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(12) **United States Design Patent**  
**Khan et al.**

(10) **Patent No.: US D940,865 S**  
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(54) **ALLOGRAFT INSERTION DEVICE**  
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D493,526 S \* 7/2004 Hwang ..... A61M 5/3134  
D24/130  
7,025,782 B2 \* 4/2006 Kobayashi ..... A61F 2/1667  
606/107  
D581,529 S \* 11/2008 Moehle ..... D24/130  
7,458,976 B2 \* 12/2008 Peterson ..... A61F 2/1678  
606/107

(Continued)

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Price, Jr., et al., "DSEK: What You Need to Know About Endothelial Keratoplasty," Copyright 2009, SLACK Incorporated, Chapter 8, pp. 97-107 (16 pages).

(\*\*) Term: **15 Years**

(Continued)

(21) Appl. No.: **29/574,341**

*Primary Examiner* — Wan Laymon

(22) Filed: **Aug. 15, 2016**

(74) *Attorney, Agent, or Firm* — Nexsen Pruet, PLLC

(51) **LOC (13) Cl.** ..... **24-02**

(57) **CLAIM**

(52) **U.S. Cl.**  
USPC ..... **D24/150; D12/133**

The ornamental design for an allograft insertion device, as shown and described.

(58) **Field of Classification Search**  
USPC ..... D24/150, 112, 127, 129, 130, 133, 147;  
606/146  
CPC ..... A61F 2/14; A61F 2/167; A61F 2/1662;  
A61F 2/1664; B65D 83/10

**DESCRIPTION**

See application file for complete search history.

(56) **References Cited**

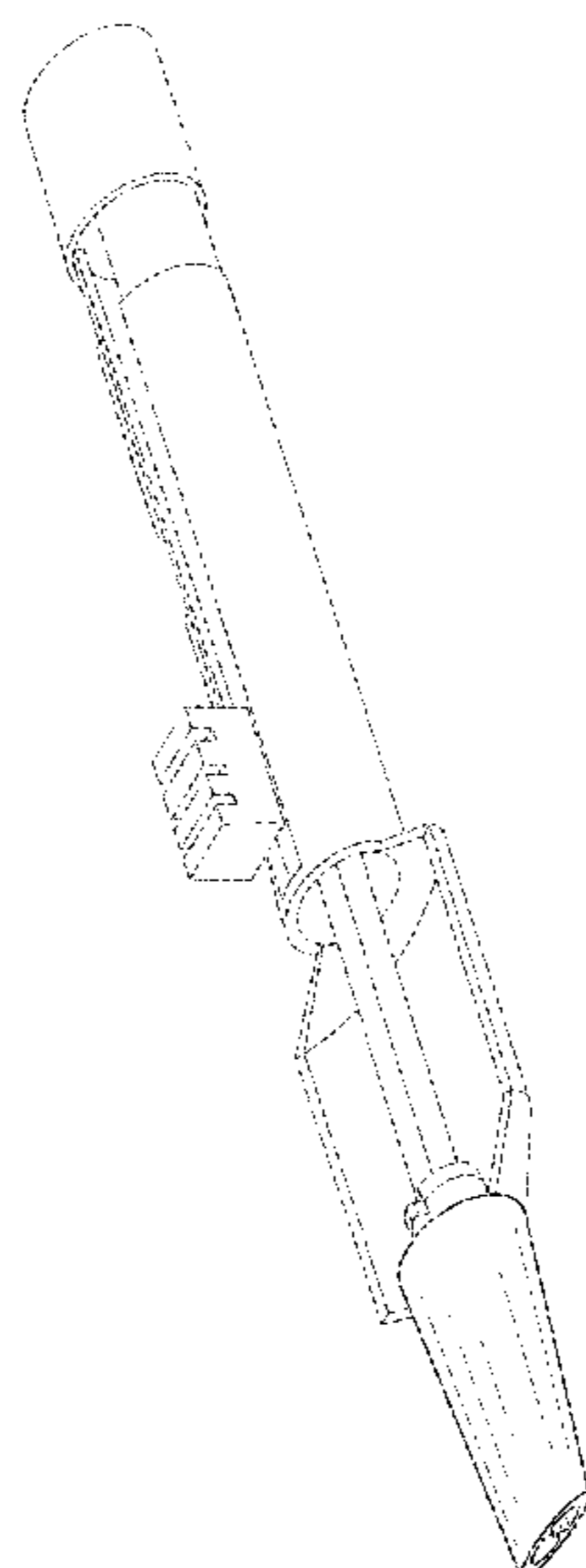
FIG. 1 is a front perspective view of an allograft insertion device according to our design;  
FIG. 2 is a rear perspective view thereof, opposite the view of FIG. 1;  
FIG. 3 is an enlarged bottom plan view thereof;  
FIG. 4 is an enlarged top plan view thereof, opposite the view of FIG. 1;  
FIG. 5 is a first side view thereof;  
FIG. 6 is a second side view thereof, opposite the view of FIG. 5;  
FIG. 7 a third side view thereof; and,  
FIG. 8 is a fourth side view thereof, opposite the view of FIG. 7.

**U.S. PATENT DOCUMENTS**

D263,331 S \* 3/1982 Parker ..... D23/213  
D309,205 S \* 7/1990 Schuster ..... D32/32  
5,190,552 A \* 3/1993 Kelman ..... A61F 2/167  
606/107  
D381,079 S \* 7/1997 Koepnick ..... D24/146  
D399,314 S \* 10/1998 Wells ..... D24/112  
D403,068 S \* 12/1998 England ..... D24/150  
6,056,757 A \* 5/2000 Feingold ..... A61F 2/1664  
606/107  
D434,149 S \* 11/2000 Mirhashemi ..... D24/133  
D441,447 S \* 5/2001 Hjertman ..... D24/133  
D491,268 S \* 6/2004 Hickingbotham ..... D24/133

The dashed broken lines are included for the purpose of illustrating environment of the design only, and form no part of the claimed design.

**1 Claim, 6 Drawing Sheets**





(56)

References Cited

U.S. PATENT DOCUMENTS

D590,942 S \* 4/2009 Petersen ..... D24/130  
 D592,748 S \* 5/2009 Boulton ..... A61F 11/006  
 D24/108  
 7,645,300 B2 \* 1/2010 Tsai ..... A61F 2/1648  
 623/6.12  
 D609,810 S \* 2/2010 Cote ..... D24/133  
 D612,052 S \* 3/2010 McCollam ..... D24/133  
 D612,939 S \* 3/2010 Boone, III ..... D24/133  
 D615,651 S \* 5/2010 Hoffmann ..... D24/147  
 7,901,421 B2 3/2011 Shiuey et al.  
 8,029,515 B2 10/2011 Shiuey  
 8,273,122 B2 \* 9/2012 Anderson ..... A61F 2/1664  
 623/6.12  
 D669,582 S \* 10/2012 Weston ..... D24/147  
 D681,808 S \* 5/2013 Holaschke ..... D24/114  
 8,523,941 B2 \* 9/2013 Ichinohe ..... A61F 9/0017  
 606/107  
 D691,268 S \* 10/2013 Marsteller ..... D24/150  
 8,636,795 B2 \* 1/2014 Torres ..... A61F 2/0095  
 623/5.11  
 8,894,664 B2 \* 11/2014 Downer ..... A61F 2/1664  
 606/107  
 D747,806 S \* 1/2016 Wargner ..... D24/150  
 D752,749 S \* 3/2016 Van Dalen ..... D24/150  
 9,522,061 B2 \* 12/2016 Downer ..... A61F 2/1678  
 D789,536 S \* 6/2017 Korenfeld ..... D24/150  
 D814,025 S \* 3/2018 Zumbrum ..... D24/129  
 D815,944 S \* 4/2018 Lind ..... D9/447  
 D832,443 S \* 10/2018 Berkely ..... D24/176  
 D835,269 S \* 12/2018 Di Ubaldi ..... D24/130  
 10,172,706 B2 \* 1/2019 Auld ..... A61F 2/167  
 2005/0034200 A1 \* 2/2005 Montemagno .... A61M 37/0015  
 427/2.28  
 2007/0050023 A1 \* 3/2007 Bessiere ..... A61F 2/1678  
 623/6.12  
 2007/0150055 A1 \* 6/2007 Pynson ..... A61F 2/1664  
 623/6.12  
 2008/0255578 A1 10/2008 Neusidl  
 2008/0269769 A1 \* 10/2008 Dybbs ..... A61F 2/14  
 606/107  
 2008/0281341 A1 \* 11/2008 Miller ..... A61F 2/14  
 606/166  
 2012/0221102 A1 \* 8/2012 Tanaka ..... A61F 2/167  
 623/6.12  
 2013/0085567 A1 4/2013 Tan et al.  
 2015/0005753 A1 1/2015 Walter et al.  
 2015/0223930 A1 8/2015 Shiuey  
 2015/0257873 A1 9/2015 Shiuey et al.  
 2020/0261214 A1 \* 8/2020 Oba ..... A61F 2/167  
 2021/0113327 A1 \* 4/2021 Auld ..... A61F 2/167  
 2021/0186682 A1 \* 6/2021 Chini ..... A61F 2/167

OTHER PUBLICATIONS

Abyaneh, "A Hybrid Approach to Determining Cornea Mechanical Properties Using a Combination of Inverse Finite Element Analysis and Experimental Techniques," Doctoral Thesis, Loughborough University Institutional Repository, Copyright Nov. 2013, pp. 1-180 (182 pages).  
 Alkatan et al., "Histopathological Findings of Failed Grafts Following Descemet's Stripping Automated Endothelial Keratoplasty (DSAEK)," Saudi Journal of Ophthalmology, Copyright 2012, vol. 26, pp. 79-85 (7 pages).  
 Bhardwaj et al., "Axial Length, Anterior Chamber Depth—A Study in Different Age Groups and Refractive Errors," Journal of Clinical and Diagnostic Research, Copyright Oct. 2013, vol. 7, No. 10, pp. 2211-2212 (2 pages).  
 Boschetti et al., "Mechanical Characterization of Porcine Corneas," Journal of Biomechanical Engineering, Copyright Mar. 2012, vol. 134, pp. 031003-1-031003-9 (9 pages).

Boyce et al., "Stress-Controlled Viscoelastic Tensile Response of Bovine Cornea," Journal of Biomechanics, Copyright 2007, vol. 40, pp. 2367-2376 (10 pages).  
 Carnell et al., "A Model for Estimating Corneal Stiffness Using an Indenter," Copyright Nov. 1992, Journal of Biomechanical Engineering, vol. 114, pp. 549-552 (4 pages).  
 Danielsen, Tensile Mechanical and Creep Properties of Descemet's Membrane and Lens Capsule, Experimental Eye Research, Copyright 2004, vol. 79, pp. 343-350 (8 pages).  
 Dias et al., "Anterior and Posterior Corneal Stroma Elasticity After Corneal Collagen Crosslinking Treatment," Experimental Eye Research, Copyright 2013, vol. 116, pp. 58-62 (5 pages).  
 Elsheikh et al., "Assessment of the Epithelium's Contribution to Corneal Biomechanics," Experimental Eye Research, Copyright 2008, vol. 86, pp. 445-451 (7 pages).  
 Elsheikh et al., "Experimental Assessment of Human Corneal Hysteresis," Current Eye Research, Copyright 2008, vol. 33, pp. 205-213 (9 pages).  
 Elsheikh et al., "Finite Element Modeling of Corneal Biomechanical Behavior," Journal of Refractive Surgery, Copyright 2010, vol. 26, No. 4, pp. 289-300 (12 pages).  
 Elsheikh et al., "Mechanical Anisotropy of Porcine Cornea and Correlation With Stromal Microstructure," Experimental Eye Research, Copyright 2009, vol. 88, pp. 1084-1091 (8 pages).  
 Elsheikh et al., "Numerical Modelling of Corneal Biomechanical Behaviour," Computer Methods in Biomechanics and Biomechanical Engineering, Copyright Apr. 2007, vol. 10, No. 2, pp. 85-95 (11 pages).  
 Eye Bank Association of America, 2013 Eye Banking Statistical Report, Copyright 2014, pp. 1-114 (114 pages).  
 Fontana et al., "Volume and Depth of the Anterior Chamber in the Normal Aging Human Eye," Copyright Oct. 1980, Archives of Ophthalmology, vol. 98, Issue 10, pp. 1803-1808 (8 pages).  
 Hatami-Marbini et al., "Hydration Dependent Biomechanical Properties of the Corneal Stroma," Experimental Eye Research, Copyright 2013, vol. 116, pp. 47-54 (8 pages).  
 Hatami-Marbini, "Hydration Dependent Viscoelastic Tensile Behavior of Cornea," Annals of Biomedical Engineering, Copyright Aug. 2014, vol. 42, No. 8, pp. 1740-1748 (9 pages).  
 Ide et al., "Descemet-Stripping Automated Endothelial Keratoplasty: Effect of Inserting Forceps on DSAEK Donor Tissue Viability by Using an In Vitro Delivery Model and Vital Dye Assay," Copyright Nov. 2007, Cornea, vol. 26, No. 9, pp. 1079-1081 (3 pages).  
 Ide, "Descemet's Stripping Automated Endothelial Keratoplasty Injecting Device," Expert Rev. Ophthalmol., Editorial, Copyright 2009, vol. 4, No. 1, pp. 5-9 (5 pages).  
 Khan et al., "An Overview on Performance Characteristics of Laser In-Situ Keratomileusis Using Lasers and Identification of Challenges," Micro and Nanosystems, Copyright Nov. 2012, vol. 4, pp. 1-12 (13 pages).  
 Khan et al., "Descemet's Stripping Automated Endothelial Keratoplasty Tissue Insertion Devices," Journal of Ophthalmic and Vision Research, Copyright 2015, vol. 10, No. 4, pp. 461-468 (8 pages).  
 Khan et al., "Finite Element Analysis of Descemet's Stripping Automated Endothelial Keratoplasty (DSAEK) Surgery Allograft to Predict Endothelial Cell Loss," Copyright 2016, Current Eye Research, DOI: 10.3109/02713683.2016.1151052, <http://dx.doi.org/10.3109/02713683.2016.1151052>, pp. 1-9 (10 pages).  
 Kling et al., "Finite-Element Modeling of Intrastromal Ring Segment Implantation Into a Hyperelastic Cornea," Investigative Ophthalmology & Visual Science, Copyright Jan. 2013, vol. 54, No. 1, pp. 881-889 (9 pages).  
 Lago et al., "A New Methodology for the In Vivo Estimation of the Elastic Constants That Characterize the Patient-Specific Biomechanical Behavior of the Human Cornea," Journal of Biomechanics, Copyright 2015, vol. 48, pp. 38-43 (6 pages).  
 Lombardo et al., "Adaptive Optics Photoreceptor Imaging," Ophthalmology, Copyright Jul. 2012, vol. 119, No. 7, pp. 1498-1499 (2 pages).  
 Mehta et al., "Glide Insertion Technique for Donor Cornea Lenticule During Descemet's Stripping Automated Endothelial Keratoplasty," J. Cataract Refract. Surg., Copyright Nov. 2007, vol. 33, pp. 1846-1850 (5 pages).

(56)

**References Cited**

## OTHER PUBLICATIONS

Nejad et al., "Finite Element Modelling of Cornea Mechanics: A Review," *Arq. Bras. Oftalmol.*, Copyright 2014, vol. 77, No. 1, pp. 60-65 (6 pages).

Nguyen et al., "A Nonlinear Anisotropic Viscoelastic Model for the Tensile Behavior of the Corneal Stroma," *Journal of Biomechanical Engineering*, Copyright Aug. 2008, vol. 130, pp. 041020-1-041020-10 (10 pages).

Nguyen et al., "An Inverse Finite Element Method for Determining the Anisotropic Properties of the Cornea," *Biotech. Model Mechanobiol.*, Copyright 2011, vol. 10, pp. 323-337 (15 pages).

Prince, Jr., et al., "Descemet's Stripping With Endothelial Keratoplasty in 200 Eyes—Early Challenges and Techniques to Enhance Donor Adherence," *J. Cataract Refract. Surg.*, Copyright Mar. 2006, vol. 32, pp. 411-418 (8 pages).

Tan et al., "Corneal Transplantation," *Ophthalmology* 3, [www.thelancet.com](http://www.thelancet.com), Copyright May 2012, vol. 379, pp. 1749-1761 (13 pages).

Tonge et al., "Minimal Preconditioning Effects Observed for Inflation Tests of Planar Tissues," *Journal of Biomechanical Engineering*, Copyright Nov. 2013, vol. 135, pp. 114502-1-114502-14 (14 pages).

Vasiliev et al., "Mechanics and Analysis of Composite Materials," Copyright 2001 Elsevier, Chapter 3, pp. 55-120 (73 pages).

Villarino, "A Note on the Accuracy of Ramanujan's Approximative Formula for the Perimeter of an Ellipse," Copyright 2000, Victoria University, *Journal of Inequalities in Pure and Applied Mathematics*, vol. 7, Issue 1, Article 21, 2006, pp. 1-22 (22 pages).

Villarino, "Ramanujan's Perimeter of an Ellipse," Copyright Feb. 2008, *Escuela de Matemática, Universidad de Costa Rica*, pp. 1-12 (12 pages).

\* cited by examiner



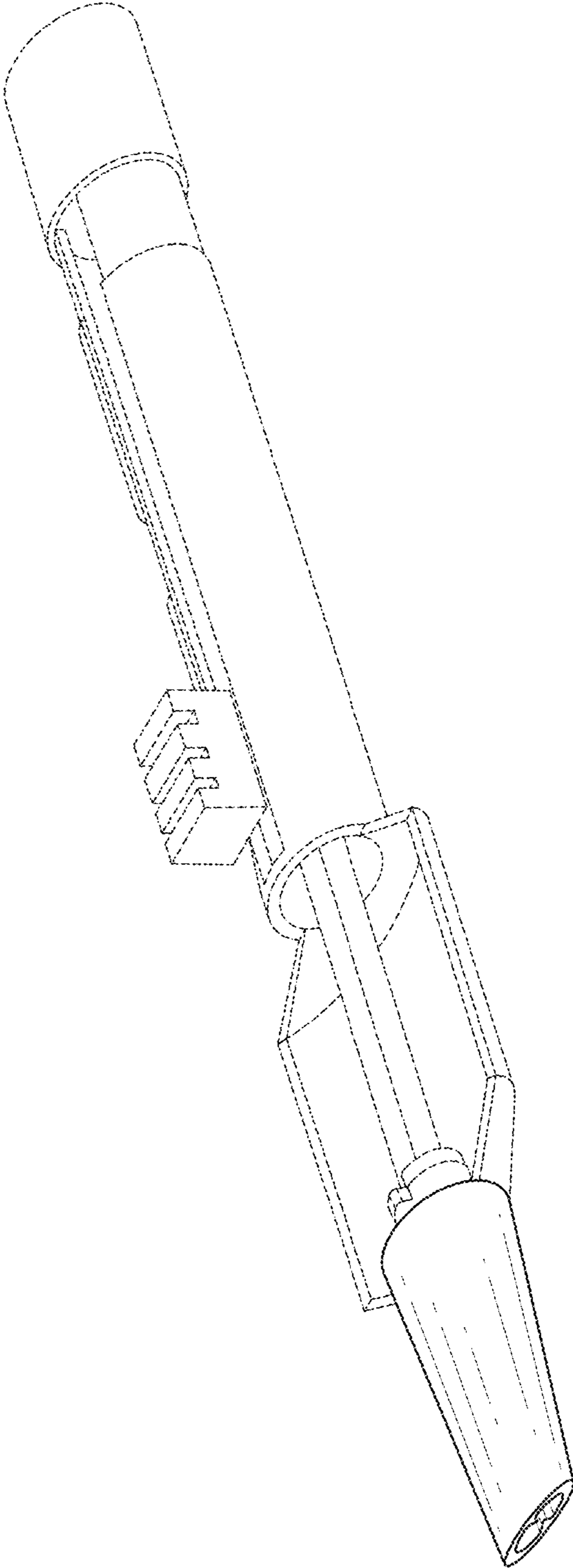


FIG. 1

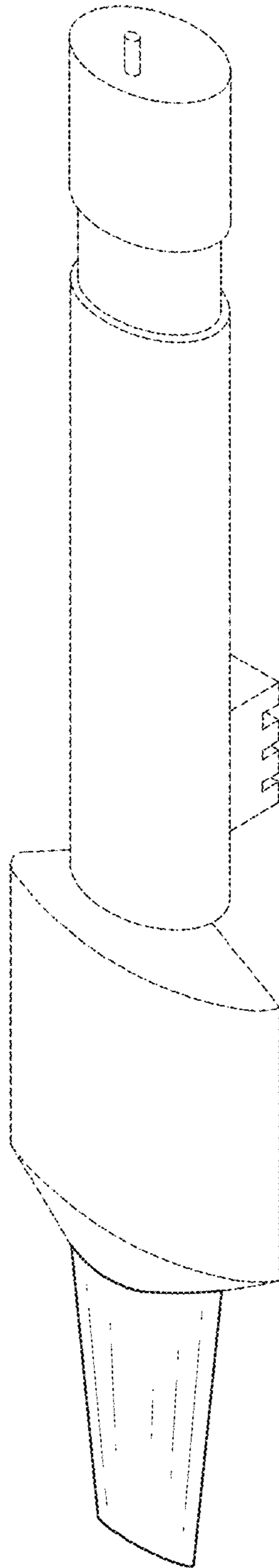


FIG. 2

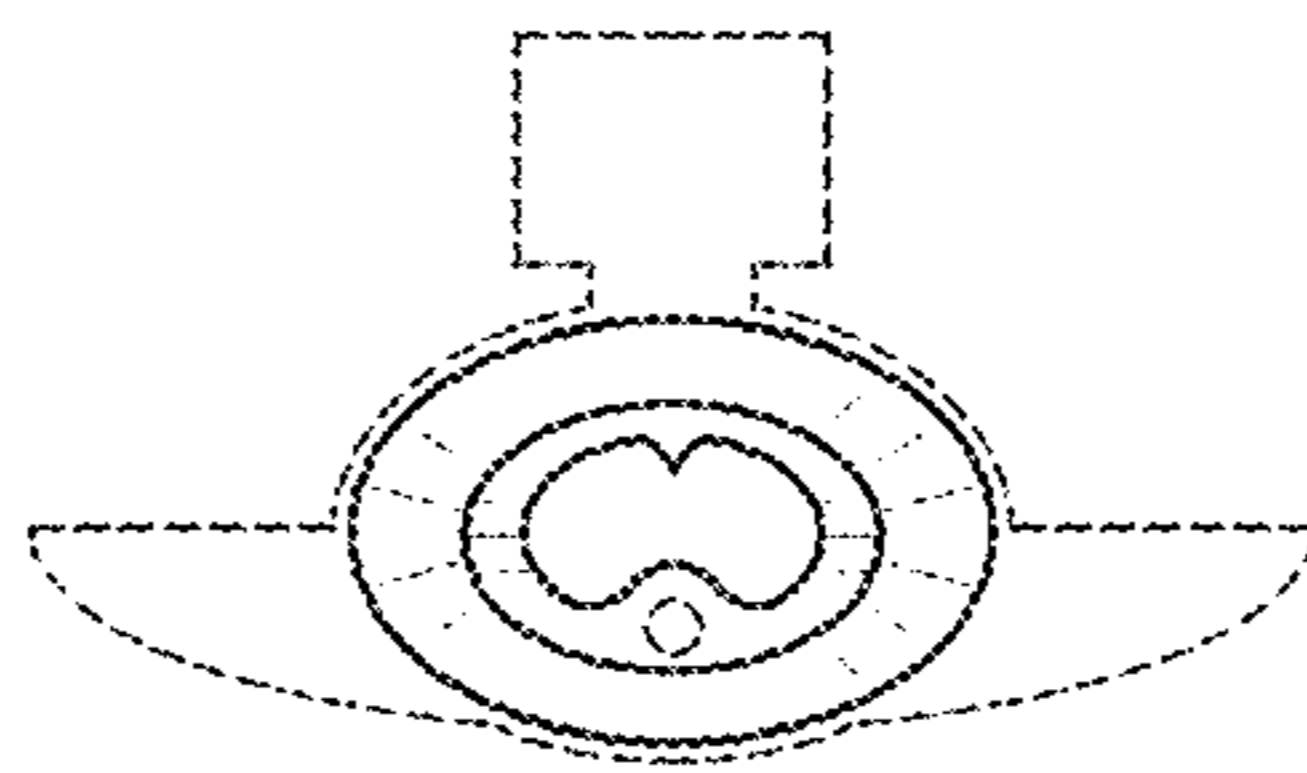


FIG. 3

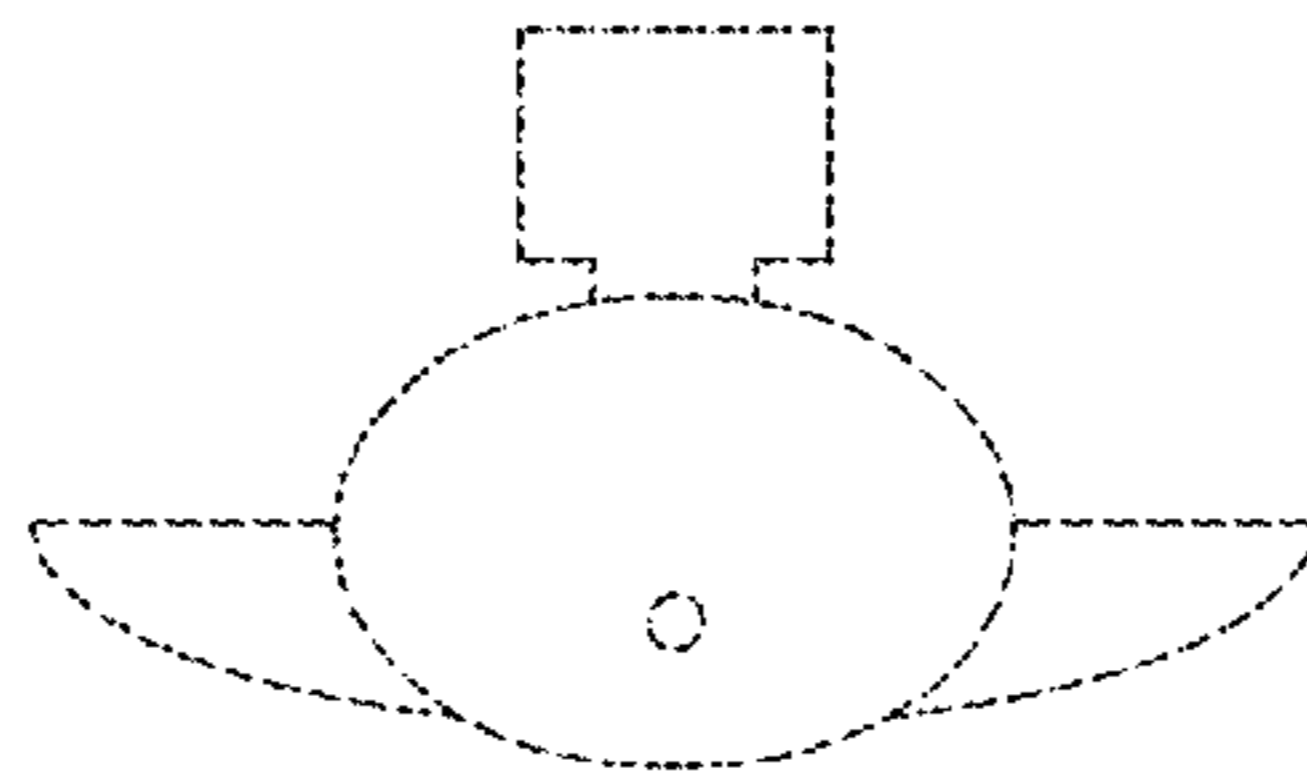


FIG. 4

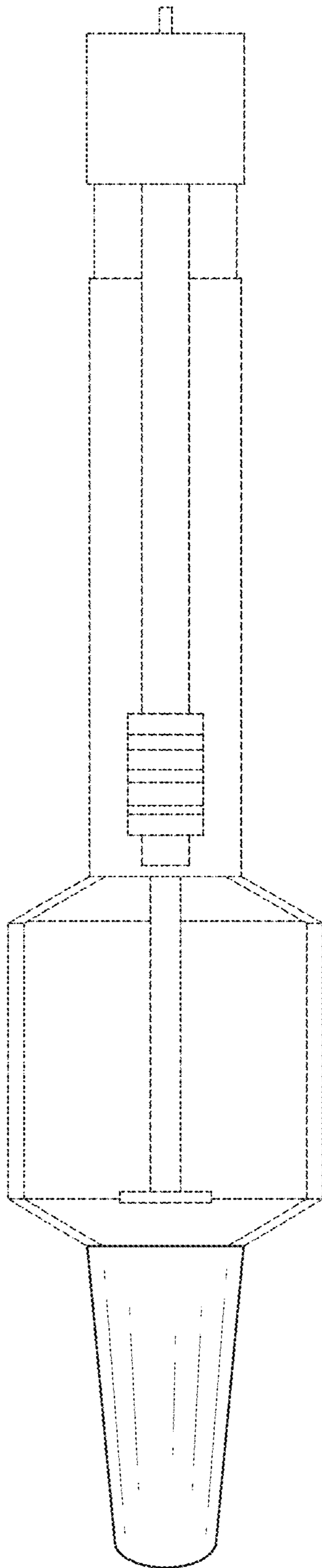


FIG. 5

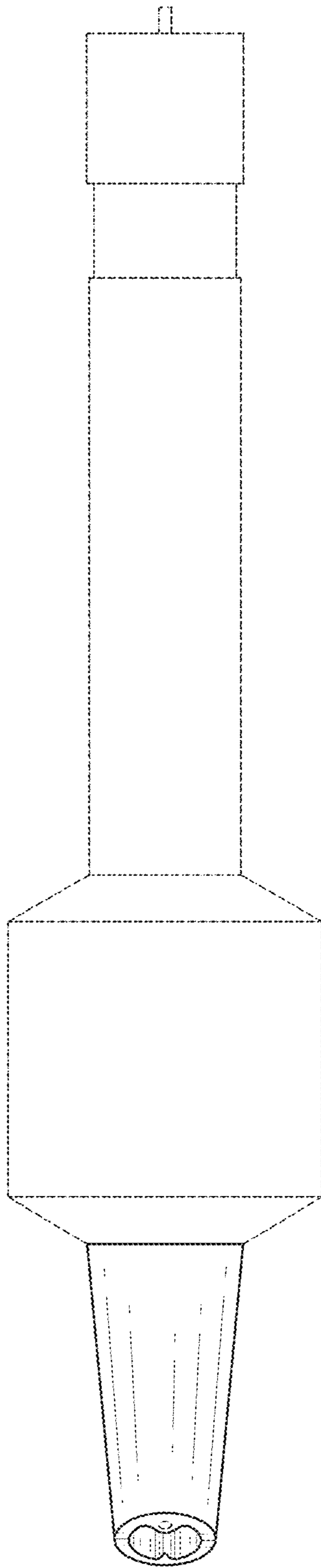


FIG. 6



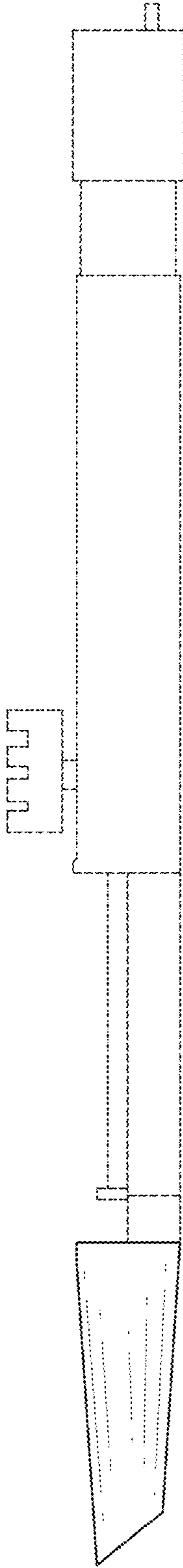


FIG. 7

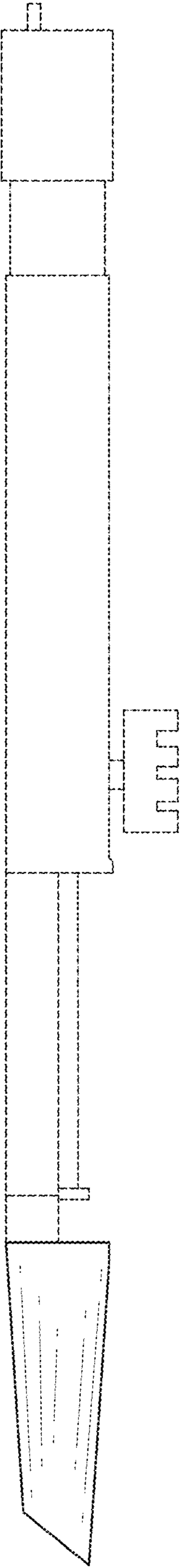


FIG. 8