



US009410593B2

(12) **United States Patent**
Kloster et al.

(10) **Patent No.:** **US 9,410,593 B2**
(45) **Date of Patent:** **Aug. 9, 2016**

(54) **NODAL SPRING ASSEMBLY FOR AN ELECTRONIC TOOTHBRUSH**

(75) Inventors: **Tyler G. Kloster**, Snoqualmie, WA (US); **Hendrik Richard Jousma**, Groningen (NL); **Michiel Allan Aurelius Schallig**, Drachten (NL); **Martinus Bernardus Stapelbroek**, Frieschepalen (NL); **Patrick A. Headstrom**, Seattle, WA (US); **Scott E Hall**, Issaquah, WA (US); **Wolter F. Benning**, Seattle, WA (US)

(73) Assignee: **KONINKLIJKE PHILIPS N.V.**, Eindhoven (NL)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 375 days.

(21) Appl. No.: **13/169,520**

(22) Filed: **Jun. 27, 2011**

(65) **Prior Publication Data**

US 2012/0326370 A1 Dec. 27, 2012

Related U.S. Application Data

(63) Continuation of application No. 12/303,162, filed as application No. PCT/IB2007/052455 on Jun. 25, 2007, now Pat. No. 8,413,969.

(60) Provisional application No. 60/817,959, filed on Jun. 30, 2006.

(51) **Int. Cl.**
F16F 1/14 (2006.01)
F16F 1/02 (2006.01)

(52) **U.S. Cl.**
CPC .. **F16F 1/025** (2013.01); **F16F 1/14** (2013.01)

(58) **Field of Classification Search**

CPC F16F 1/02; F16F 1/025; F16F 1/027; F16F 1/14; F16F 1/16; F16F 1/18; F16F 1/26
USPC 267/154, 158, 160, 180, 182; 15/22.1, 15/22.2, 167.1, 110
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,617,602 A 4/1997 Okada
6,003,189 A 12/1999 Falleiros
2003/0204924 A1* 11/2003 Grez et al. 15/22.1
2010/0154151 A1* 6/2010 Grez et al. 15/22.1

FOREIGN PATENT DOCUMENTS

WO 9315628 A 8/1993
WO 2005058189 A 6/2005
WO WO 2008/001302 A2 * 1/2008

OTHER PUBLICATIONS

“NASGRO Stress Intensity Factor Solutions”, <http://www.swri.edu/4org/d18/mateng/matint/NASGRO/Overview/Solution.htm>.

* cited by examiner

Primary Examiner — Robert A Siconolfi

Assistant Examiner — Vu Q Nguyen

(57) **ABSTRACT**

A nodal-mounted spring arrangement for an electronic toothbrush includes a V-shaped spring member secured at both ends so that it can operate in out-of-phase torsion mode along the axial dimension thereof. In one embodiment, the V-shaped spring member includes two extended end regions, which extend below a longitudinal edge of the middle portion of the V-spring. The free ends of the extended portions are joined by a flat cross-piece. This “closed end” region is present at both ends of the V-spring.

5 Claims, 5 Drawing Sheets

