

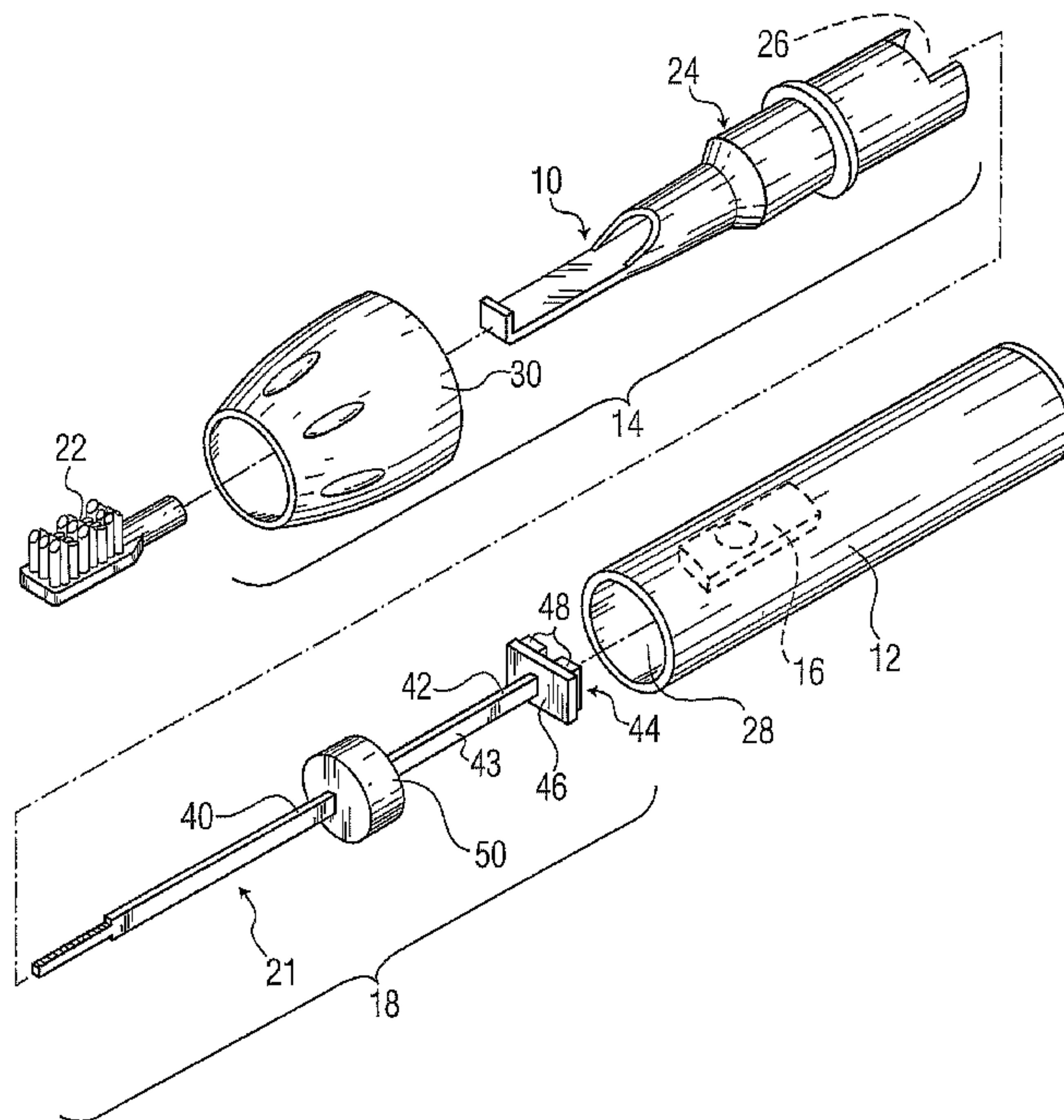


(86) Date de dépôt PCT/PCT Filing Date: 2004/12/09  
 (87) Date publication PCT/PCT Publication Date: 2005/06/30  
 (85) Entrée phase nationale/National Entry: 2006/09/20  
 (86) N° demande PCT/PCT Application No.: IB 2004/052737  
 (87) N° publication PCT/PCT Publication No.: 2005/058190  
 (30) Priorité/Priority: 2003/12/11 (US60/528,638)

(51) Cl.Int./Int.Cl. *A61C 17/34* (2006.01),  
*A61C 17/22* (2006.01)  
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(54) Titre : TETE DE BROSE A AXE MONTE POUR BROSE A DENTS A MOTEUR A ENTRAINEMENT  
TRANSVERSAL

(54) Title: MOUNTED BEAM BRUSHHEAD FOR A TRANSVERSE DRIVE POWER TOOTHBRUSH



(57) Abrégé/Abstract:

The resonator assembly for a power toothbrush includes an elongated solid rod made from stainless steel, having a back assembly which includes permanent magnets which interact with an electromagnet in a drive system in the handle of the toothbrush to produce a transverse motion of the rod. A mount member is connected to the rod at a selected point along its length, and is mounted to a toothbrush housing so that the rod resonates about the mount member at a selected frequency.

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

(19) World Intellectual Property  
Organization  
International Bureau



(43) International Publication Date  
30 June 2005 (30.06.2005)

PCT

(10) International Publication Number  
**WO 2005/058190 A1**

(51) International Patent Classification<sup>7</sup>: **A61C 17/34**,  
17/22

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(21) International Application Number:  
PCT/IB2004/052737

(22) International Filing Date: 9 December 2004 (09.12.2004)

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(25) Filing Language: English

(26) Publication Language: English

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

(30) Priority Data:  
60/528,638 11 December 2003 (11.12.2003) US

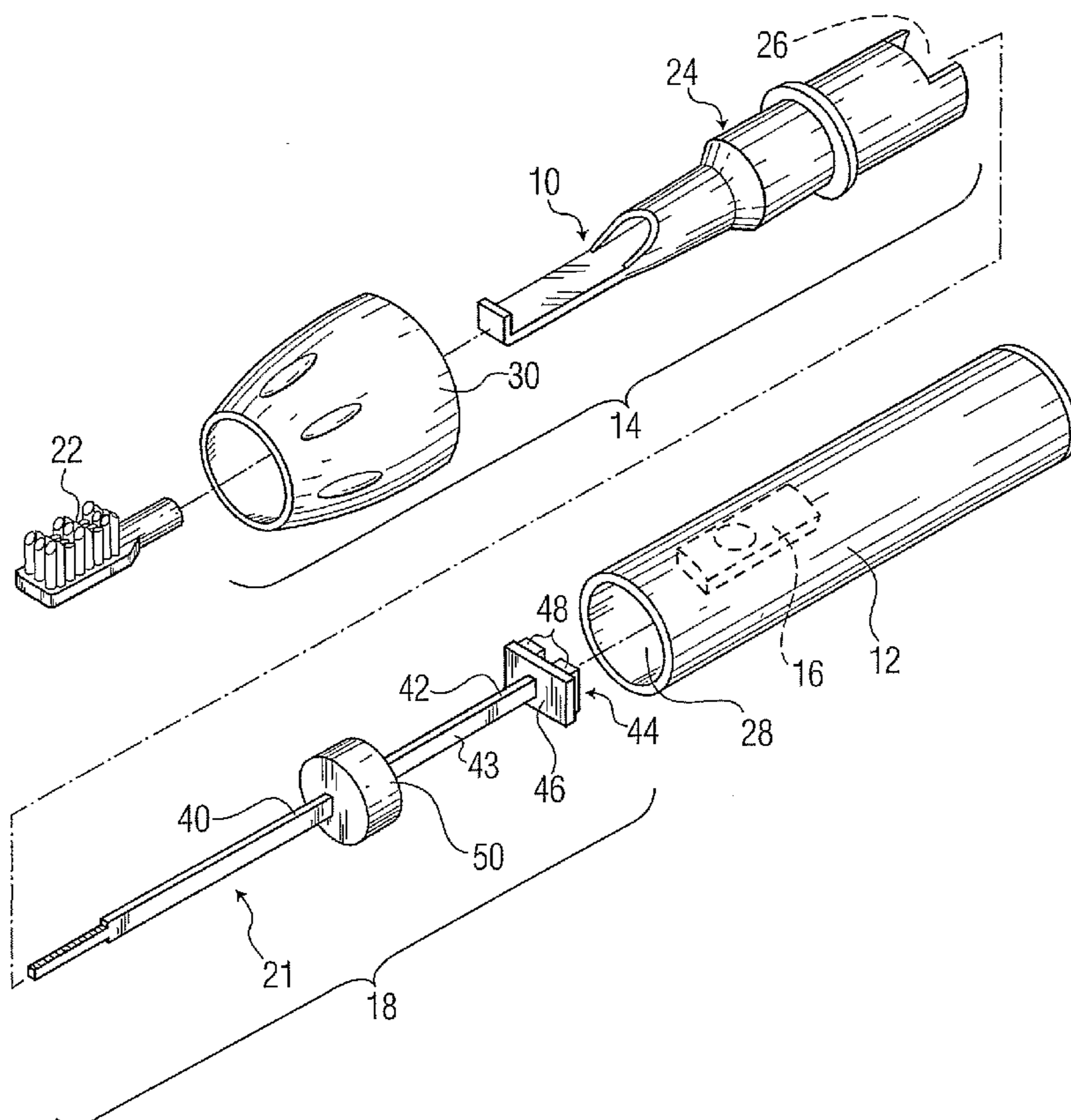
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[Continued on next page]

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WO 2005/058190 A1

**WO 2005/058190 A1**

**(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, HU, IE, IS, IT, LT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW, ARIPO patent (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI patent (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)) for the following designations* AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ,

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

**Published:**

— *with international search report*

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

## **MOUNTED BEAM BRUSHHEAD FOR A TRANSVERSE DRIVE POWER TOOTHBRUSH**

This invention relates generally to power toothbrushes, and more specifically concerns a resonator structure for a transverse drive power toothbrush.

5 Many power toothbrushes which operate at or near a resonant frequency associated with the toothbrush structure have structurally complicated resonator assemblies. The drive system for the toothbrush, usually located in the handle, produces a movement of the resonator assembly, which includes a mounting shaft or similar member having a brushhead mounted on a distal end thereof. The resonator assembly includes a mounting  
10 element to the toothbrush housing, for example, a torsion pin or other spring member. Many resonator assemblies, however, while often providing effective results, such as that shown in U.S. Patent No. 5,378,153, must be manufactured and mounted with substantial precision, requiring a careful and expensive manufacturing process.

Further, the physical connection, for instance brazing, between the various parts of  
15 the resonator assembly, can be defective, leading to breakage and/or reduced performance. Such a resonator assembly also frequently requires a number of individual parts. The individual parts must be connected in such a way that the assembly resonates at the preselected resonant frequency, within a relatively close tolerance (+5 Hz).

It is desirable that improvements be made in the cost and reliability of such a  
20 resonator system, without sacrificing the performance thereof.

Accordingly, the present invention is a resonator assembly for a power toothbrush having a drive system comprising: an elongated drive member, having a back assembly at a rear end thereof, cooperating with the drive system to move the driven member, the driven member being adapted to receive a workpiece at a distal end thereof; and a mount member  
25 which mounts the driven member to a toothbrush housing so that the driven member moves about the mount member at a selected frequency.

Figure 1 is an exploded view which includes the beam-type brushhead of the present invention.

Figure 2 shows the resonator portion of the assembly of Figure 1.

30 Figure 1 shows a complete power toothbrush 10 which includes a handle portion 12 and a head portion 14, which is attached to the handle portion 12 in some manner, such as by mating threaded sections or clips or some other similar structure. Toothbrush 10 also

includes a drive assembly shown generally at 16 in the handle portion 12 of the toothbrush, the drive assembly cooperatively working with a resonator assembly 18, which typically will include a drive shaft 21 on which a workpiece such as a toothbrush brushhead 22 is located.

5           In the embodiment shown, head portion 14 also includes a mounting assembly 24 which surrounds the resonator assembly 18, including the drive shaft 21. A rear end portion 26 of the mounting assembly 24 fits into a mating front portion 28 of the handle. A nut 30 is used to securely attach the mounting assembly 24 with the resonator to the handle 12.

10           Resonator assembly 18, is shown in more detail in Figure 2. In the embodiment shown, resonator assembly 18 includes an elongated metal rod 40 which in the embodiment shown functions as the drive shaft 21 and is made from stainless steel, but could also be made from other materials, including spring steel, and in another embodiment a thermoplastic material. In the embodiment shown, the rod is approximately  
15 3.75 inches long by 0.125 inches wide and 0.75 inches thick. The rod 40 could be solid or hollow, like a tube.

          At a rear end 42 of rod 40 is a back assembly 44, which includes a small iron plate 46, upon which are mounted a pair of permanent magnets 48-48. In the embodiment shown, permanent magnets 48-48 cooperatively work with an electromagnet portion of  
20 drive system 16 to produce a back-and-forth (transverse) movement of back assembly 44, including the rear portion 43 of rod 40. Such a driving arrangement is shown in detail in U.S. Patent No. 5,189,751, the contents of which are hereby incorporated by reference. At a selected point along the length of rod 40 is a mounting member 50. In the embodiment shown, the mounting member 50 is located approximately 1.5 inches from the rear end 42  
25 of rod 40. The mounting member is a urethane cylinder into which rod 40 is pressed.

          Mounting member 50 in turn is pressed into the mounting assembly 24. In the embodiment shown, the mounting member 50 is 60-75 shore-D material. It is approximately 0.5 inches in diameter and 0.375 inches thick. These dimensions, however, can be varied. The mounting member 50 could alternatively be made from hard metal,  
30 such as steel, or thermoplastic material. The durometer of the mounting member in one embodiment is selected to provide a particular Q for the appliance. The mounting member

further can be changed by changing the material or its position along the rod 40 to give a desired frequency of performance and amplitude of brushhead movement.

Further, the arrangement can be used to guide the user with respect to the proper amount of force applied by the user on the toothbrush against the teeth. If the force applied is too large or too small, very little or no amplitude of the brush results. When the force applied by the user is just right, an effective, desirable amplitude of the brush movement results.

In operation, the single beam rod 40 acts as a spring member for the toothbrush, resonating about mount element 50, which will typically move a small amount. With the resonator rod 40 mounted as shown, and a drive arrangement comprising an electromagnet and the backplate 44 with permanent magnets on the rear end of rod 40, a transverse (back-and-forth action) of rod 40 results, with the distal end of the rod, *i.e.* the end upon which the brush 22 is mounted, moving in an opposite direction to the movement of the rear portion 43 of the rod 40.

The advantages of the resonator structure as shown are that it can be manufactured as a precision part relatively easily and inexpensively; further, it has good repeatability and reliability. There is no dependence upon brazing connections to other parts. Hence, the single beam resonator has manufacturing and operating advantages over other resonator structures.

Although a preferred embodiment of the invention has been disclosed for purposes of illustration, it should be understood the various changes, modifications and substitutions may be incorporated in the embodiment without departing from the spirit of the invention is defined by the claims as follows:

## CLAIMS:

1. A resonator assembly for a power toothbrush having a drive system, comprising:  
an elongated rod member, having a back assembly at a rear end thereof,  
cooperating with the drive system to move the rod member, the rod member being adapted to receive a workpiece at a distal end thereof; and  
a mount member which mounts the rod member to a toothbrush housing so that said rod member moves about the mount member at a selected frequency.
2. The assembly of claim 1, wherein the rod member is solid.
3. The assembly of claim 1, wherein the rod member is hollow.
4. The assembly of claim 2, wherein the rod member is metal, and wherein the mount member is urethane, having a 60-75 shore-D durometer rating.
5. The assembly of claim 2, wherein the back assembly includes a plate and a plurality of permanent magnets, which interact with an electromagnet in the drive system to produce a transverse motion of the rod member.
6. The assembly of claim 1, wherein the rod member is a plastic material.

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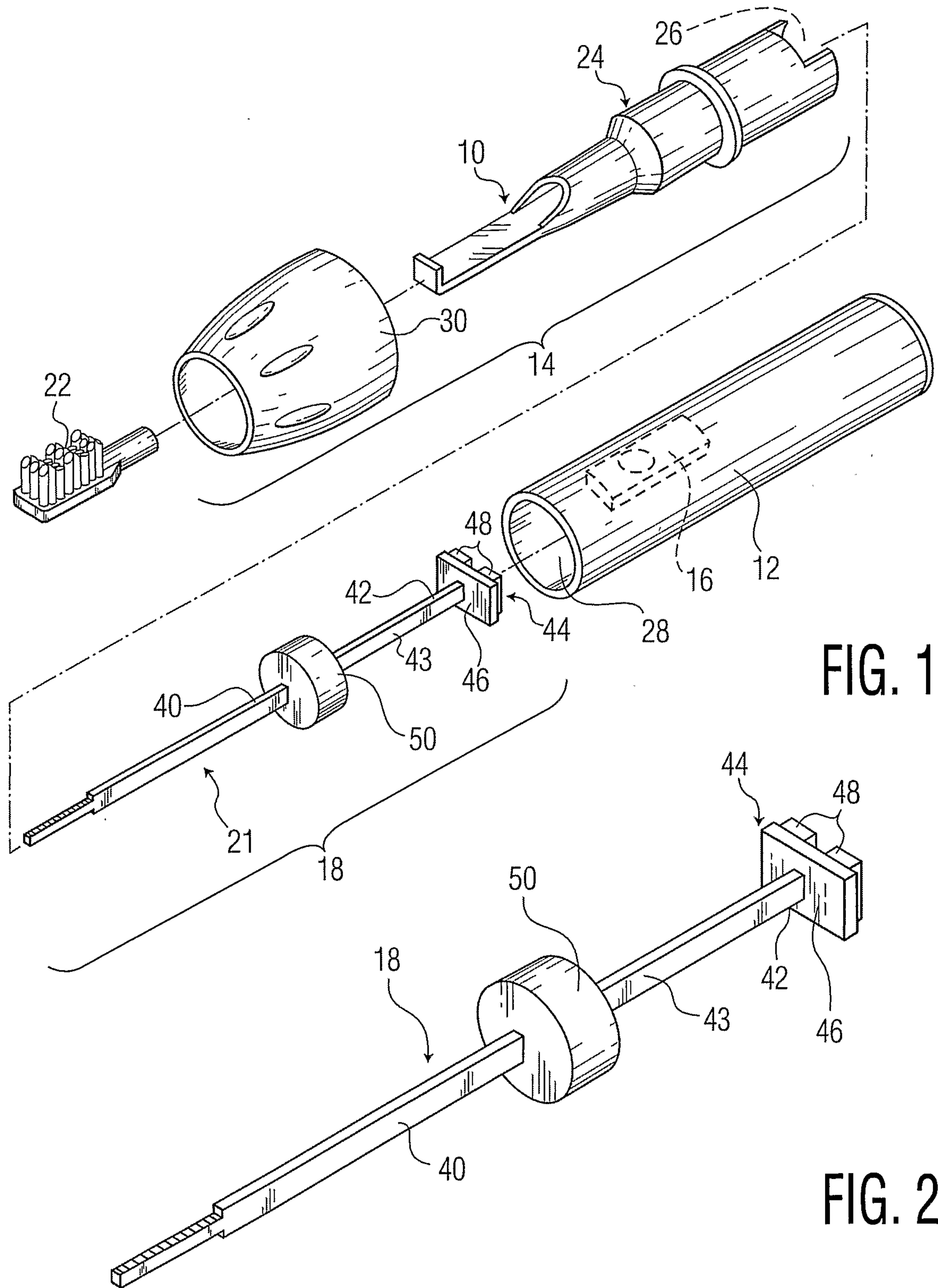


FIG. 1

FIG. 2



