Office de la Propriété Intellectuelle du Canada
Un organisme d'Industrie Canada

Canadian Intellectual Property Office
An agency of Industry Canada

CA 2709756 C 2015/09/22

(11)(21) 2 709 756

(12) BREVET CANADIEN
CANADIAN PATENT

(13) C

(86) Date de dépôt PCT/PCT Filing Date: 2008/12/09
(87) Date publication PCT/PCT Publication Date: 2009/06/25
(45) Date de délivrance/Issue Date: 2015/09/22
(85) Entrée phase nationale/National Entry: 2010/06/17
(86) N° demande PCT/PCT Application No.: IB 2008/055168
(87) N° publication PCT/PCT Publication No.: 2009/077922
(30) Priorité/Priority: 2007/12/18 (US61/014,496)

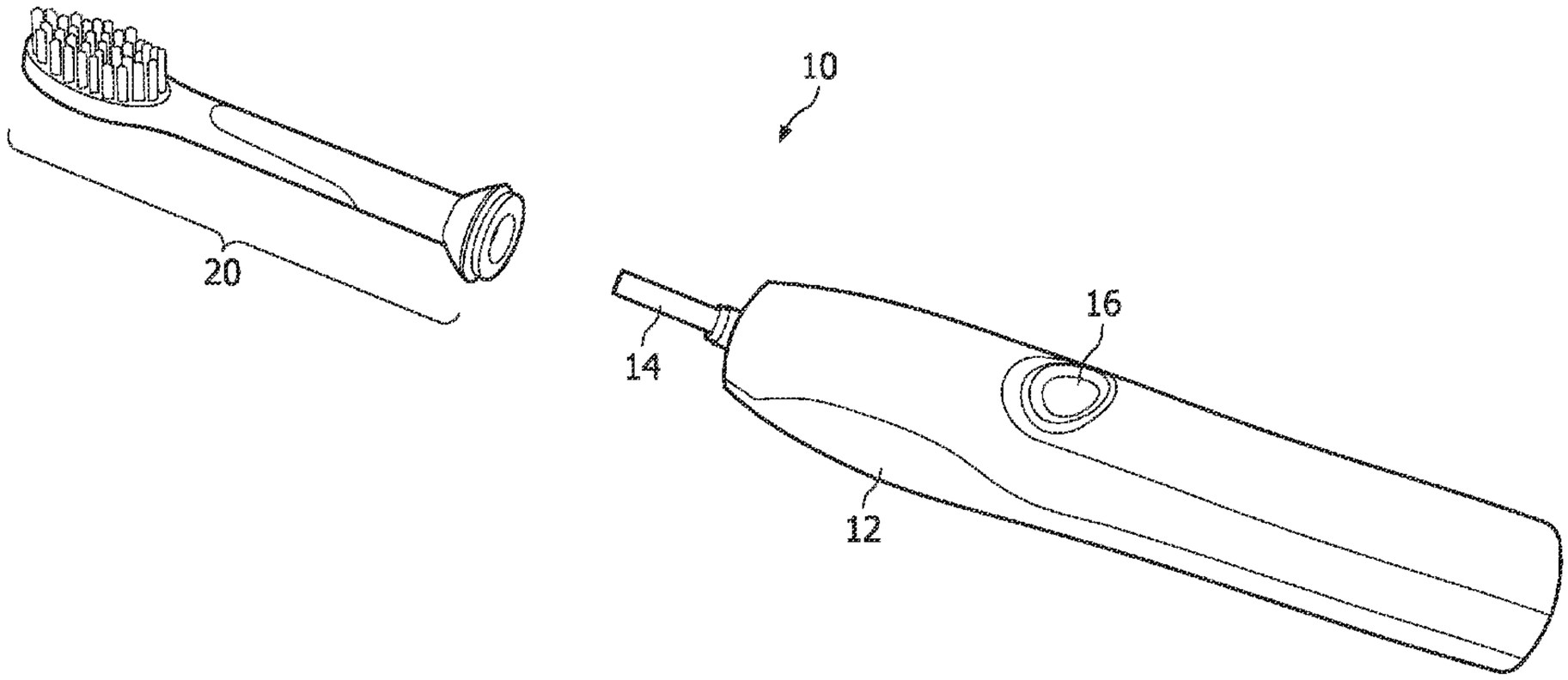
(51) Cl.Int./Int.Cl. *A61C 17/22* (2006.01)

(72) Inventeurs/Inventors:
SALE, KYLE, US;
HEADSTROM, PATRICK A., US;
KLOSTER, TYLER G., US

(73) Propriétaire/Owner:
KONINKLIJKE PHILIPS ELECTRONICS N.V., NL

(74) Agent: SMART & BIGGAR

(54) Titre : INTERFACE ENTRE TETE ET MANCHE DE BROSSE POUR BROSSE A DENTS ELECTRIQUE
(54) Title: A BRUSHHEAD/HANDLE INTERFACE FOR A POWER TOOTHBRUSH



(57) Abrégé/Abstract:
The brushhead/handle interface includes a brushhead assembly(20) which has a brush member (26) for cleaning teeth. A driveshaft (14) extends from a handle portion (12) of the toothbrush (10), which is driven in an oscillating manner through a selected rotational angle. The driveshaft includes one or more contact regions (49). The coupling member includes an interface portion or portions (46) which are forced against the contact regions of the driveshaft by a single spring member when the driveshaft is inserted into the coupling member. The single spring (34) exerts a sufficient force on the interface portions of the coupling member against the contact regions of the driveshaft to produce both a reliable torque transfer between the driveshaft and the brushhead assembly and to maintain axial retention of the brushhead assembly on the driveshaft during operation of the toothbrush.

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
25 June 2009 (25.06.2009)

PCT

(10) International Publication Number
WO 2009/077922 A1

(51) International Patent Classification:
A61C 17/22 (2006.01)

(21) International Application Number:
PCT/IB2008/055168

(22) International Filing Date:
9 December 2008 (09.12.2008)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
61/014,496 18 December 2007 (18.12.2007) US

(71) Applicant *(for all designated States except US)*: **KONINKLIJKE PHILIPS ELECTRONICS, N.V.** [NL/NL]; Groenewoudseweg 1, NL-5621 BA Eindhoven (NL).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **SALE, Kyle, A.** [US/US]; P.O. Box 3001, 345 Scarborough Road, Briarcliff Manor, NY 10510-8001 (US). **HEADSTROM, Patrick, A.** [US/US]; P.O. Box 3001, 345 Scarborough Road, Briarcliff Manor, NY 10510-8001 (US). **KLOSTER, Tyler, G.** [US/US]; P.O. Box 3001, 345 Scarborough Road, Briarcliff Manor, NY 10510-8001 (US).

(74) Agent: **DAMEN, Daniel, M.**; Philips Intellectual Property & Standards, High Tech Campus 44, P.O. Box 220, NL-5600 AE Eindhoven (NL).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, NO, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

— *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

Published:

— *with international search report*

[Continued on next page]

(54) **Title:** A BRUSHHEAD/HANDLE INTERFACE FOR A POWER TOOTHBRUSH

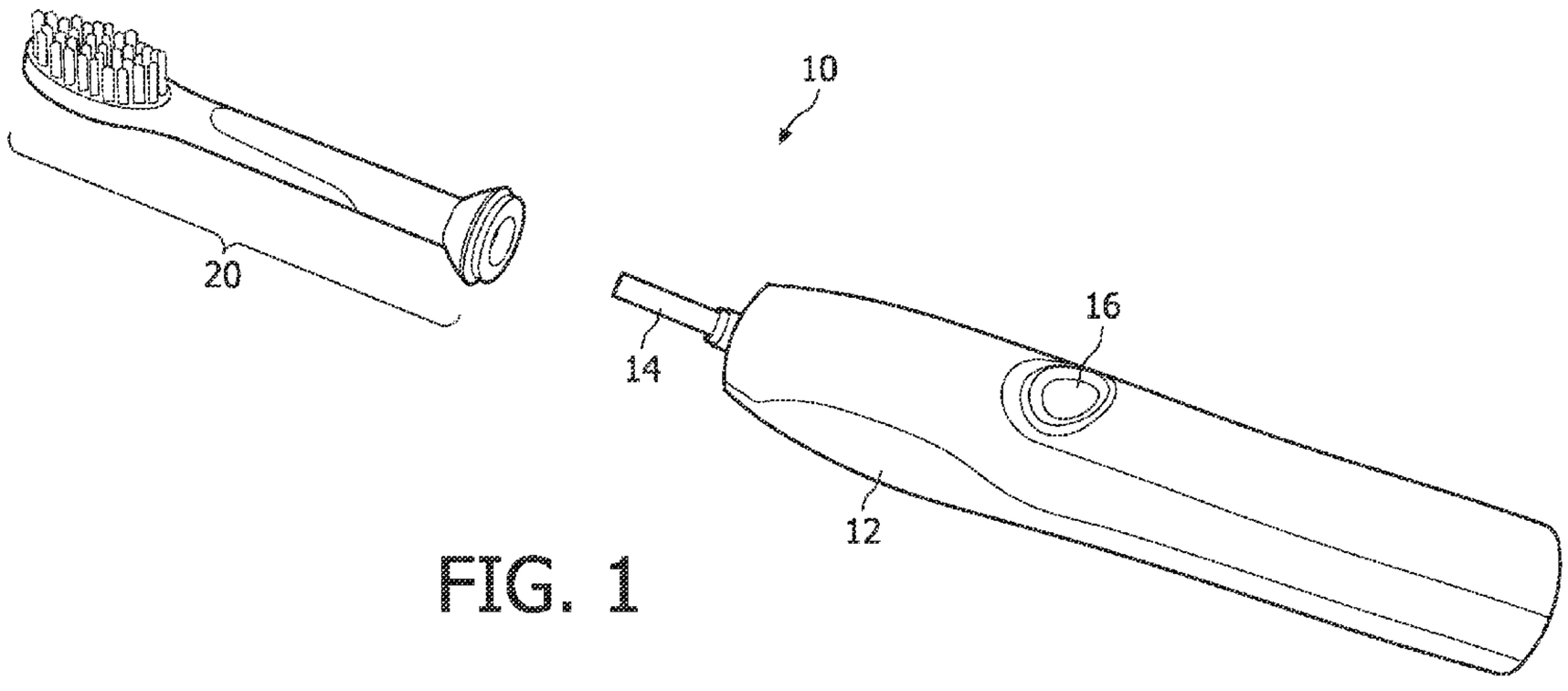


FIG. 1

(57) **Abstract:** The brushhead/handle interface includes a brushhead assembly(20) which has a brush member (26) for cleaning teeth. A driveshaft (14) extends from a handle portion (12) of the toothbrush (10), which is driven in an oscillating manner through a selected rotational angle. The driveshaft includes one or more contact regions (49). The coupling member includes an interface portion or portions (46) which are forced against the contact regions of the driveshaft by a single spring member when the driveshaft is inserted into the coupling member. The single spring (34) exerts a sufficient force on the interface portions of the coupling member against the contact regions of the driveshaft to produce both a reliable torque transfer between the driveshaft and the brushhead assembly and to maintain axial retention of the brushhead assembly on the driveshaft during operation of the toothbrush.

WO 2009/077922 A1

WO 2009/077922 A1

— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

A BRUSHHEAD/HANDLE INTERFACE FOR A POWER TOOTHBRUSH

This invention relates generally to handle/brushhead interface arrangements for power toothbrushes, and more specifically concerns such an interface in which the torque transfer function and axial retention function of the brushhead relative to the toothbrush driveshaft is accomplished by a single spring and coupling combination.

Many power toothbrushes have a structural arrangement in which a driveshaft, driven rotationally or through a selected angle of oscillation, extends from a handle portion of the toothbrush, with the drive mechanism being contained within the handle portion. A removable brushhead assembly fits onto the extending driveshaft. The brushhead assembly includes a coupling member, which fits into an arm portion of the brushhead assembly. At the distal end of the arm portion is a brush member for cleaning teeth. The driveshaft extends into and securely mates with the coupling member.

The structural interaction between the drive shaft and the coupling member must be such as to reliably transfer the torque of the moving driveshaft to the brushhead and to maintain the torque transfer under load. The load refers to a combination of the torque created by the inertial mass of the oscillating brushhead and the forces created by the interaction with the tissues and other elements of the user's mouth. The structural interaction must also be sufficient to hold the brushhead on the driveshaft, which is referred to as axial retention, during operation of the toothbrush, while also permitting the brushhead to be conveniently removed by the user. Axial retention can be a challenging aspect of such an arrangement if the brushhead is to be removed regularly for cleaning or other purposes. The arrangement must be such that the functions of torque transfer and axial retention are not degraded even after the brushhead assembly has been removed numerous, perhaps hundreds, of times during the lifetime of the brushhead assembly.

The present arrangement is capable of reliably providing both the torque transfer and the axial retention functions, while permitting a large number of removals of the brushhead assembly from the driveshaft.

The disclosed arrangement is a brushhead/handle interface for a power toothbrush, comprising: a brushhead assembly having a brush member at one end thereof for cleaning teeth; a driveshaft extending from a handle portion of the toothbrush, driven such that it oscillates through a selected rotational angle, the driveshaft having one or more contact regions in which are located interface surfaces; a coupling member positioned at the other end of the brushhead assembly for receiving the driveshaft, wherein the coupling member includes one or more interface portions which come into physical contact with said interface surfaces of the driveshaft when the driveshaft is inserted into the coupling member; and a spring member positioned so as to exert a force against the coupling member large enough that the physical contact between said interface portion or portions of the coupling member and said one or more contact regions of the driveshaft is sufficient to produce a reliable torque transfer between the drive shaft and the brushhead assembly and to maintain axial retention of the brushhead assembly on the driveshaft during operation of the toothbrush, while permitting a user to remove the brushhead assembly from the driveshaft when the toothbrush is not operating.

According to an aspect there is provided a brushhead/handle interface for a power toothbrush, comprising: a brushhead assembly having a brush member at one end thereof for cleaning teeth; a driveshaft extending from a handle portion of the toothbrush, driven such that it oscillates through a selected rotational angle, the driveshaft having one or more contact regions in which are located interface surfaces; a coupling member positioned at the other end of the brushhead assembly and having a body with an internal axial opening for receiving the driveshaft, wherein the coupling member includes one or more interface portions which come into physical contact with said interface surfaces of the driveshaft when the driveshaft is inserted into the coupling member; and a spring member positioned around a part of the body portion so as to exert a force against the coupling member large enough that the physical contact between said interface portion or portions of the coupling member and said one or more contact regions of the driveshaft is sufficient to produce a reliable torque transfer between the driveshaft and the brushhead assembly and to maintain axial retention of the brushhead assembly on the driveshaft during operation of the toothbrush, while permitting a

user to remove the brushhead assembly from the driveshaft when the toothbrush is not operating.

Figure 1 is a partially exploded view of a toothbrush described herein comprising a handle portion and a brushhead assembly portion.

Figure 2 is an exploded view of the brushhead assembly portion of Figure 1.

Figures 3A and 3B are isometric views of the coupling member shown in Figure 2.

Figure 4 is an isometric view of a spring member portion of the brushhead assembly of Figure 2.

Figure 5 is a cross-sectional view of the coupling member of Figure 2.

Figure 6 is an isometric view of a driveshaft with a first contact surface embodiment.

Figure 7 is an elevational view of a driveshaft with another contact surface embodiment.

Figure 8 is a side elevational view of the driveshaft of Figure 6.

Figure 9 is a simplified cross-sectional view of the handle/brushhead assembly interface of Figures 5, 6 and 8.

Figures 10A-10C are simplified cross-sectional views of three variations of another embodiment of the brushhead assembly/handle interface.

Figure 11 is a simplified cross-sectional view of another embodiment of the brushhead assembly/handle interface.

Figures 12A-12C are simplified cross-sectional views of three variations of another embodiment of the brushhead assembly/handle interface.

Figures 13A-13C are simplified cross-sectional views of three variations of a still further embodiment of the brushhead assembly/handle interface.

Figure 1 shows a toothbrush 10 which includes a handle portion 12 with a drive assembly which includes an extending driveshaft 14, the driveshaft driven by a motor (not shown) positioned within handle 12. The motor moves the driveshaft in an oscillating manner through a selected angle. The motor is controlled by a user-operated on/off switch 16. Removably mounted on driveshaft 14 is a brushhead assembly 20.

Referring to Figure 2, the brushhead assembly 20 includes a coupling assembly 22 which fits snugly into and is captured by an arm portion 24 of the brushhead assembly. Positioned on a distal end of the arm portion is a conventional brush member 26 which cleans the teeth. In operation, brush member 26 rotates/oscillates back and forth through a selected angle to accomplish the desired cleansing. The coupling assembly may further include a ring 28 at the proximal end 30 of the coupling assembly. The ring can be different colors to identify the user of the brushhead assembly. The coupling assembly further includes a spring member 34 which fits around a portion of the body of the coupling assembly 22.

The coupling assembly is shown in more detail in Figures 3A and 3B. It includes a base portion 36, the lower end of which may be configured to receive ring 28. Forward of ring 28 is an inwardly angled surface portion 38, substantially cone-shaped. Forwardly of the angled portion 38 is a coupling body portion 40. The body portion 40 includes an internal axial opening which receives the driveshaft 14. Along one side of the body portion 40 is a rib 41 which extends for substantially the length of the body portion, the rib fitting snugly into a mating slot in arm portion 24. The rib 41 locates and maintains the physical relationship between the coupling assembly and the arm portion 24.

On the opposite side of the body portion from rib 24 is a coupling strip 44. This is shown in both Figures 3B and Figure 5. In the embodiment shown, coupling strip 44 is fixedly mounted to the body portion 40 at the opposing ends of the strip and is free to flex to some extent between its two ends. The body portion 40 is made from acetal which permits flexing of the coupling strip to occur, while being tough enough to resist abrasion and compression deformation or creep during the life of the brushhead. Coupling strip 44 is approximately 0.6 mm long and approximately 0.3 mm wide. It is approximately 0.80 mm thick, except for a first interface contact member portion 46, which is approximately 1.323 mm thick. The first interface contact member 46 is a bulge or block which extends inwardly from coupling strip 44 approximately 0.16 mm, sufficient to make a significant physical contact with the inserted driveshaft 14. Alternatively, the first interface contact member could be located on spring member 34, in which case the coupling strip 44 could be eliminated.

As indicated above, spring member 34 is positioned around a part of the body portion 40 of the coupling assembly. Spring member 34 is shown in more detail in Figure 4. The spring member is, in the embodiment shown, an angled C-shaped configuration, although it could be other configurations, including an oval or a closed arrangement. The spring could also be a leaf spring or a coil spring. Spring member 34 is arranged and configured to provide an inwardly directed force against the body portion of the coupling assembly with sufficient frictional and physical contact between the body portion and the driveshaft to produce the desired torque transfer as well as axial retention. In the embodiment shown, this force is in the range of 30-60 newtons, preferably approximately 50 newtons. The body portion of the coupling assembly and the extending portion of the driveshaft can be of various configurations to achieve this desired functional result.

In one embodiment, referring to Figures 6 and 8, a contact portion 49 on the driveshaft includes a plurality of grooves 50 which extend laterally across the contact portion, which is flat. In this embodiment, there are a total of five grooves, which number can be varied. The grooves are approximately 0.10 mm deep, have a generally curved configuration, with a distance of 0.65 mm center to center. The physical interaction

between the grooves 50 in the first contact portion of the driveshaft and the first interface contact member 46 produces a good torque transfer between the driveshaft and the brushhead assembly, as well as sufficient axial retention to maintain the brushhead assembly on the driveshaft during operation of the toothbrush. The axial retention is also such as to permit the user to conveniently remove the brushhead from the driveshaft for cleaning and the like, without degrading the torque transfer and axial retention functions.

Figure 7 shows another embodiment of a driveshaft contact portion 55. In this embodiment, contact portion 55 has been roughened, such as by sandblasting or the like. The surface finish is 0.80 μmeters or rougher, *e.g.* up to 1.6 μmeters. This driveshaft surface, with the interface contact member 46 of the coupling member described above, is also sufficient to accomplish the desired torque transfer and axial retention functions.

Figure 9 shows a simplified representation of the embodiment of Figures 5, 6 and 8. It includes a grooved driveshaft 64, an interface contact member 66 of a coupling member and a representation of the spring function at 68. Portions 70-70 refer generally to the brushhead assembly arm, in which the coupling assembly is mounted. Portion 69 refers to the part of the coupling member on the opposite side of the driveshaft from the interface contact member. In this embodiment, the spring pressure is against the interface contact member, which bears directly against the grooves 71 on the driveshaft 64.

Figures 10A-10C show another embodiment in which driveshaft 72 has a slot in a surface thereof, the slot being sufficiently large to accommodate an interface contact member portion of the coupling assembly. Each of the embodiments of Figures 10A-10C includes a spring function 73. Figure 10A shows a slot 74 in surface 76 of driveshaft 72 and an interface contact member 77 fitting therein. Figure 10B shows a slot 80 in surface 81 of the driveshaft opposite from spring function 73 and an interface contact member 75 which extends from coupling assembly on the opposite side from spring function73 into slot 80. Figure 10C shows a driveshaft 72 with slots 86 and 88 on both (opposing) sides of the driveshaft, into which are fitted a first interface contact member 90 on the same side of the driveshaft as spring function 73, and a second interface contact member 92 extending from coupling assembly 93 on the opposite side of the driveshaft from spring function 73.

Figure 11 shows a further embodiment, in which a driveshaft 96 includes a protrusion 98 from surface 99 thereof, on the spring function side of the driveshaft. Interface contact member 100 is positioned adjacent to one end 102 of the driveshaft protrusion 98.

Figures 12A-12C show additional embodiments in which protrusions are located on one or both sides of the driveshaft, with the interface contact members having a slot into which the protrusions fit. In Figure 12A, driveshaft 104 includes a protrusion 106 on the spring function side of the driveshaft. Interface contact member 108 includes a slot 110 into which protrusion 106 fits. Figure 12B shows a driveshaft 112 with a protrusion 114 on the side opposite from the spring function side. Protrusion 114 fits into a slot 118 in the coupling assembly on the side opposite from the spring function side of the coupling assembly. Figure 12C shows a driveshaft 124 having protrusions 126 and 128 on opposing sides of the driveshaft. On the spring side of the driveshaft is interface contact member 130, which has a slot 132 therein to receive protrusion 126, while in the opposing side of the coupling assembly is a slot 136 into which fits protrusion 128.

Figures 13A-13C show further embodiments with roughened surfaces on contact portions of the driveshaft, like that shown in Figure 7. Figure 13A includes a driveshaft 140 having a roughened surface region 142 on the spring function side of the driveshaft. Interface contact member 144 makes sufficient physical contact with the roughened surface 142 to accomplish the desired functions. Figure 13B shows a driveshaft 146 with a roughened surface region 148 on the side of the driveshaft opposite from the spring function. Coupling assembly portion 150 on the opposite side of the driveshaft makes the required physical contact with the roughened region 148. Figure 13C shows a driveshaft 152 with roughened surface regions 154 and 156 on opposite sides of the driveshaft. Interface contact member 160 engages roughened surface region 154, while the surface of coupling assembly portion 164 on the opposite side from interface member 160 engages roughened surface region 156.

It should be understood that other arrangements/configurations between the driveshaft and portions of the coupling assembly are possible.

Although a preferred embodiment of the invention has been disclosed here for the purposes of illustration, it should be understood that various changes, modifications and substitutions may be incorporated in the embodiment without departing from the scope of the invention, which is defined by the claims which follow.

64869-1404

CLAIMS:

1. A brushhead/handle interface for a power toothbrush, comprising:

a brushhead assembly having a brush member at one end thereof for cleaning teeth;

a driveshaft extending from a handle portion of the toothbrush, driven such that it oscillates through a selected rotational angle, the driveshaft having one or more contact regions in which are located interface surfaces;

a coupling member positioned at the other end of the brushhead assembly and having a body with an internal axial opening for receiving the driveshaft, wherein the coupling member includes one or more interface portions which come into physical contact with said interface surfaces of the driveshaft when the driveshaft is inserted into the coupling member; and

a spring member positioned around a part of the body portion so as to exert a force against the coupling member large enough that the physical contact between said interface portion or portions of the coupling member and said one or more contact regions of the driveshaft is sufficient to produce a reliable torque transfer between the driveshaft and the brushhead assembly and to maintain axial retention of the brushhead assembly on the driveshaft during operation of the toothbrush, while permitting a user to remove the brushhead assembly from the driveshaft when the toothbrush is not operating.

2. The interface of claim 1, wherein the coupling member includes a coupling strip member fixedly mounted to the body portion of the coupling member at the opposing ends of the strip member and is free to flex to some extent between its two ends so as to permit movement of the strip member therebetween, and wherein the coupling strip member includes an interface portion, extending inwardly in the direction of the driveshaft, resulting in physical contact between said interface portion and an interface surface of the driveshaft when the driveshaft is received in the brushhead assembly.

3. The interface of claim 1, wherein the user is able to remove the brushhead assembly a large plurality of times without degrading the torque transfer and axial retention capabilities.

4. The interface of claim 1, wherein the spring member is substantially C-shaped in cross-section.

5. The interface of claim 2, wherein the interface surfaces of the driveshaft include a plurality of lateral grooves which extend across the contact region of the driveshaft and wherein the interface portion of the coupling member is substantially larger than any of the grooves.

6. The interface of claim 2, wherein the interface surfaces of the driveshaft include a slot, and wherein an interface portion of the coupling member is configured to fit within the slot.

7. The interface of claim 6, wherein the interface surfaces of the driveshaft include a slot on a side of the driveshaft opposite from a side against which the spring force is exerted, and wherein one of the interface portions of the coupling member includes a protrusion configured to fit within said slot.

8. The interface of claim 6, wherein the interface surfaces of the driveshaft include slots in opposing sides thereof and wherein, the interface portions of the coupling member include protrusions configured to fit within the slots.

9. The interface of claim 1, wherein the interface surfaces of the driveshaft include a protrusion and wherein an interface portion of the coupling member fits against the driveshaft adjacent the protrusion.

10. The interface of claim 1, wherein the interface surfaces of the driveshaft include at least one protrusion extending therefrom, and wherein the interface portions of the coupling member include a slot into which the driveshaft protrusion fits.

11. The interface of claim 10, wherein the interface surfaces of the driveshaft

include protrusions on opposing sides thereof, and wherein the interface portions of the coupling member include slots which receive the protrusions.

12. The interface of claim 1, wherein the interface surfaces of the driveshaft include at least one roughened region, and wherein an interface portion of the coupling member makes said physical contact with the roughened portion.

13. The interface of claim 12, wherein the interface surfaces of the driveshaft include roughened regions on opposing sides of the driveshaft and wherein the interface portions of the coupling member make said physical contact with the roughened regions.

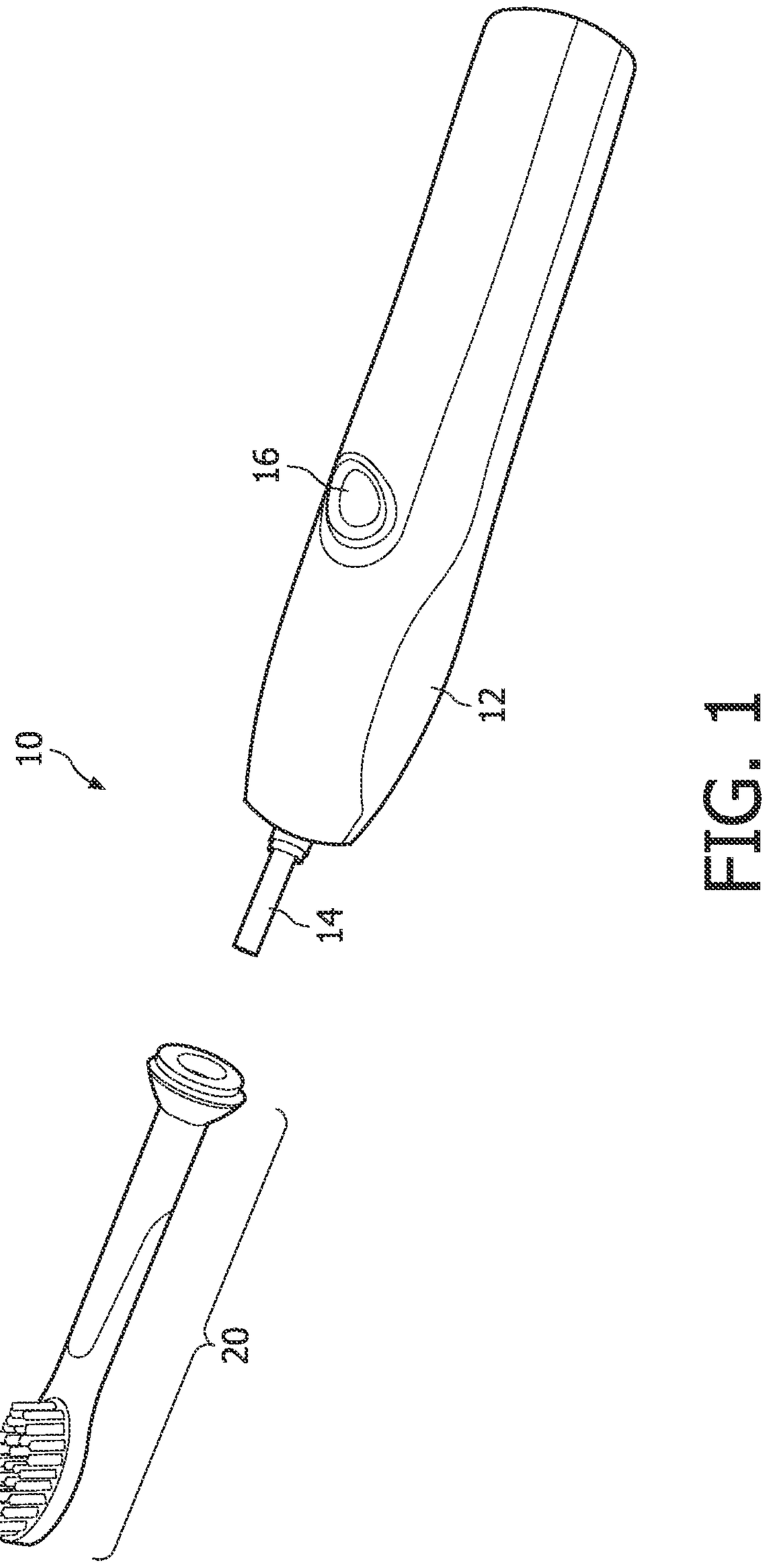


FIG. 1

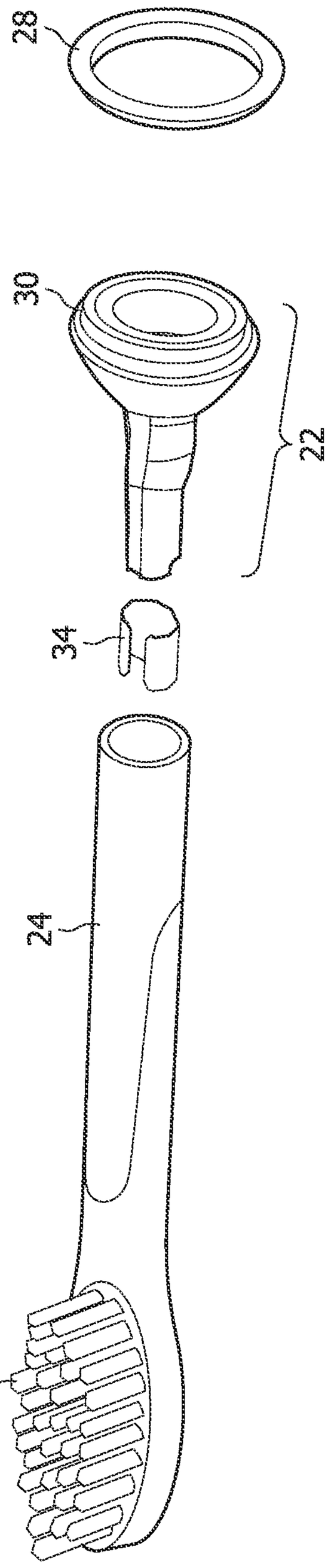


FIG. 2

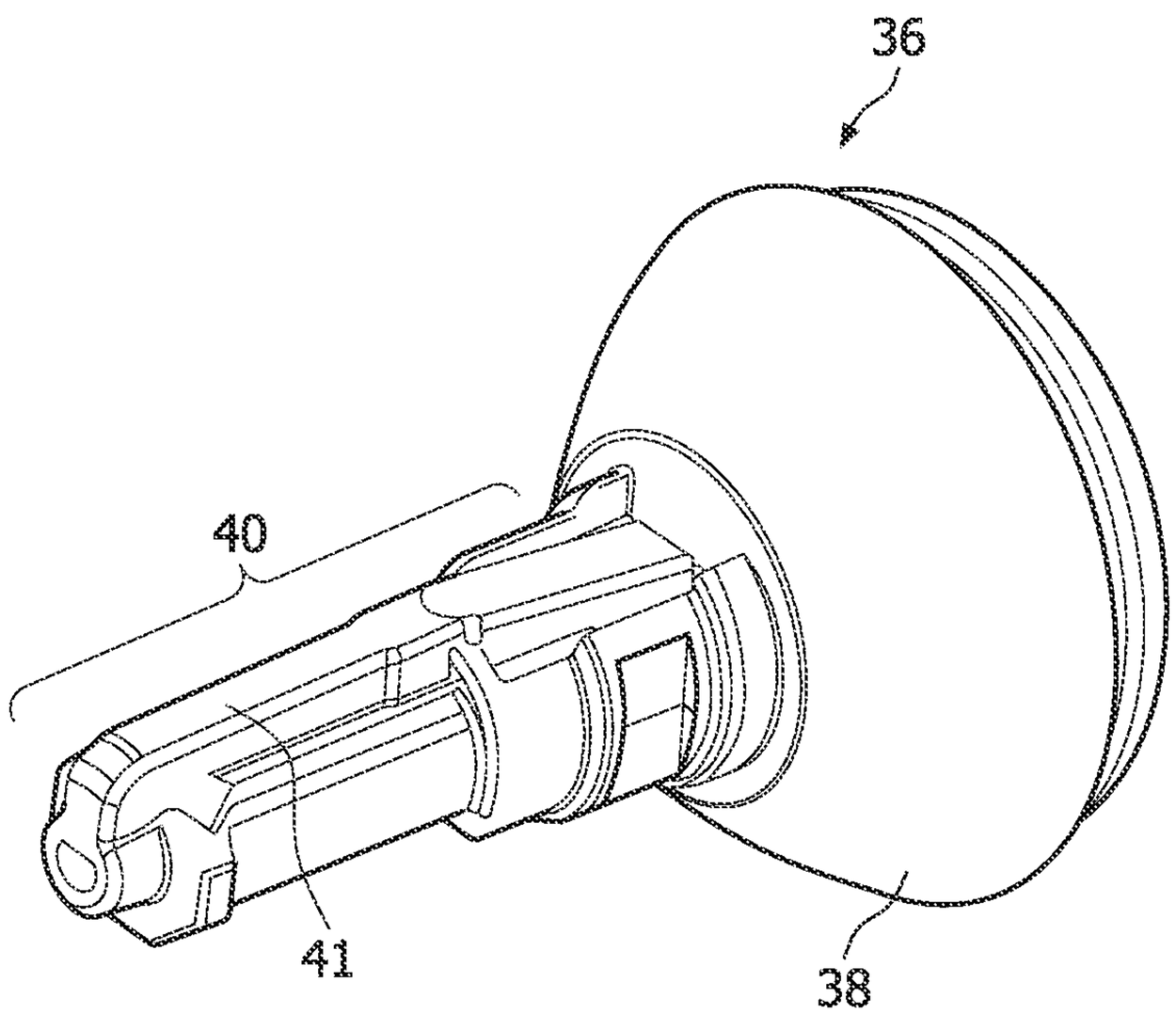


FIG. 3A

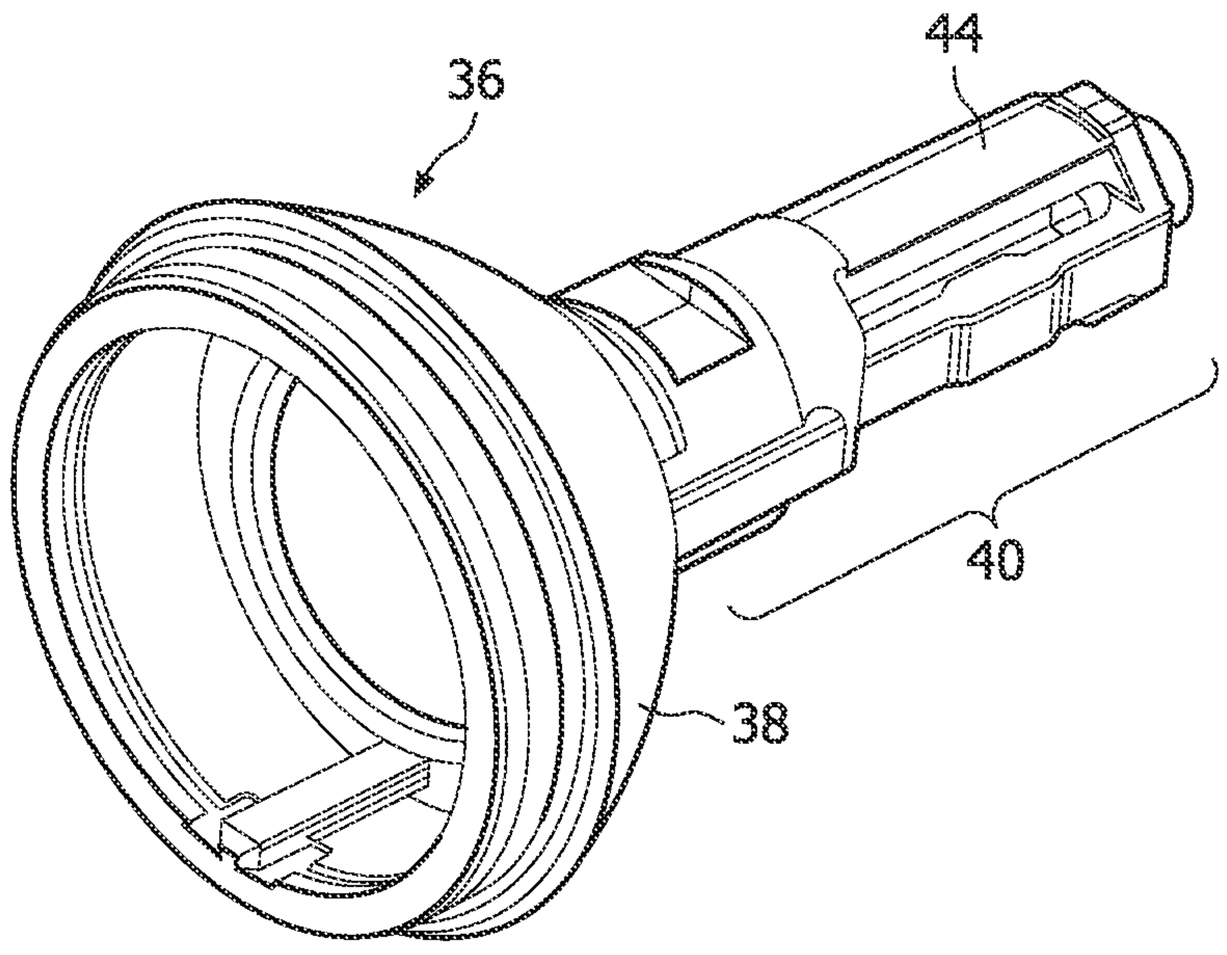


FIG. 3B

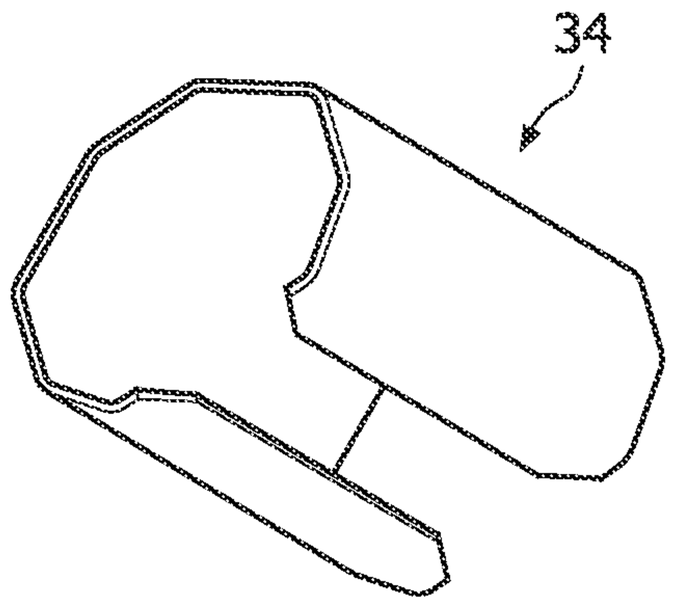


FIG. 4

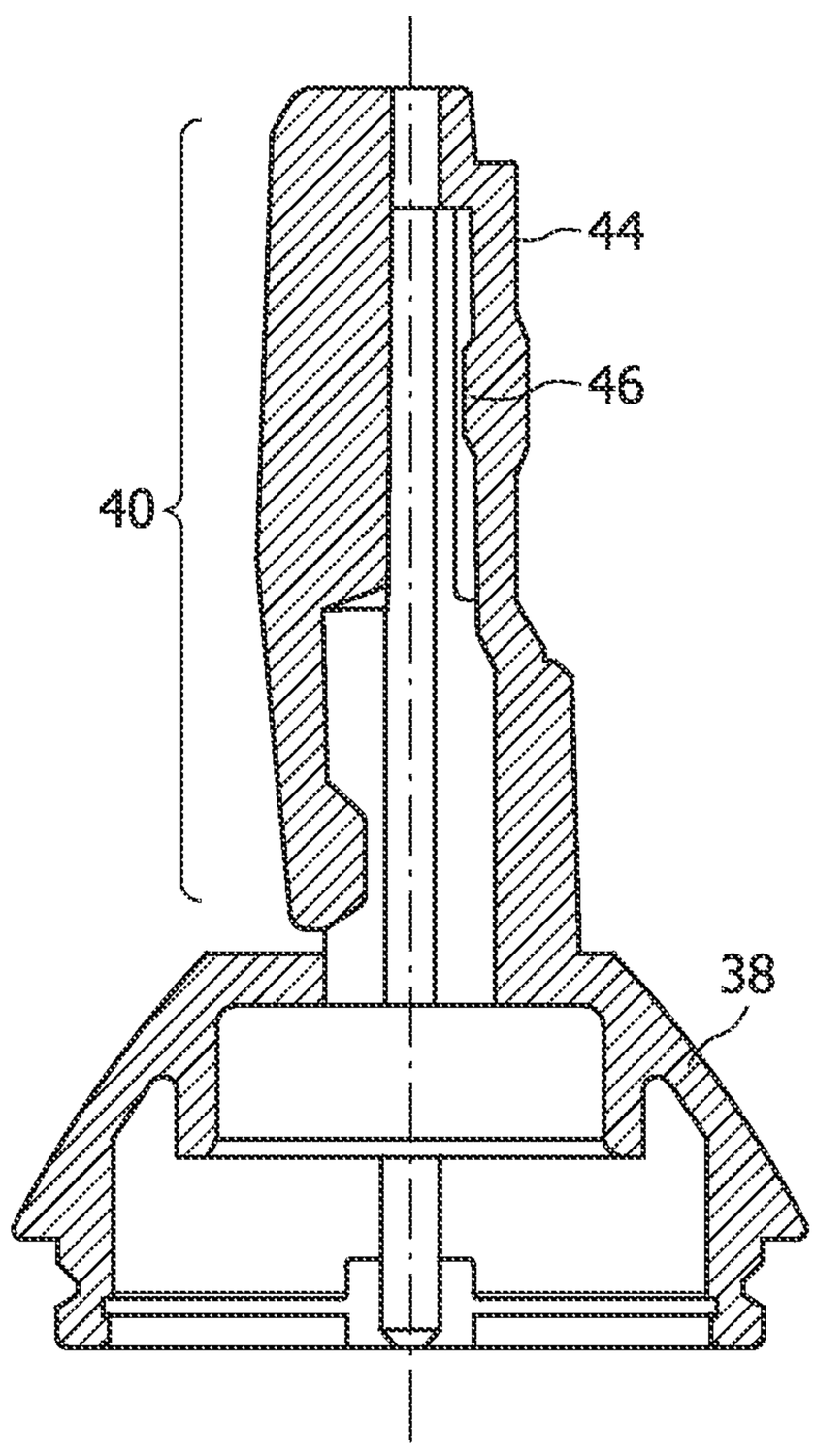


FIG. 5

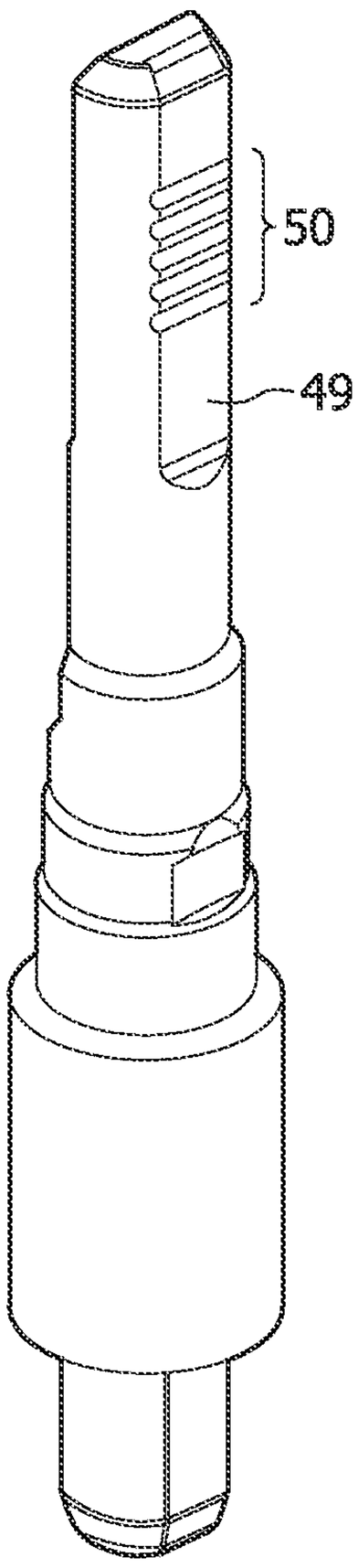


FIG. 6

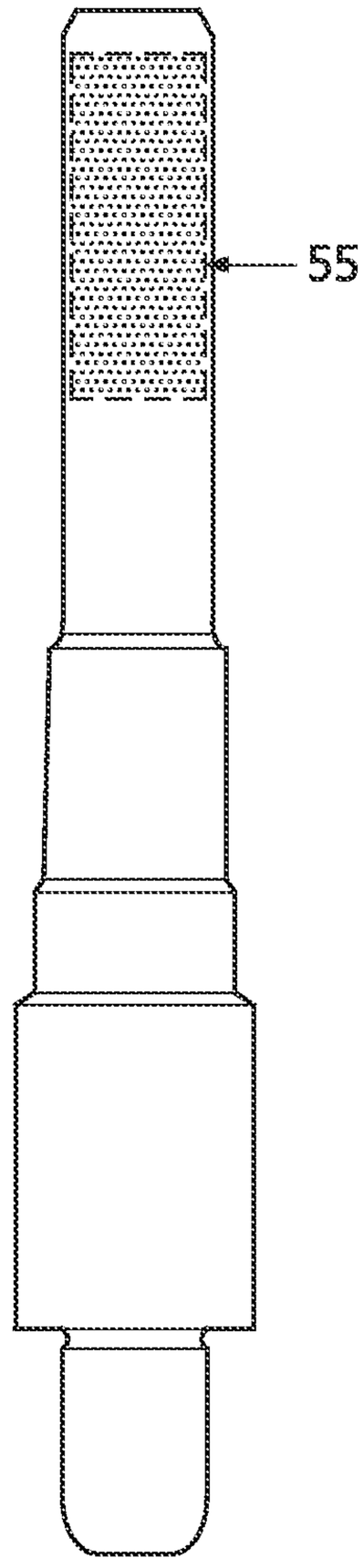


FIG. 7

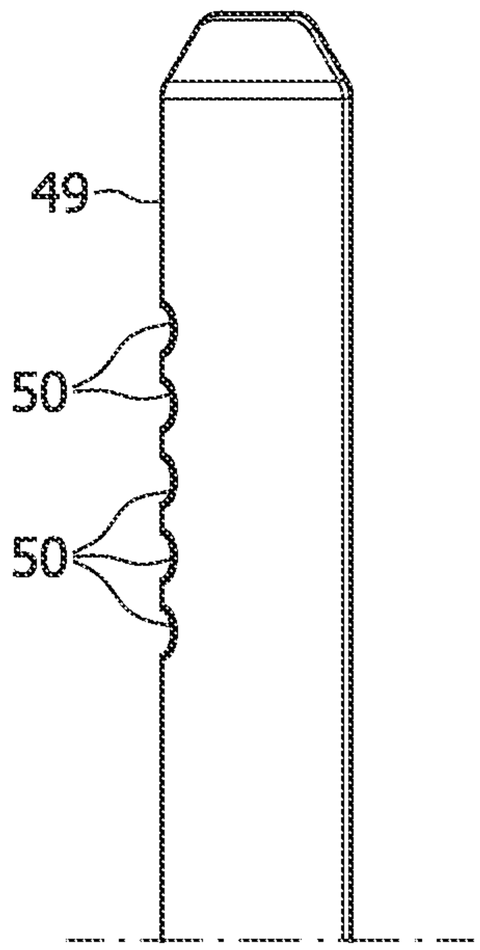


FIG. 8

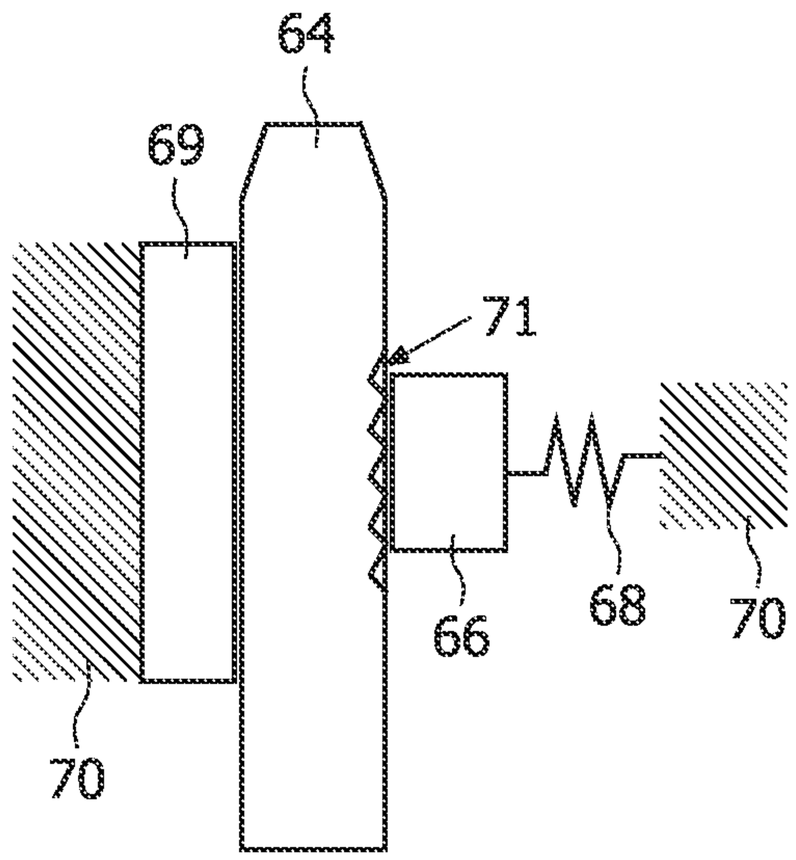


FIG. 9

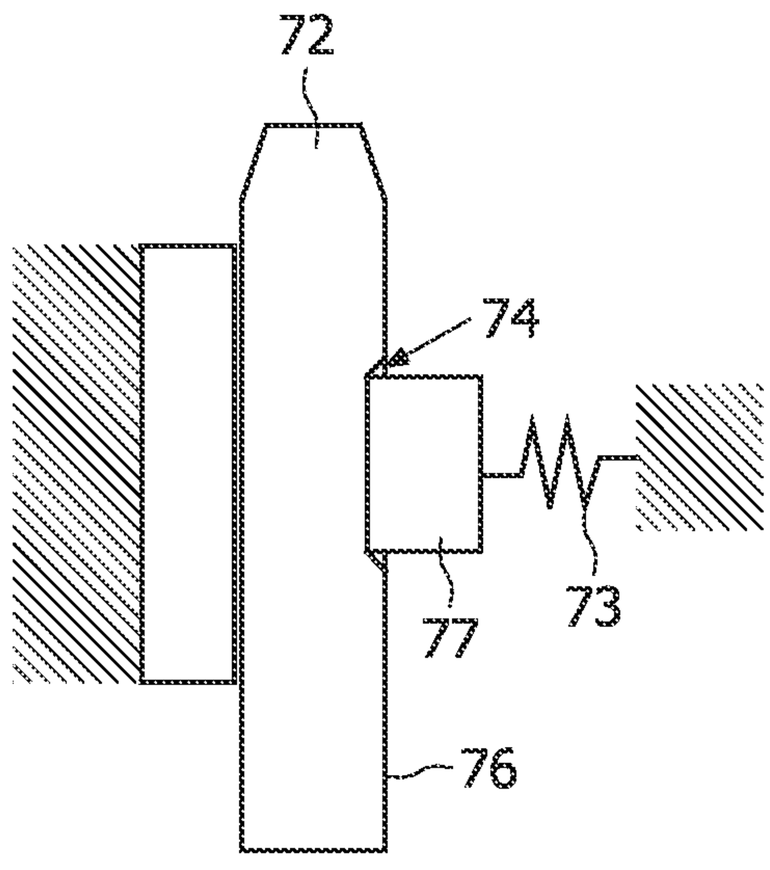


FIG. 10A

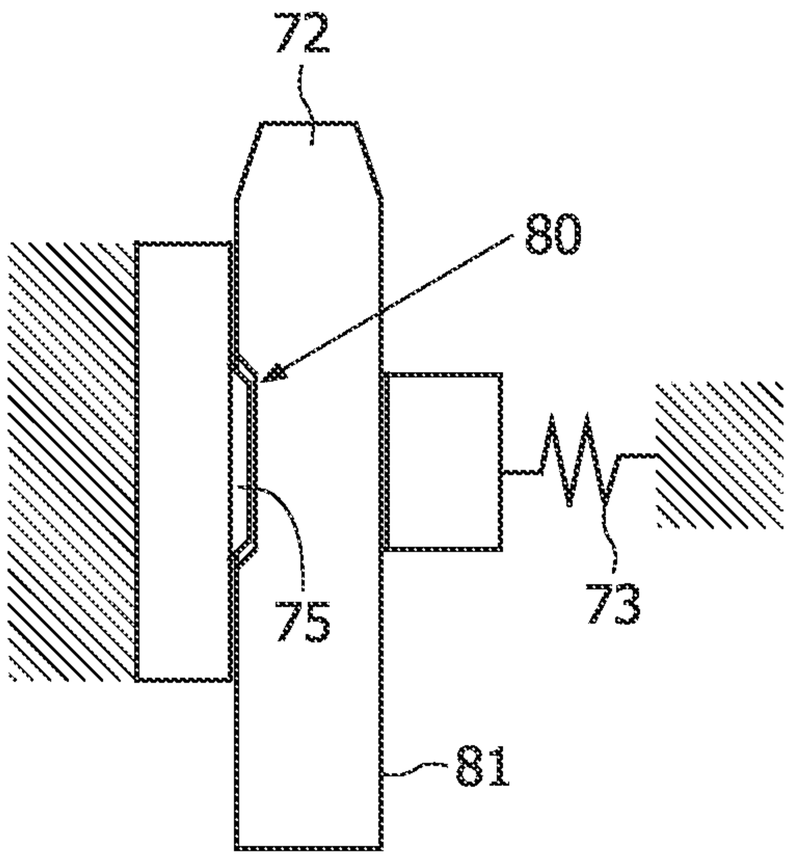


FIG. 10B

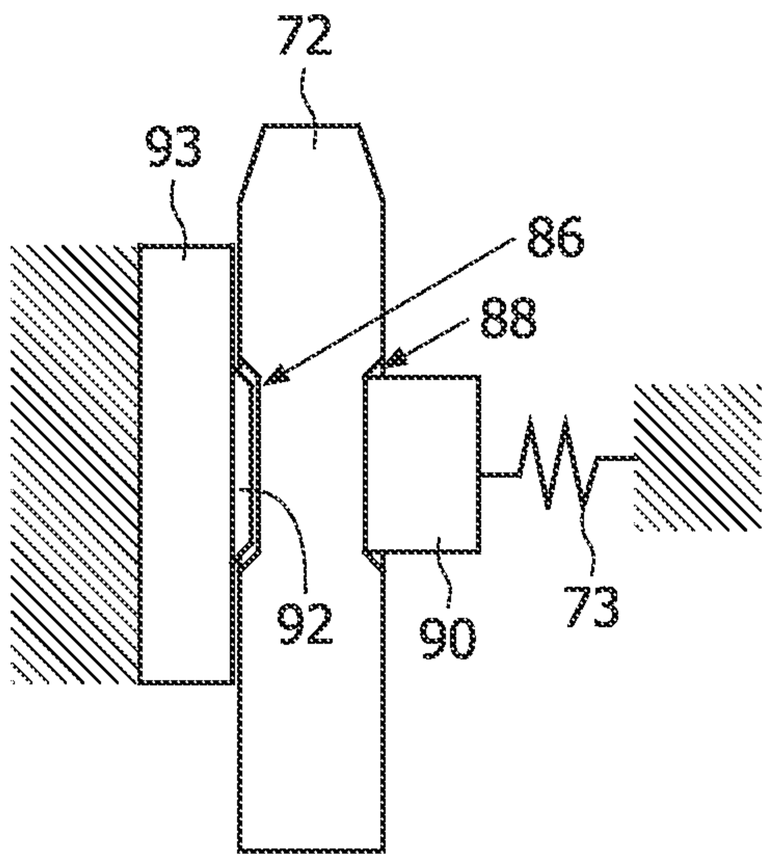


FIG. 10C

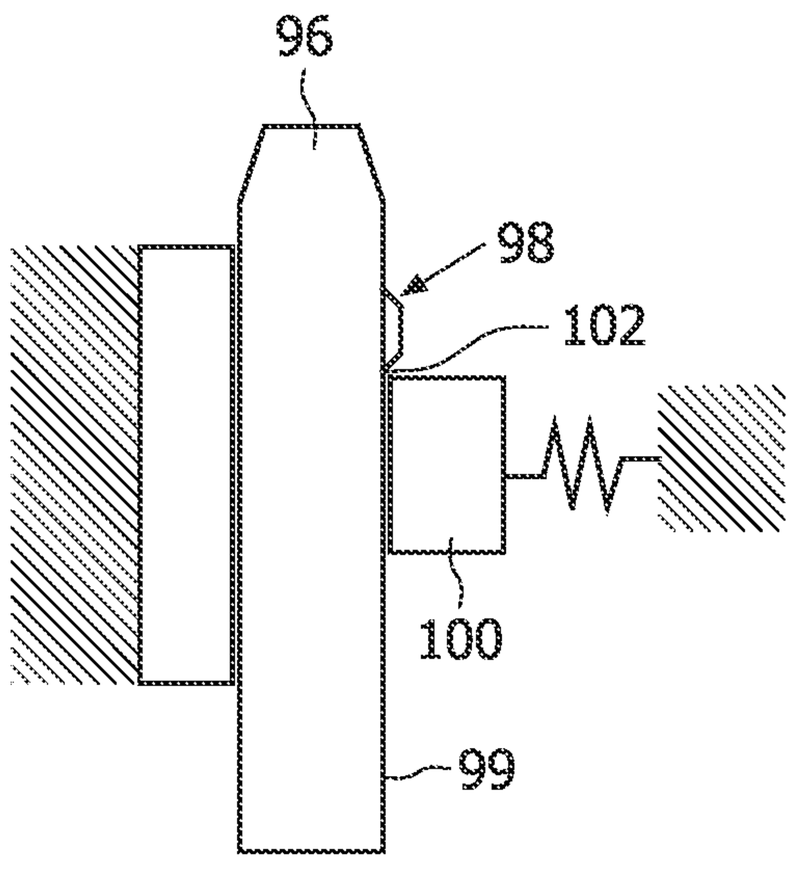


FIG. 11

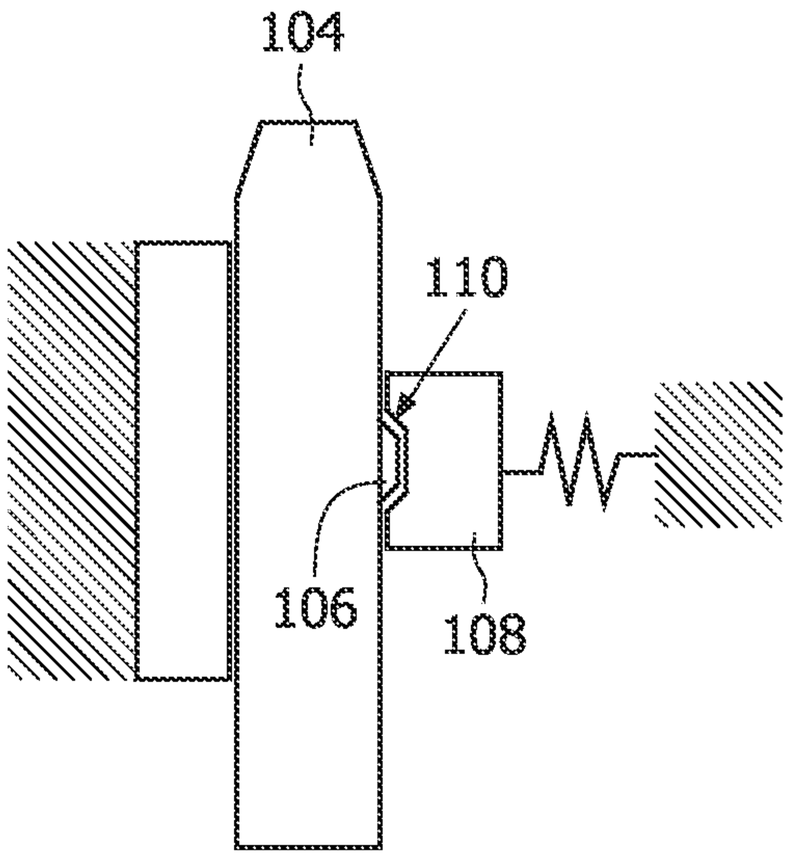


FIG. 12A

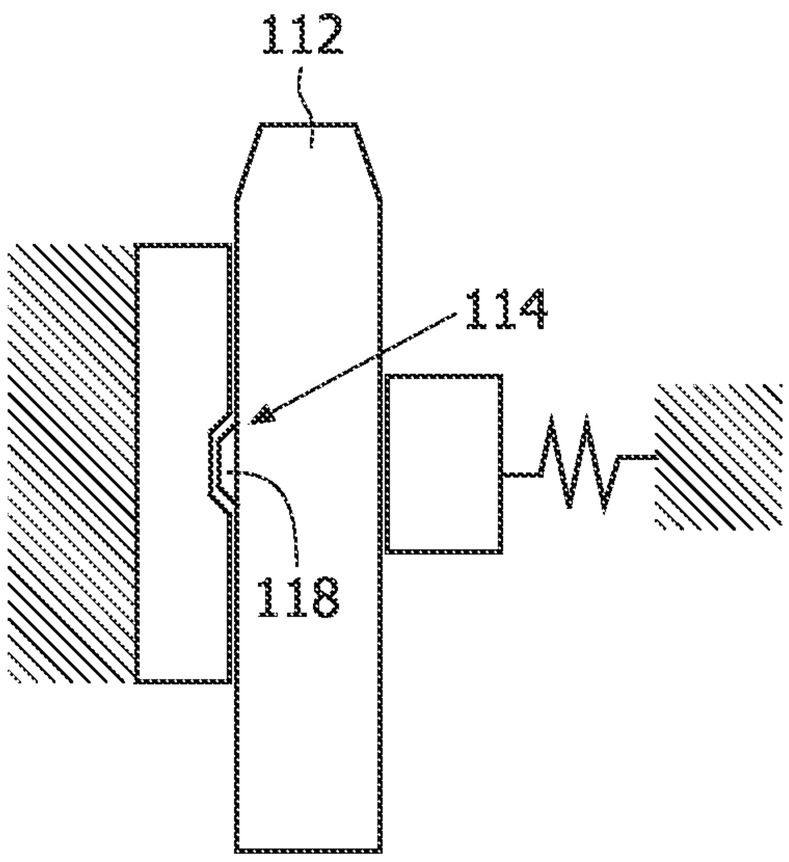


FIG. 12B

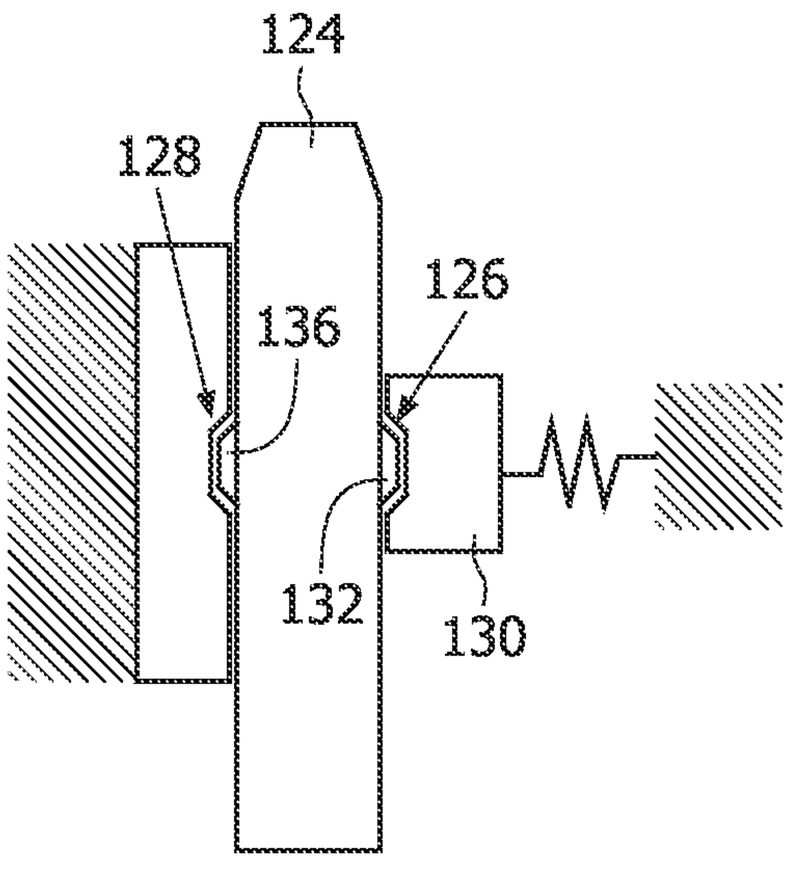


FIG. 12C

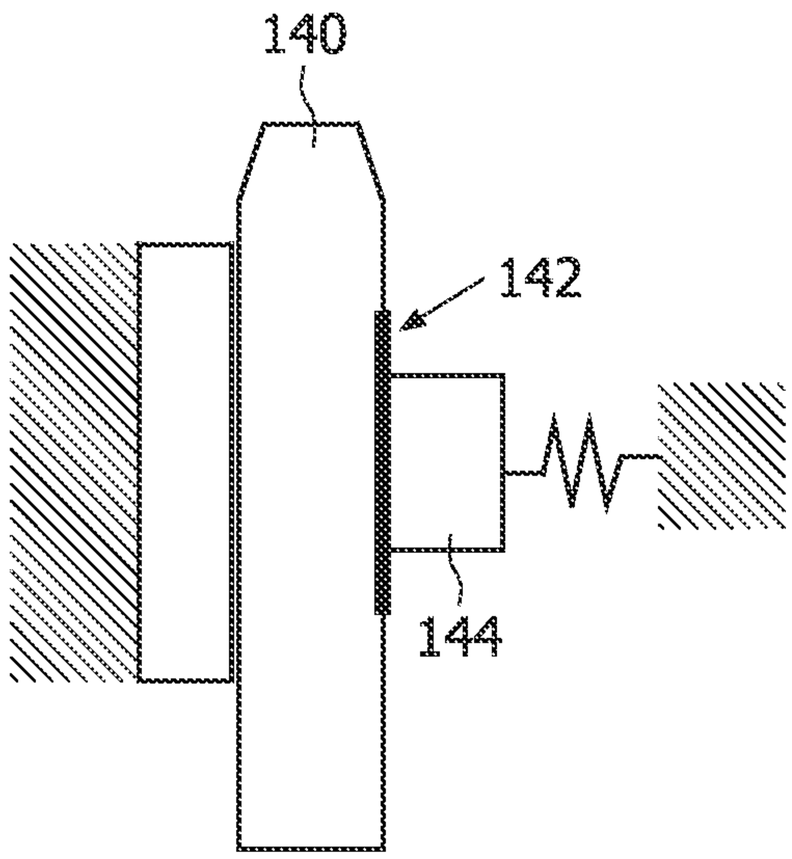


FIG. 13A

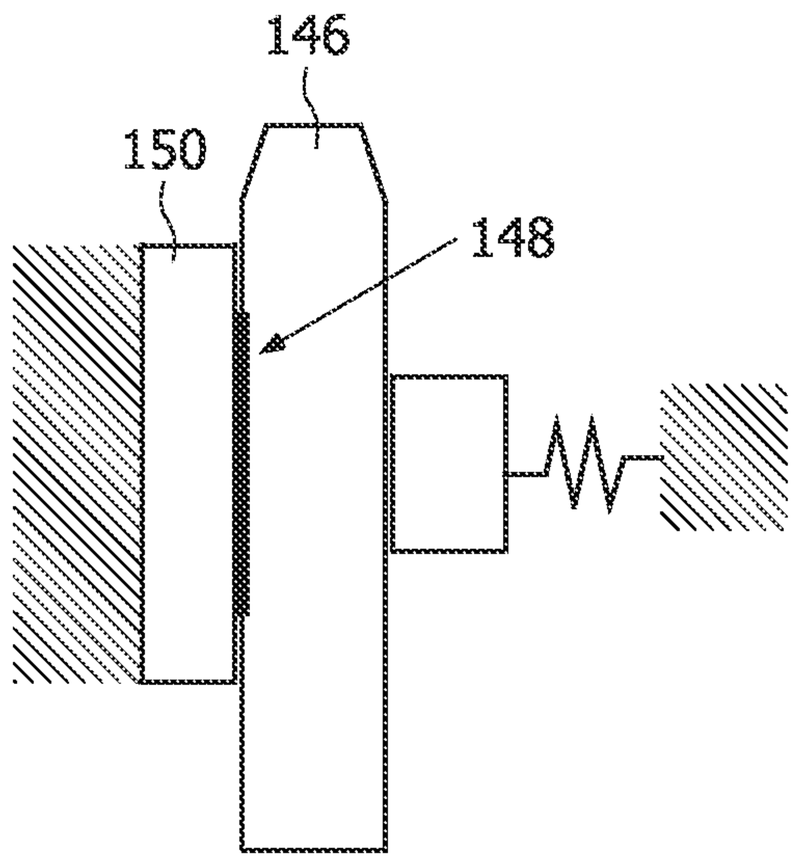


FIG. 13B

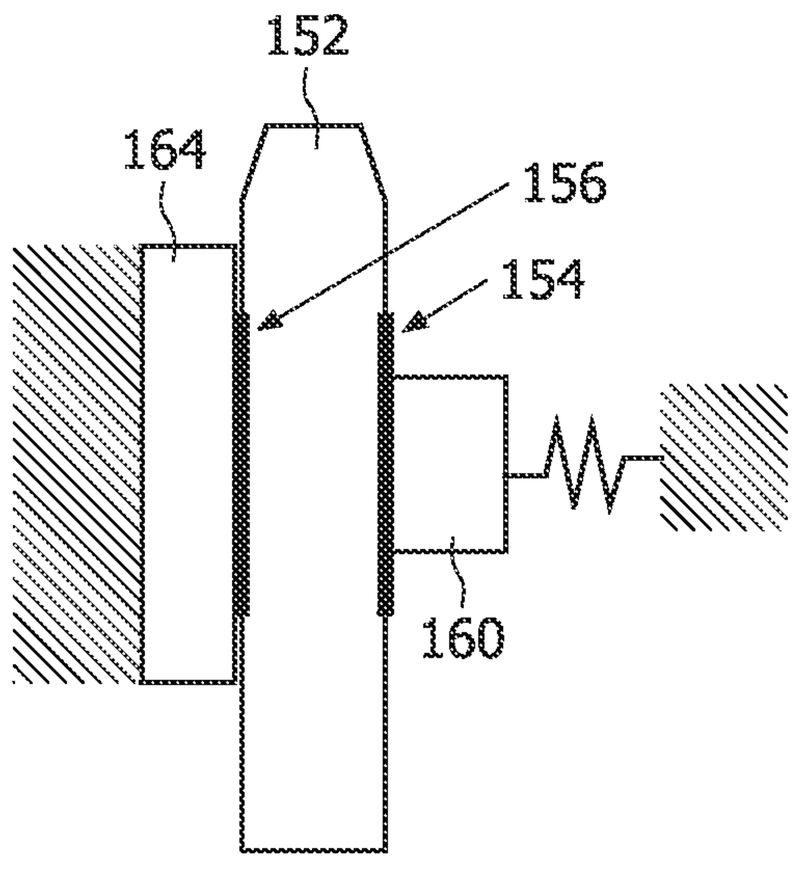
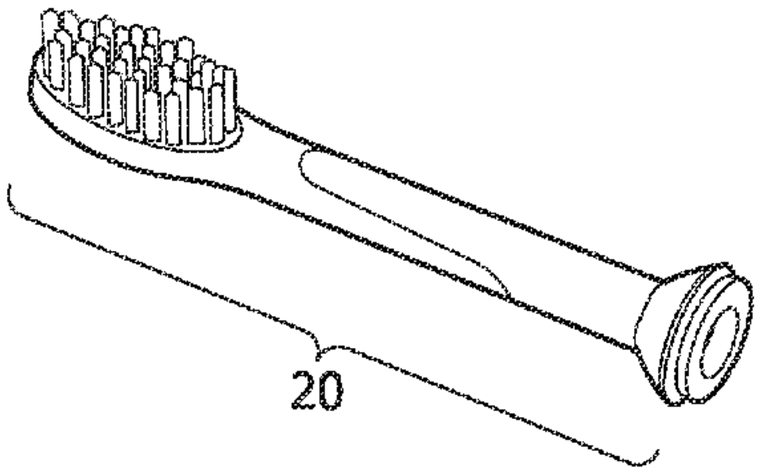
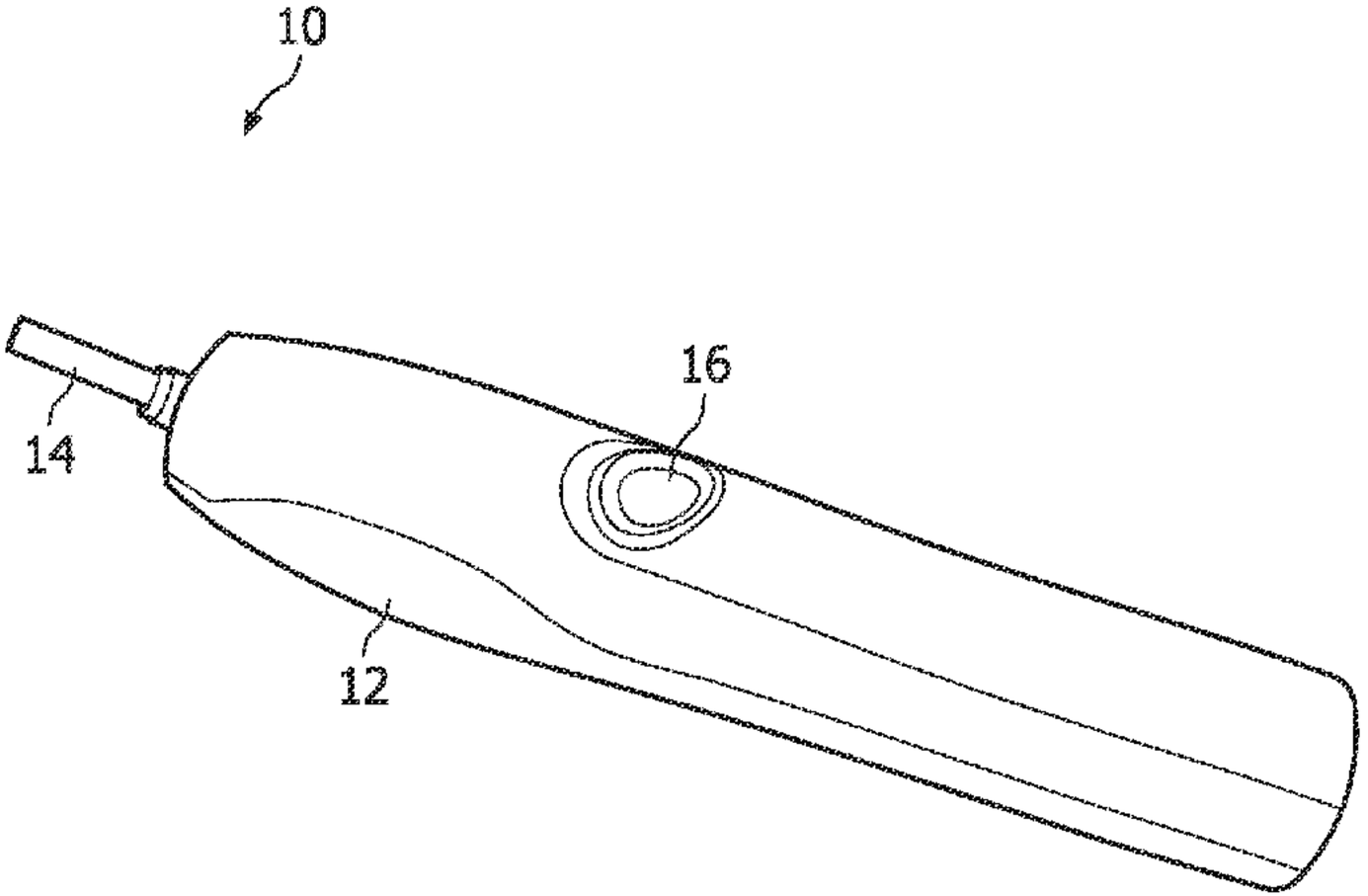


FIG. 13C


20


10
16
14
12