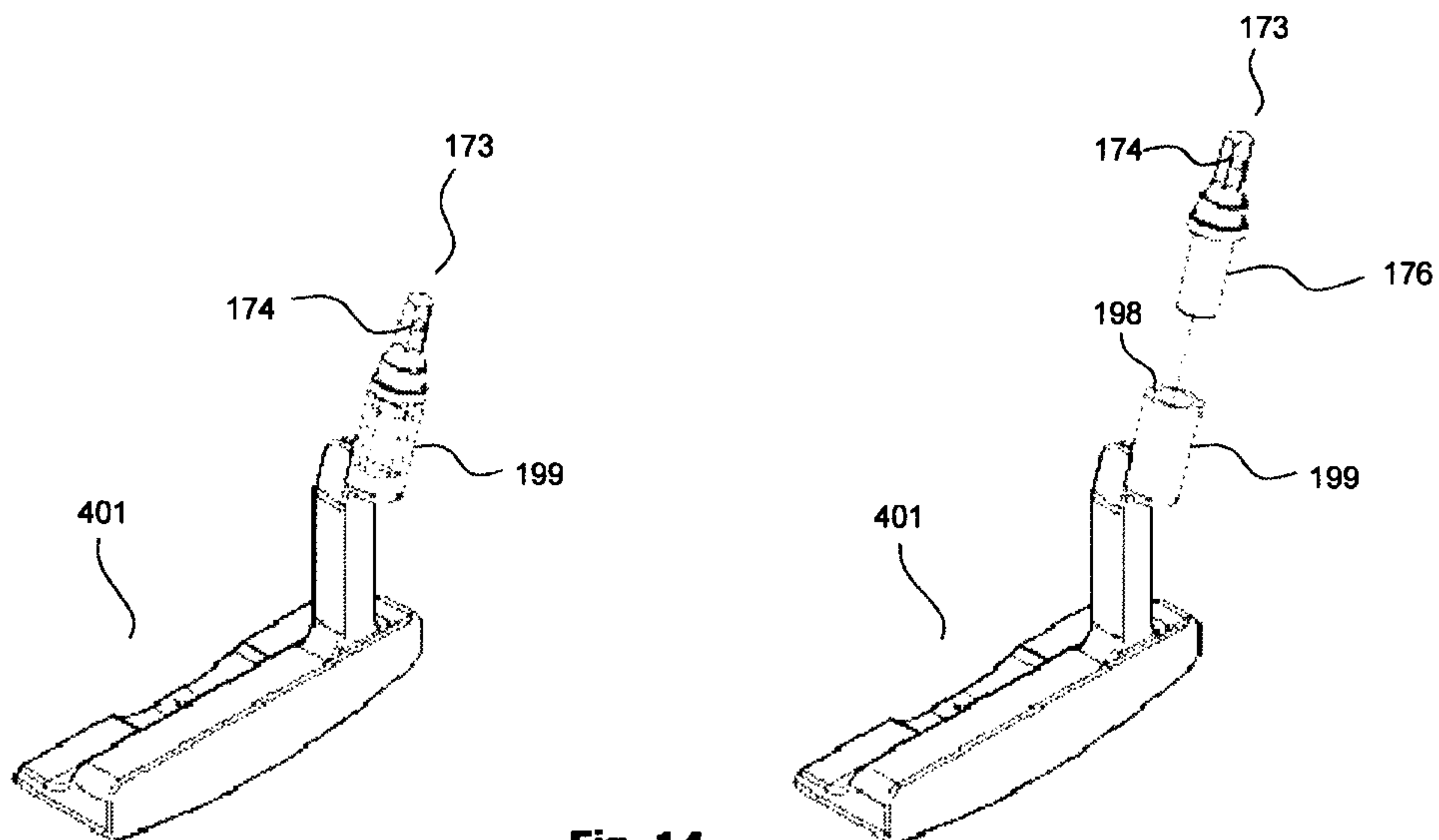


Fig. 14

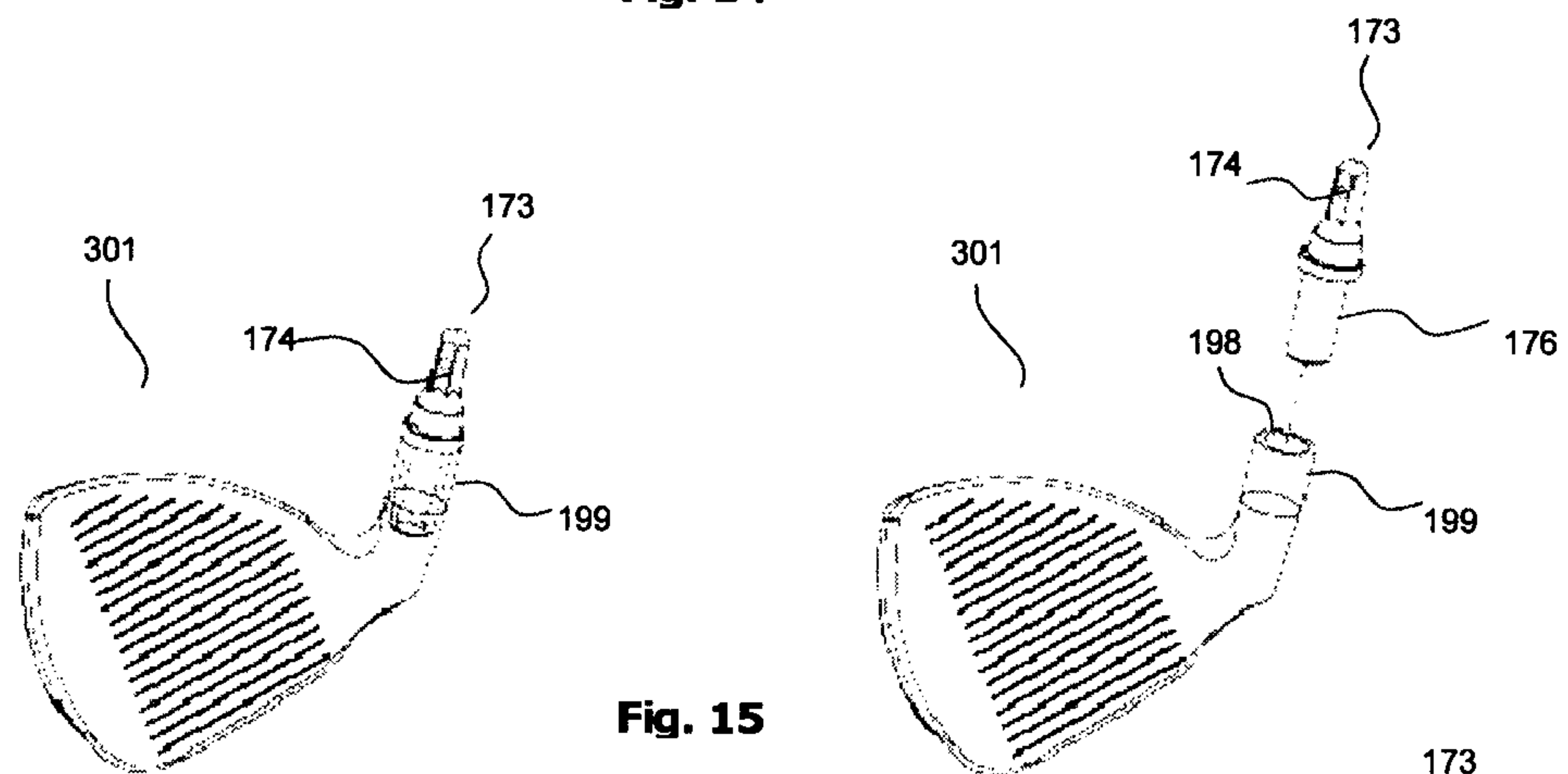


Fig. 15

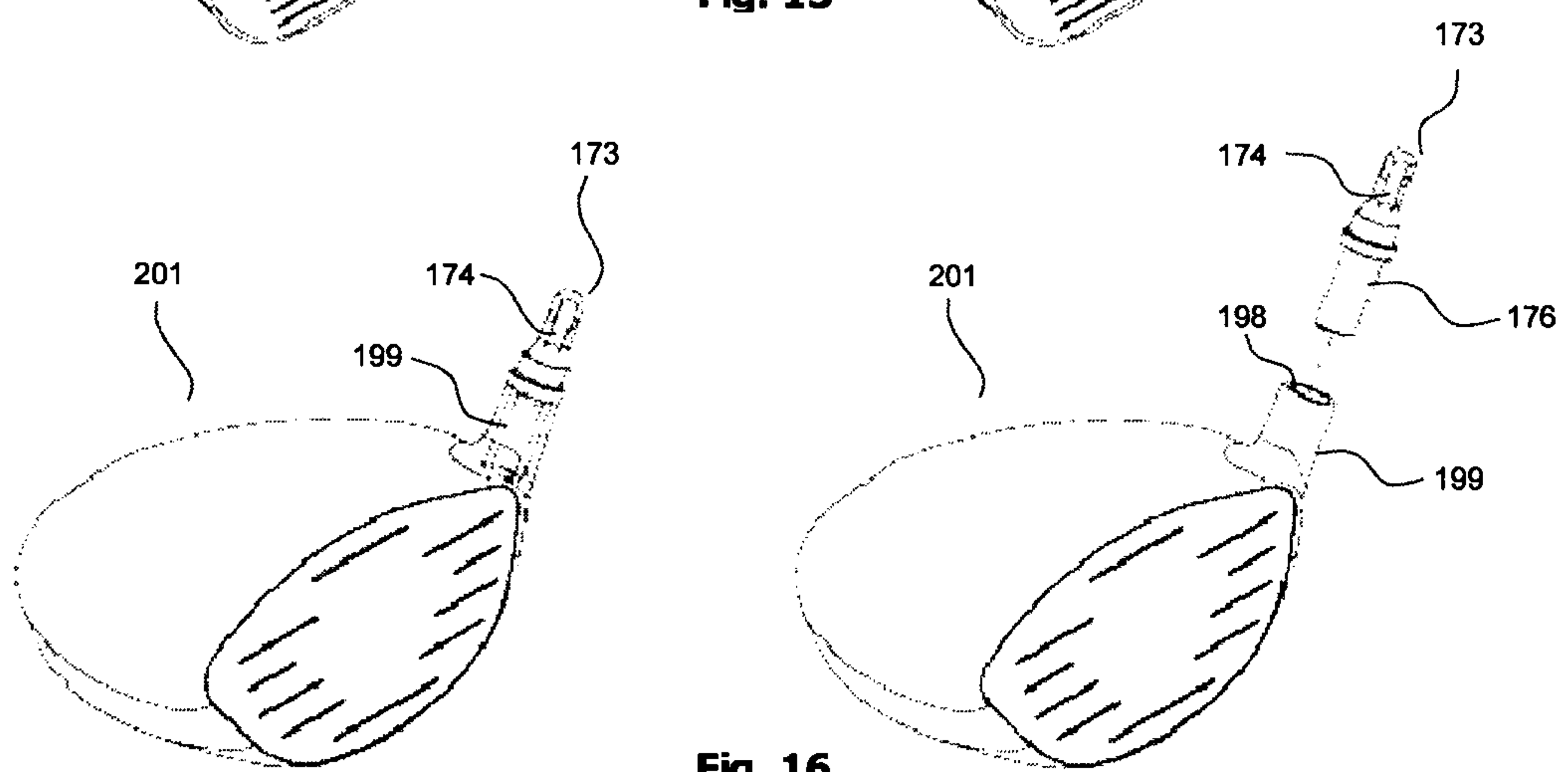
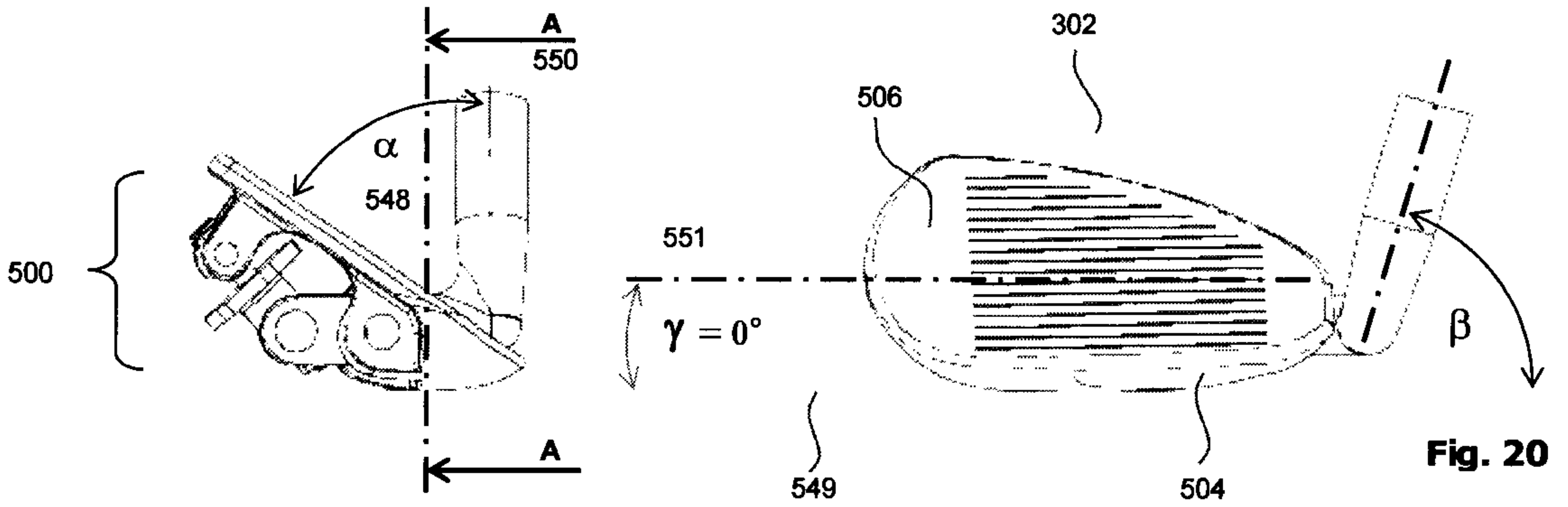
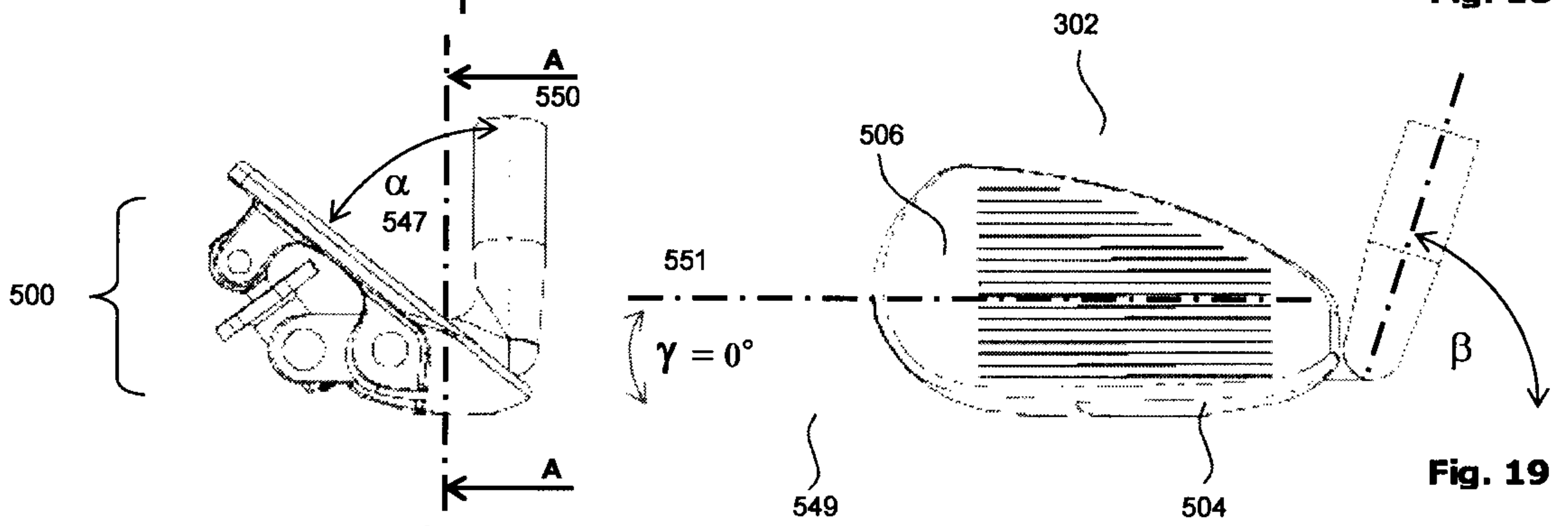
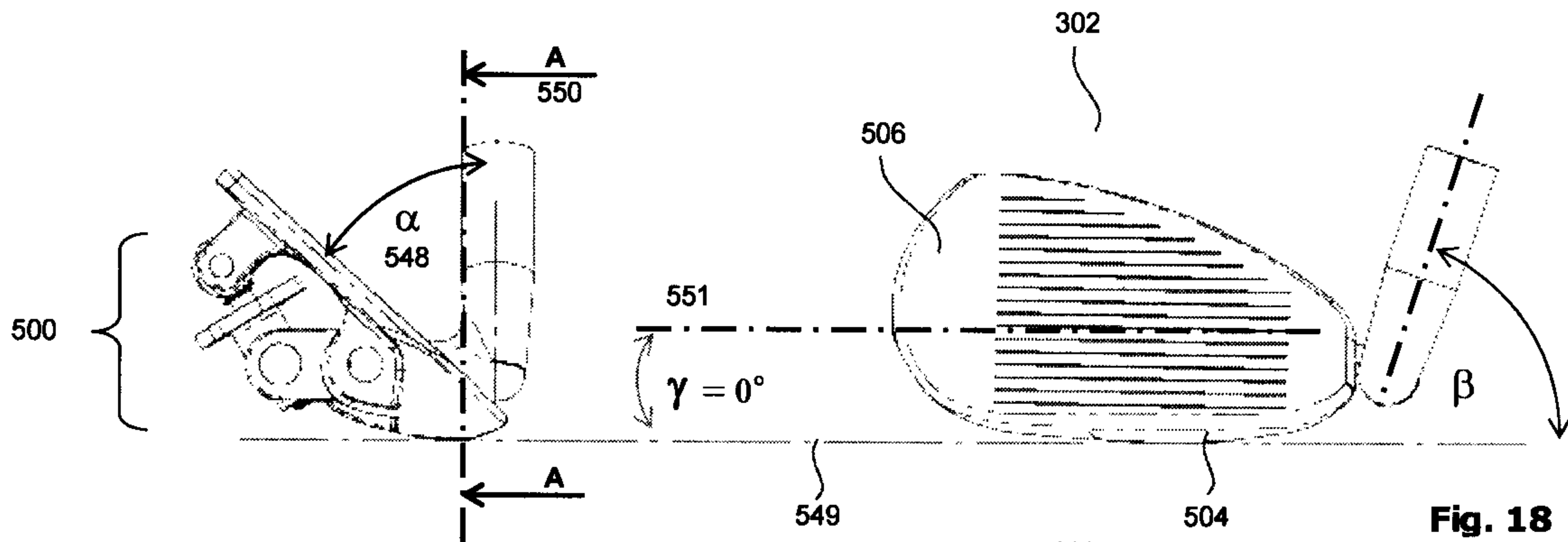
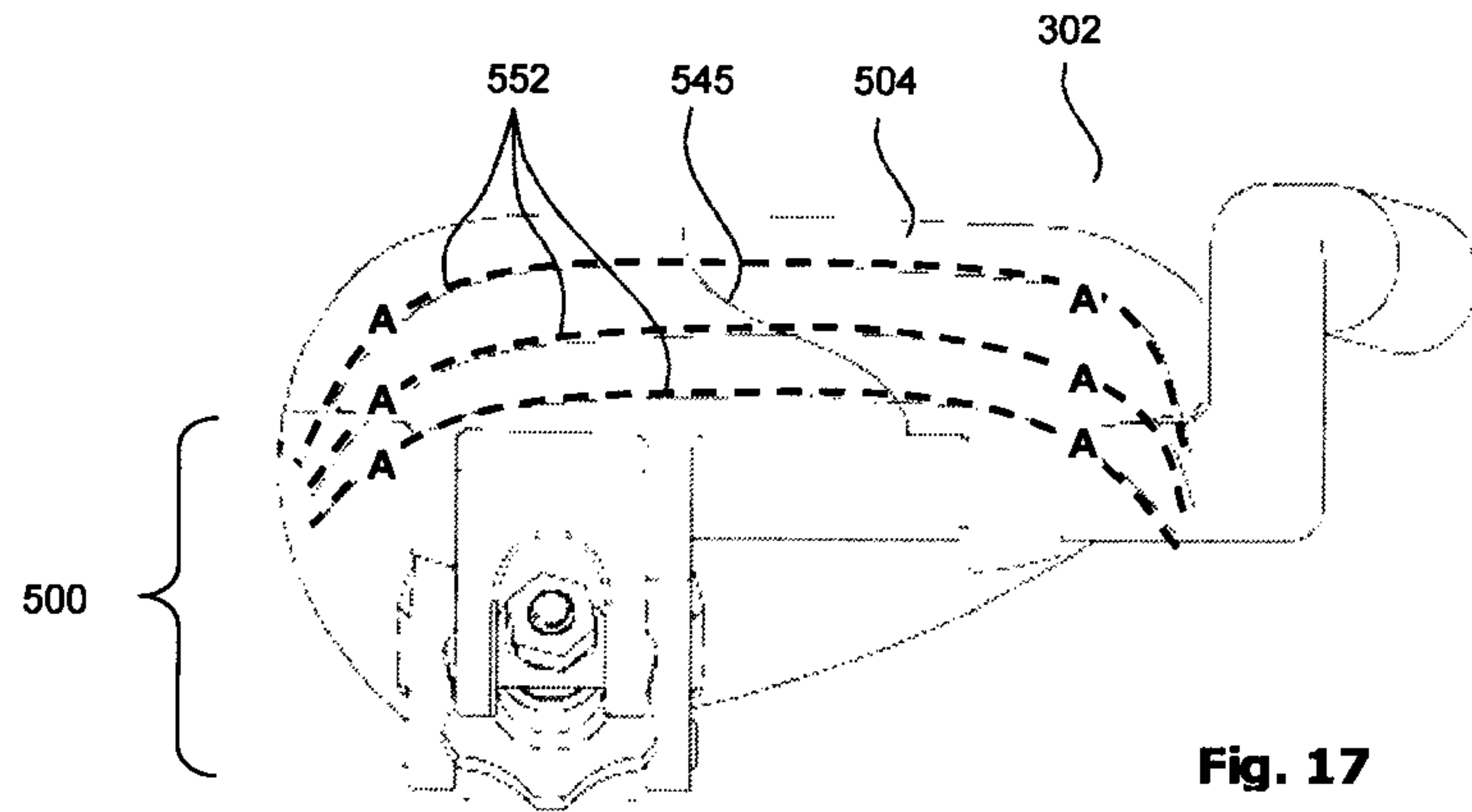


Fig. 16

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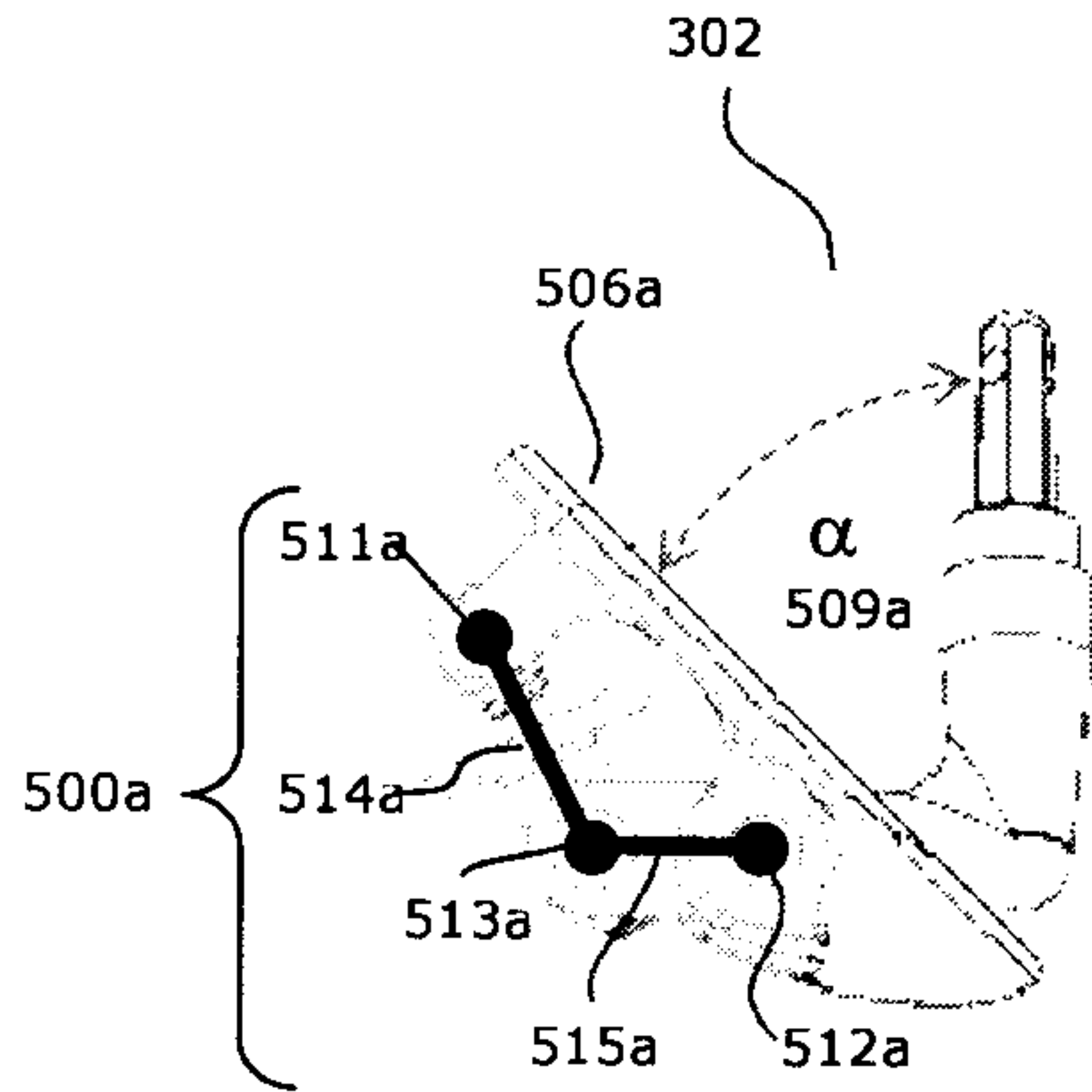


Fig. 21

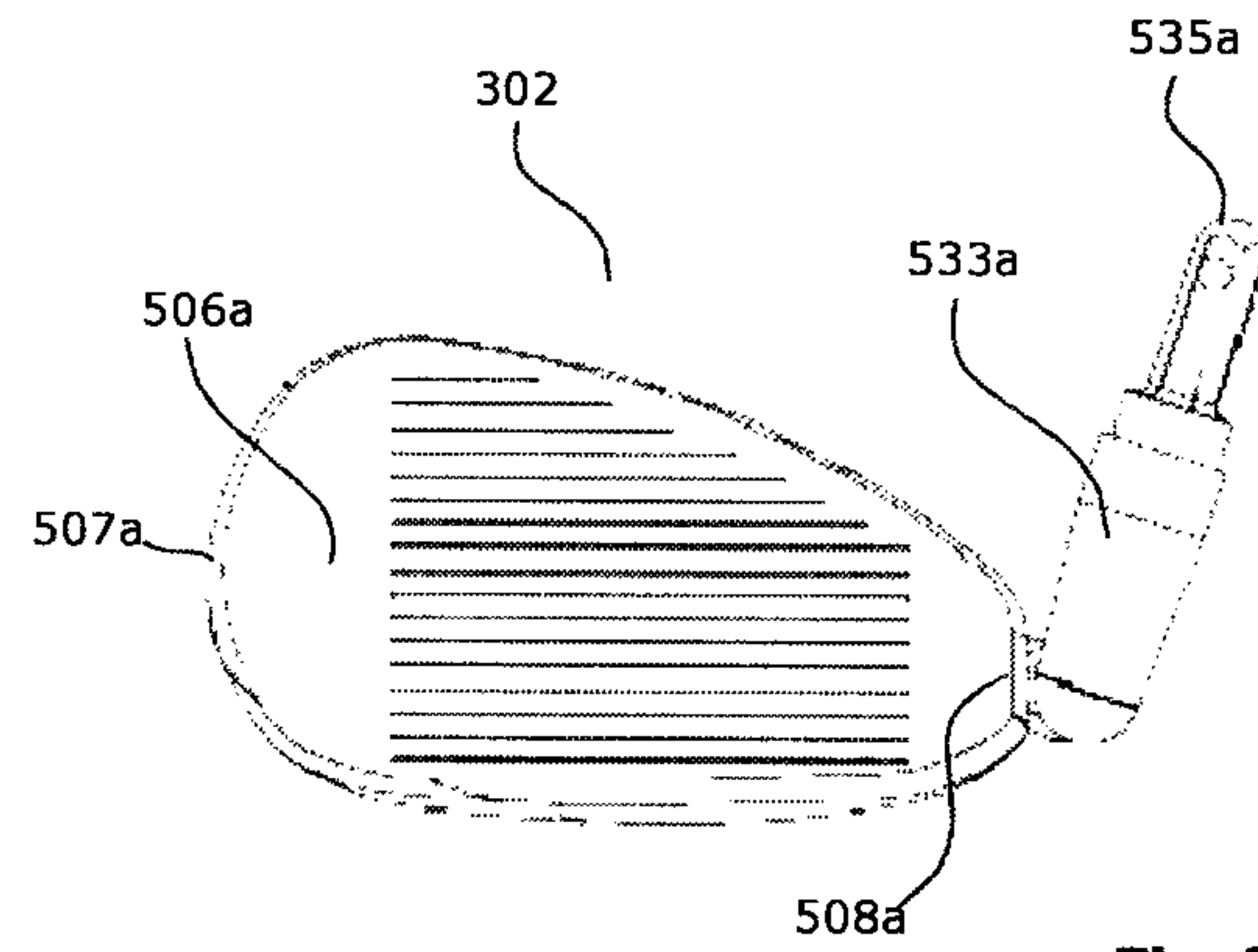


Fig. 22

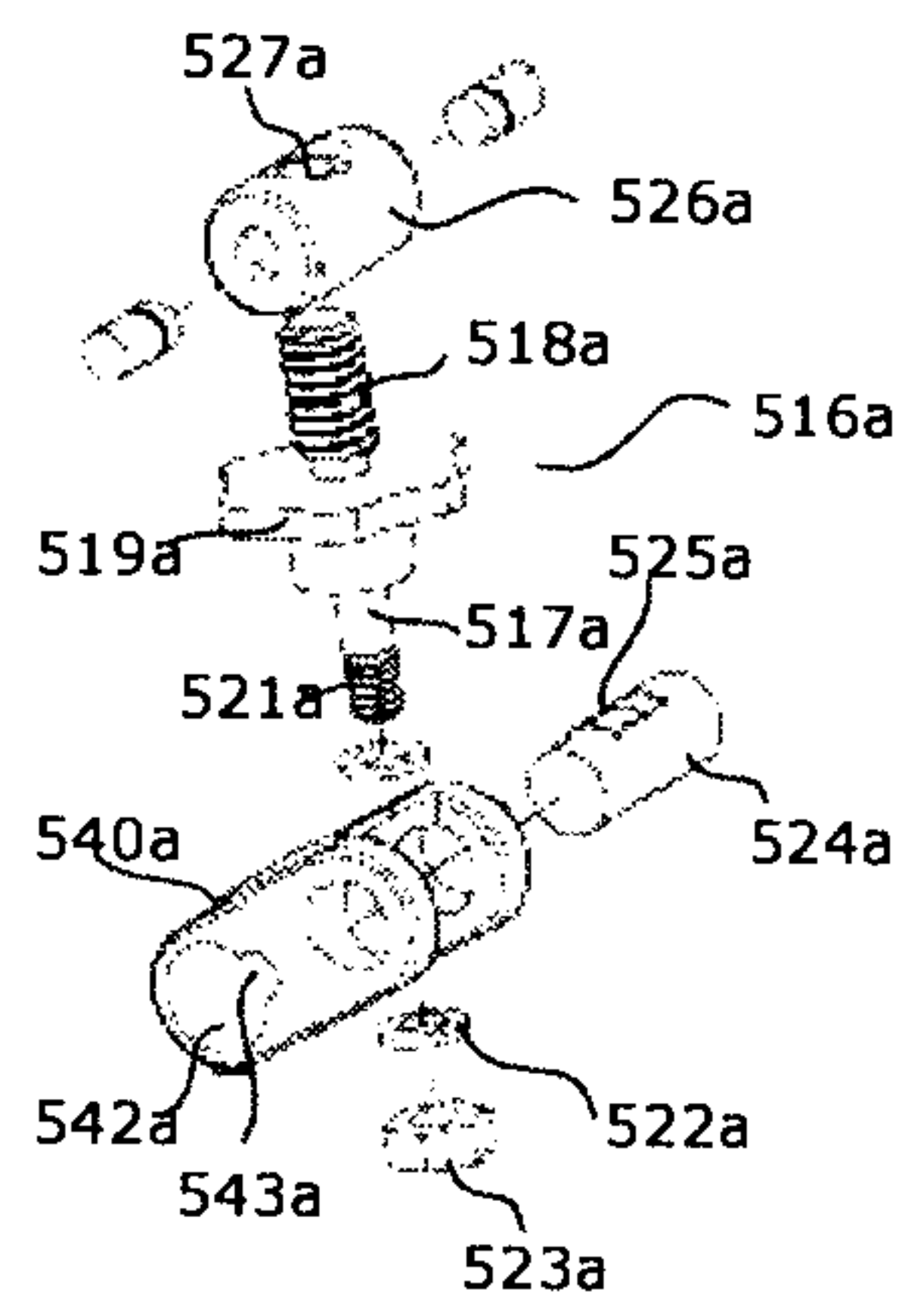


Fig. 23

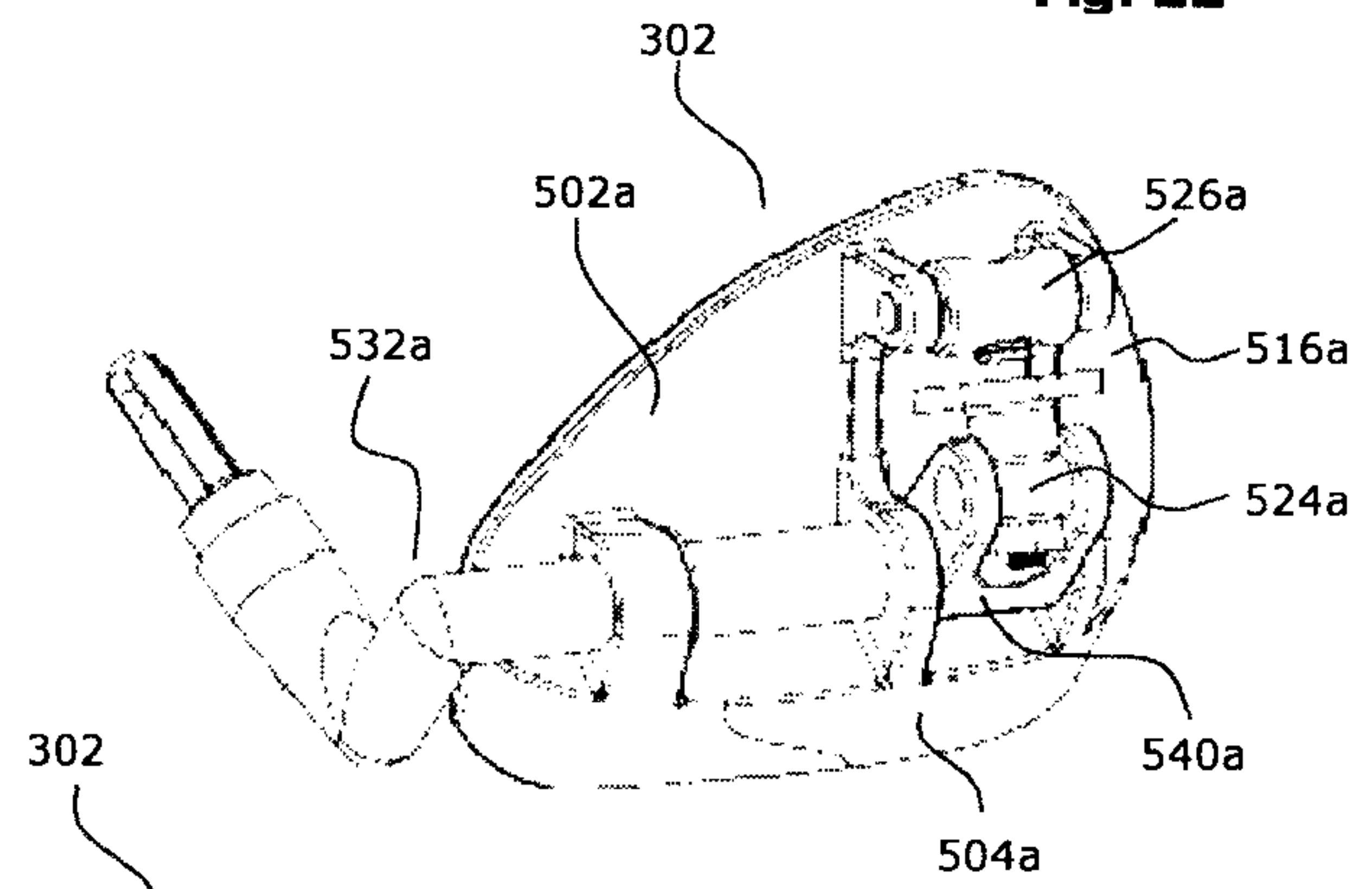


Fig. 24

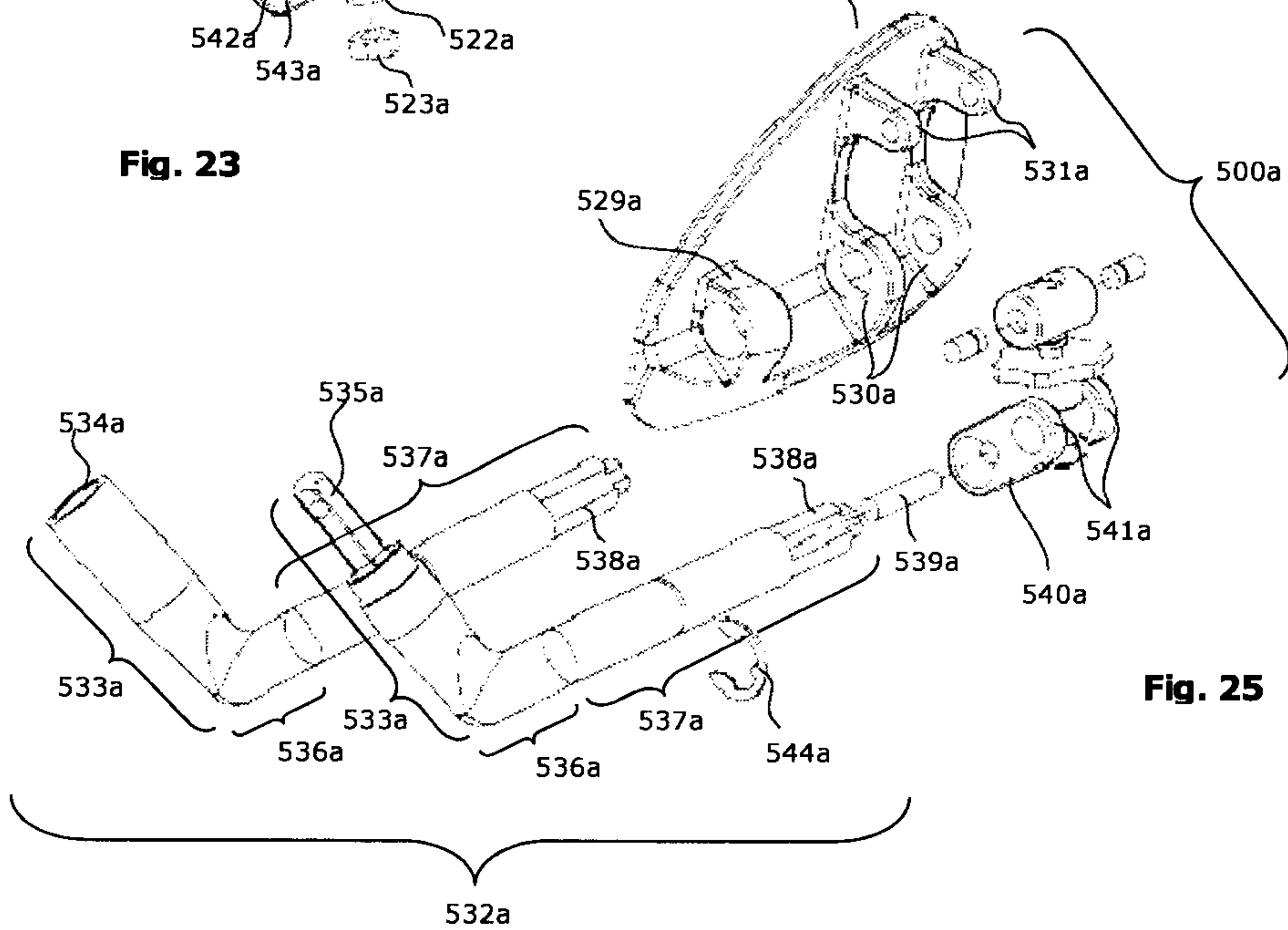


Fig. 25

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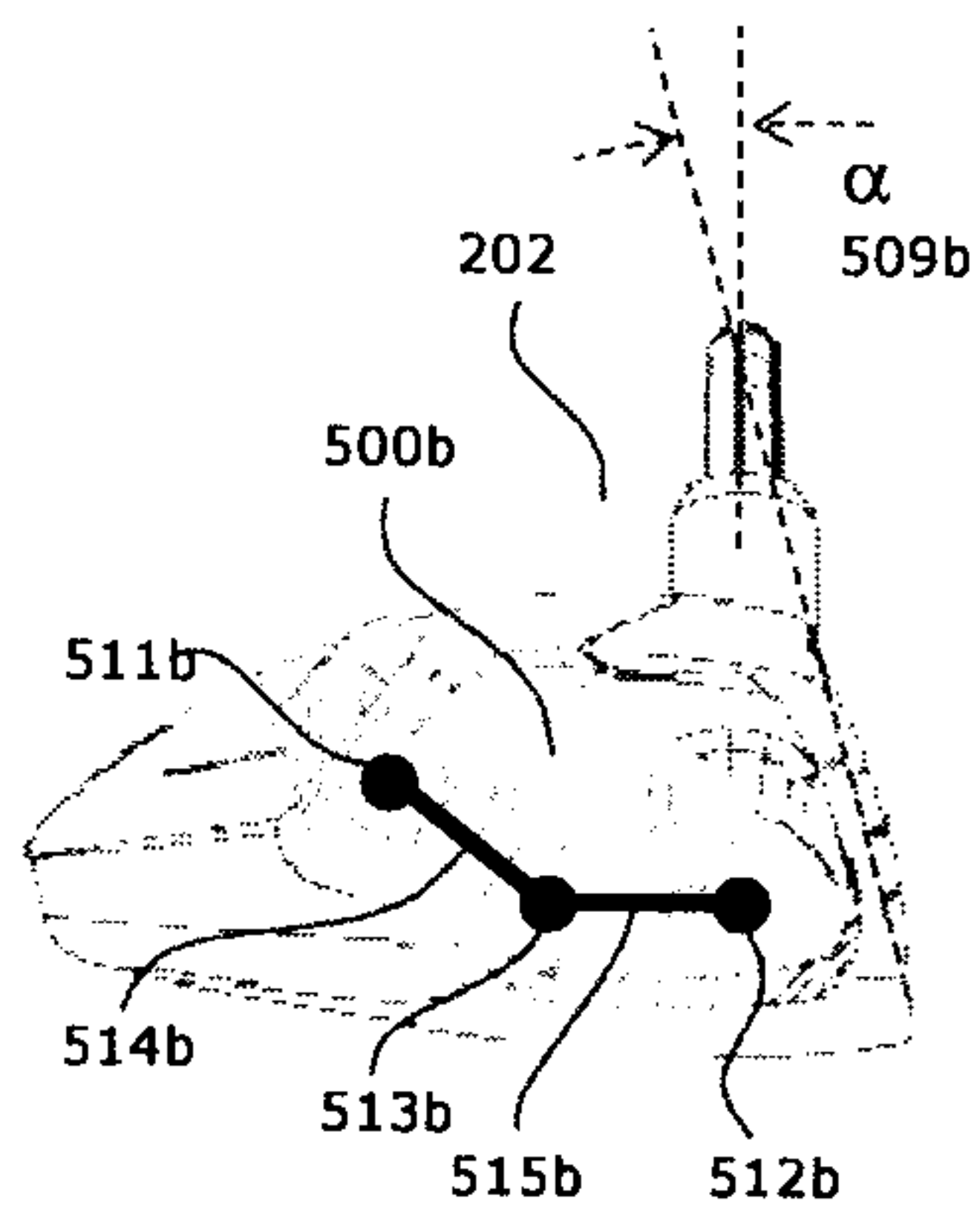


Fig. 26

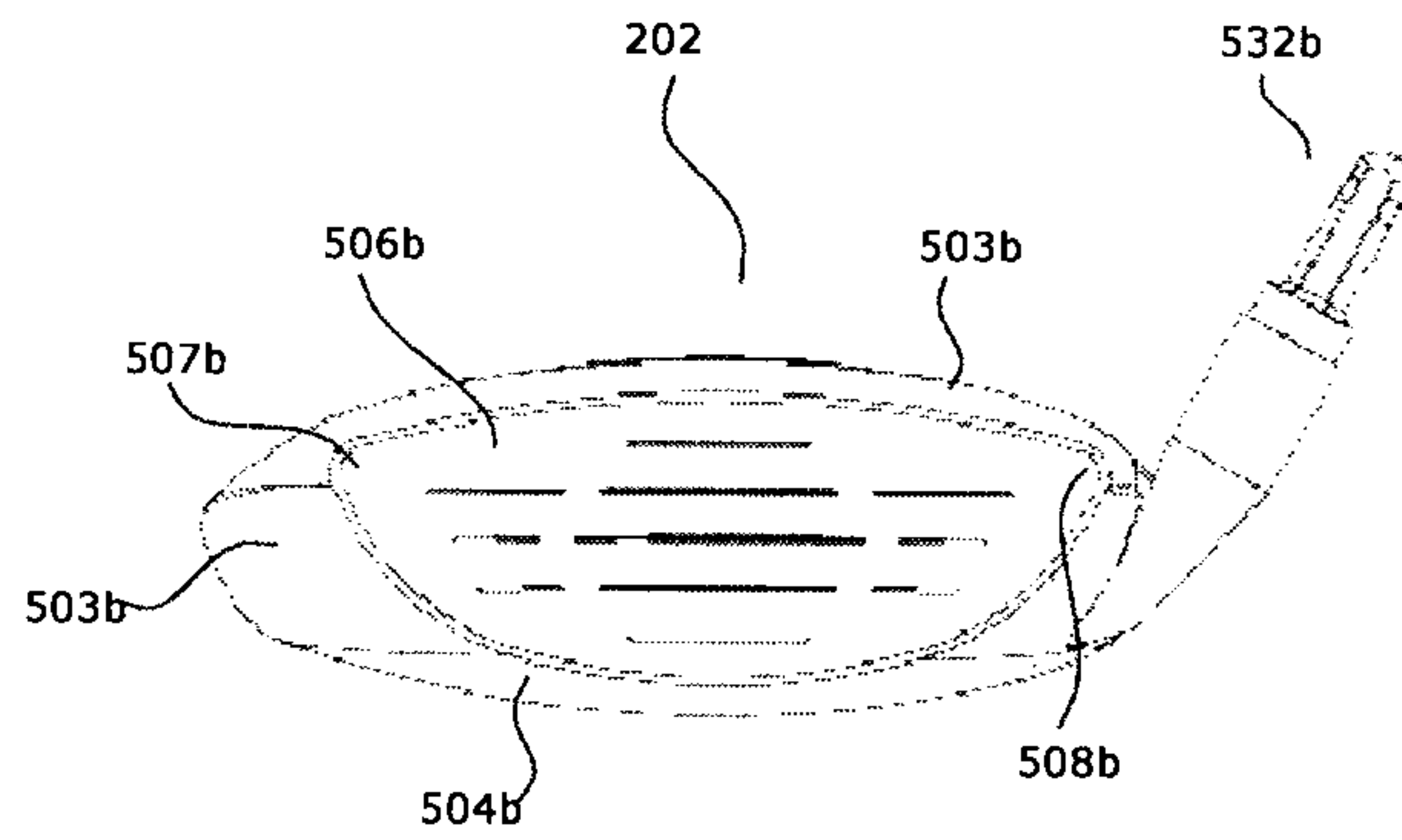


Fig. 27

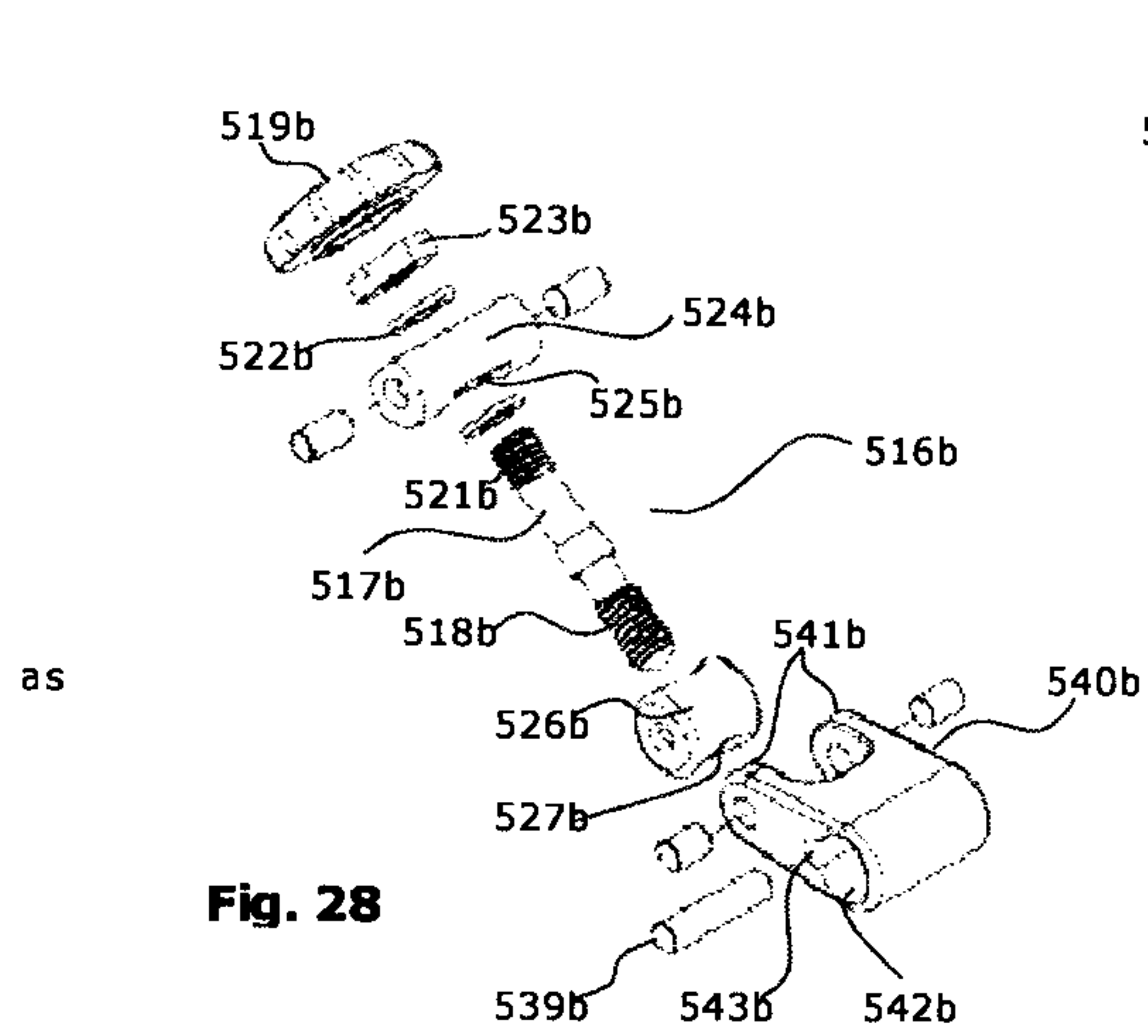


Fig. 28

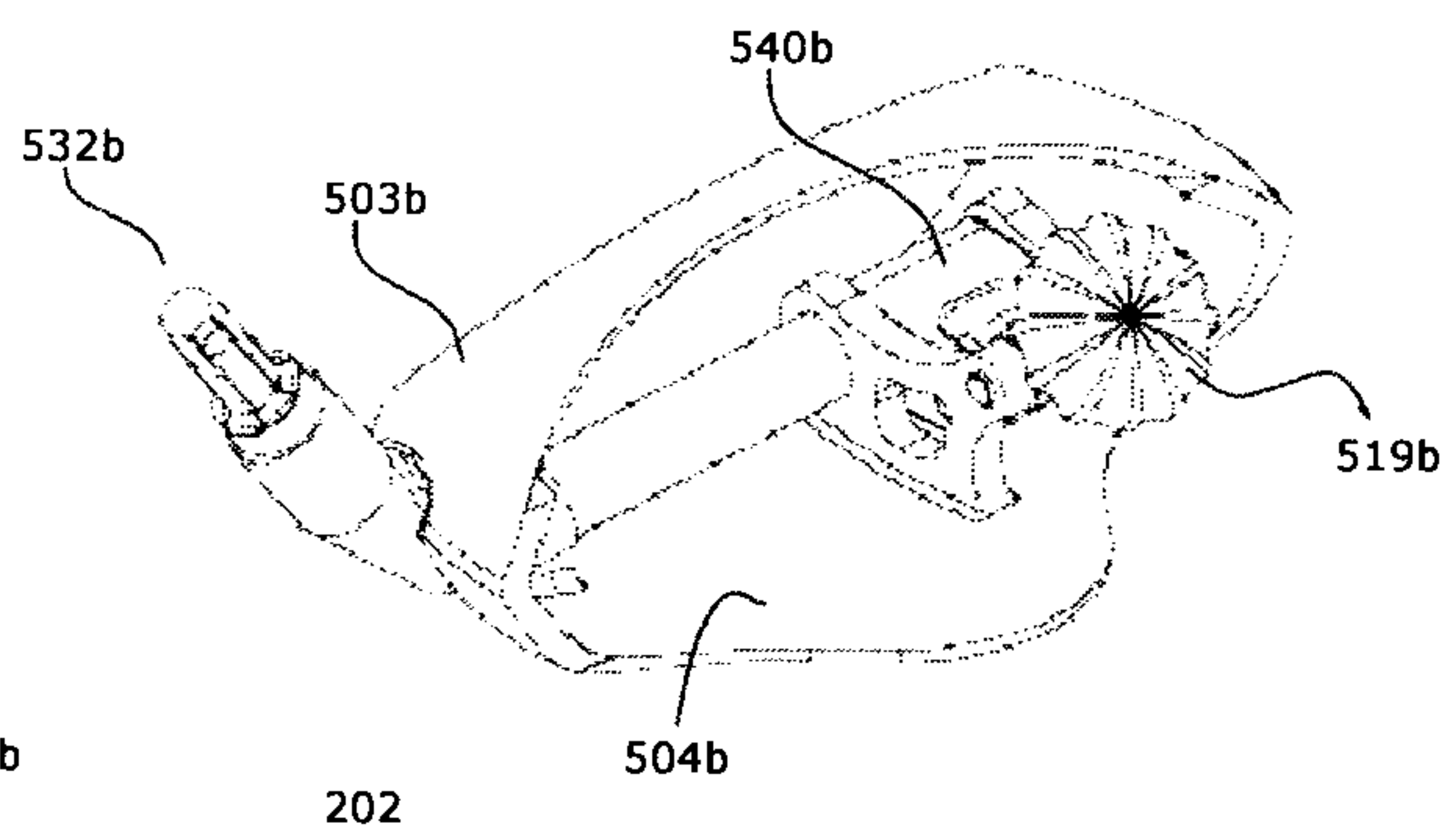


Fig. 29

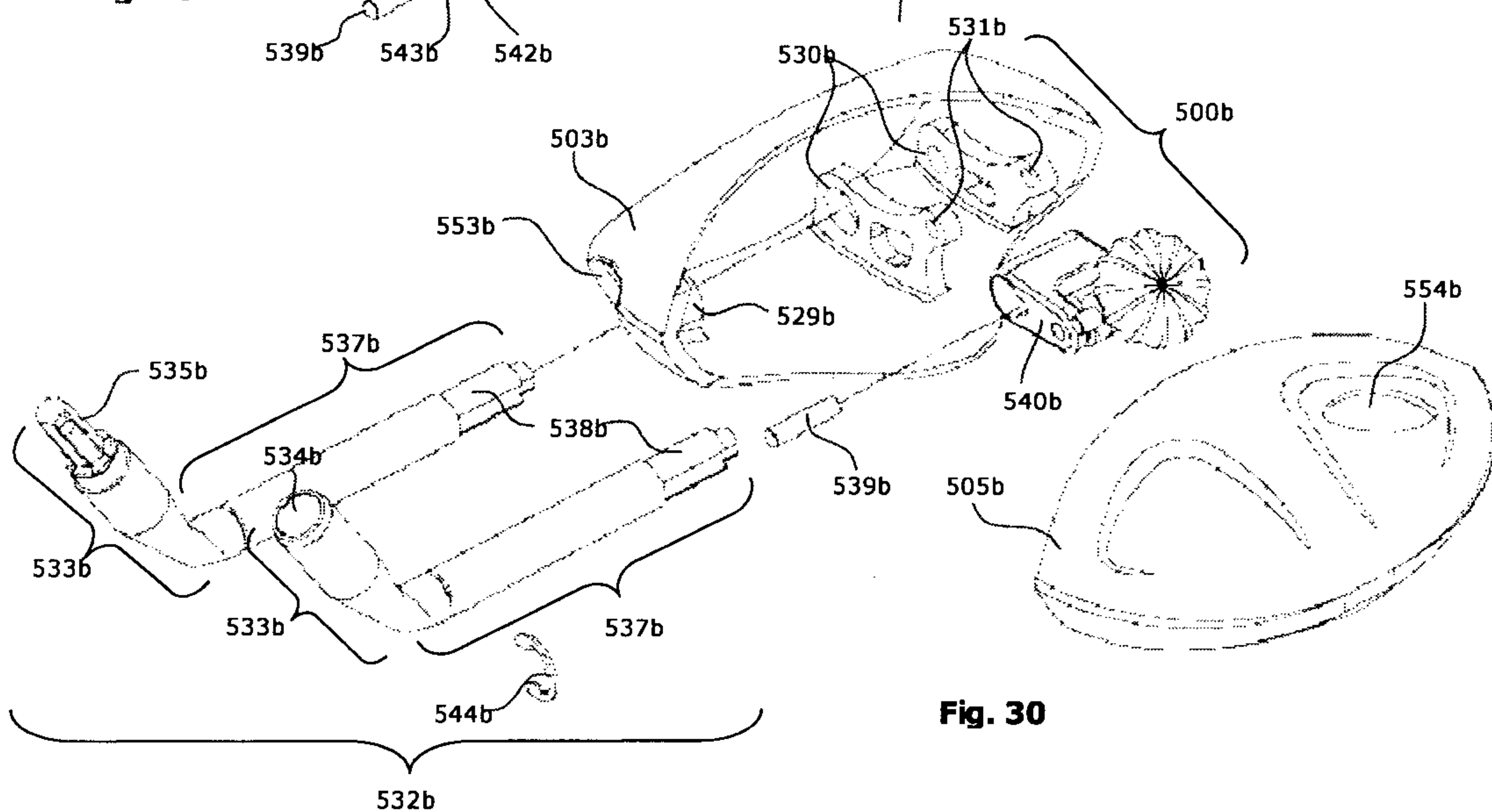


Fig. 30

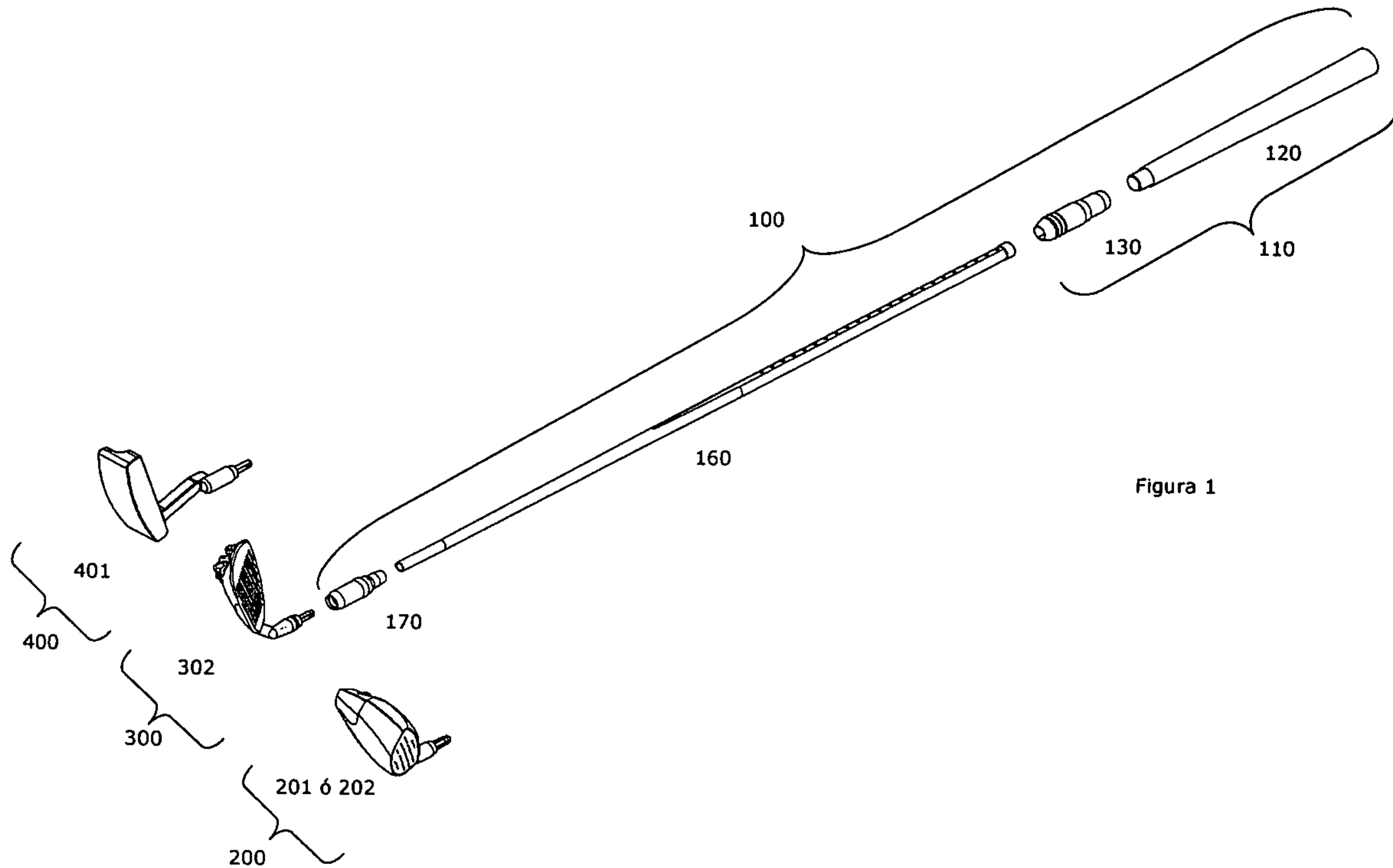


Figura 1