



US00D910848S

(12) **United States Design Patent** (10) **Patent No.:** **US D910,848 S**
Garcia (45) **Date of Patent:** **** Feb. 16, 2021**

(54) **END EFFECTOR COUPLER STEM**

(71) Applicant: **Zimmer Biomet CMF and Thoracic, LLC**, Jacksonville, FL (US)

(72) Inventor: **Saddy Garcia**, St. Augustine, FL (US)

(73) Assignee: **Zimmer Biomet CMF and Thoracic, LLC**, Jacksonville, FL (US)

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

(21) Appl. No.: **29/721,682**

(22) Filed: **Jan. 22, 2020**

Related U.S. Application Data

(63) Continuation of application No. 29/640,121, filed on Mar. 12, 2018, now Pat. No. Des. 878,585.

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

(52) **U.S. Cl.**
USPC **D24/145**

(58) **Field of Classification Search**
USPC D24/145, 158, 184–186, 232, 127–128;
600/228–229; 248/176.1, 205.1
CPC A61B 2017/291; A61B 17/2909
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

2,752,116 A 6/1956 Minnis
3,910,538 A 10/1975 Baitella
4,143,652 A * 3/1979 Meier A61B 90/50
600/229
4,402,481 A 9/1983 Sasaki
(Continued)

FOREIGN PATENT DOCUMENTS

CN 107614817 A 1/2018
DE 102015104810 A1 9/2016
(Continued)

OTHER PUBLICATIONS

“3840 Series Holder”, Fisso—Rail-mounted instrument holding arm / articulated, [Online]. [Accessed Oct. 16, 2017]. Retrieved from the Internet: <URL: <http://www.medicalexpo.com/prod/fisso/product-67723-681104.html>>, 3 pgs.

(Continued)

Primary Examiner — Wan Laymon

(74) *Attorney, Agent, or Firm* — Schwegman Lundberg & Woessner, P.A.

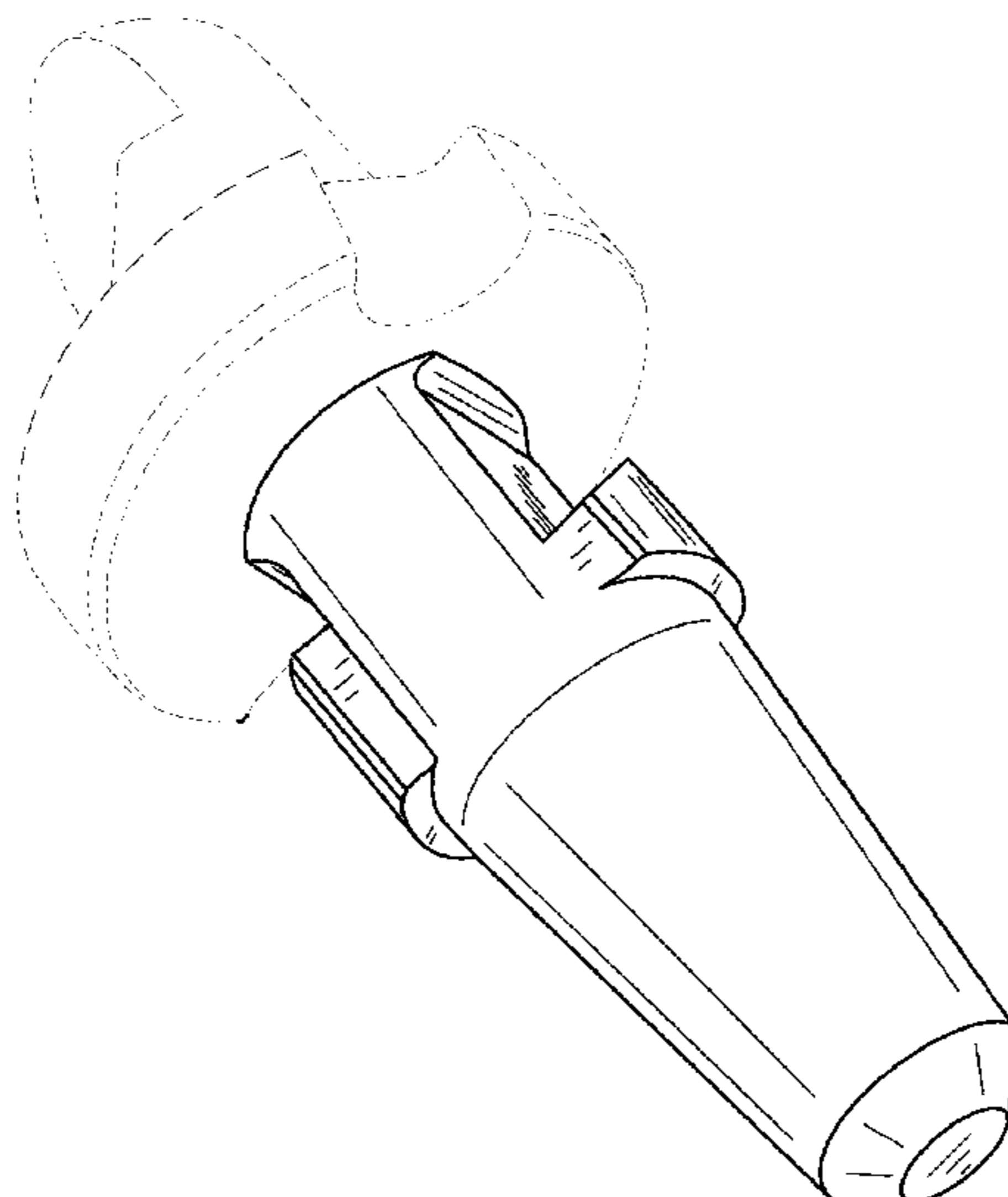
(57) **CLAIM**

The ornamental designs for an end effector coupler stem, as shown and described.

DESCRIPTION

FIG. 1 is perspective view of an end effector coupler stem, showing an embodiment of my new design; FIG. 2 is a right-side planar view thereof; FIG. 3 is a left-side planar view thereof; FIG. 4 is a front planar view thereof; FIG. 5 is a back planar view thereof; FIG. 6 is a top planar view thereof; and FIG. 7 is a bottom planar view thereof. FIG. 8 is a top-left-perspective view of an end effector coupler stem, showing an embodiment of my new design; FIG. 9 is a right-side planar view thereof; FIG. 10 is a left-side planar view thereof; FIG. 11 is a front planar view thereof; FIG. 12 is a back planar view thereof; FIG. 13 is a top planar view thereof; and, FIG. 14 is a bottom planar view thereof. Subject matter shown in any type of broken lines in the drawings are included for the purpose of illustration portions of the end effector coupler stem and form no part of the claimed design.

1 Claim, 8 Drawing Sheets



(56)

References Cited

U.S. PATENT DOCUMENTS

4,514,117	A	4/1985	Scott	
D382,639	S *	8/1997	Musgrave	D24/127
5,779,209	A	7/1998	Rello	
5,824,085	A	10/1998	Sahay et al.	
6,210,325	B1 *	4/2001	Bartie	A61B 1/00149 600/229
6,340,345	B1 *	1/2002	Lees	A61B 17/0206 600/229
6,467,362	B2	10/2002	Erikson	
6,575,653	B1	6/2003	Kräuter	
6,663,563	B1 *	12/2003	Sharratt	A61B 1/00149 600/228
6,860,877	B1	3/2005	Sanchez et al.	
D602,128	S *	10/2009	Williams	D23/262
7,611,378	B1	11/2009	Brekosky et al.	
8,382,048	B2 *	2/2013	Nesper	A61B 90/50 248/160
9,592,096	B2	3/2017	Maillet et al.	
9,937,012	B2 *	4/2018	Hares	A61B 34/30
D878,585	S *	3/2020	Garcia	D24/145
10,687,792	B2	6/2020	Garcia et al.	
10,687,915	B2	6/2020	Schlosser et al.	
10,772,704	B2	9/2020	Garcia et al.	
2002/0017857	A1	2/2002	Hashimoto et al.	
2002/0074472	A1	6/2002	Gaida et al.	
2002/0117857	A1	8/2002	Eckstein	
2002/0177857	A1	11/2002	Otsuka et al.	
2002/0188293	A1	12/2002	Manzo	
2004/0172012	A1	9/2004	Otsuka et al.	
2010/0020002	A1	1/2010	Van Woudenberg et al.	
2010/0200002	A1	8/2010	Orban, III et al.	
2011/0290855	A1	12/2011	Moore et al.	
2011/0315843	A1	12/2011	Hung	
2012/0182134	A1	7/2012	Doyle	
2012/0265240	A1	10/2012	Ganske et al.	
2013/0187022	A1	7/2013	Duportal et al.	
2014/0343572	A1	11/2014	Windolf et al.	
2014/0379038	A1	12/2014	Dogramadzi et al.	
2015/0032215	A1	1/2015	Slamin et al.	
2015/0100066	A1	4/2015	Kostrzewski et al.	
2016/0081753	A1	3/2016	Kostrzewski	
2016/0151120	A1	6/2016	Kostrzewski et al.	
2016/0270780	A1	9/2016	Hall et al.	
2017/0340210	A1	11/2017	Chuang	
2017/0340389	A1	11/2017	Otto et al.	
2017/0360521	A1	12/2017	Johnson	
2018/0116758	A1	5/2018	Schlosser et al.	
2018/0256217	A1	9/2018	Dekel et al.	
2018/0360544	A1	12/2018	Vanheule et al.	
2019/0167356	A1	6/2019	Britton et al.	
2019/0274665	A1	9/2019	Garcia	
2019/0274777	A1	9/2019	Garcia et al.	
2019/0274778	A1	9/2019	Billard et al.	
2019/0274780	A1	9/2019	Nowatschin et al.	
2020/0281576	A1	9/2020	Garcia et al.	

FOREIGN PATENT DOCUMENTS

EP	2777539	A2	9/2014
EP	2143372	B1	12/2014
EP	3274521	A1	1/2018
JP	S57144399	A	9/1982
JP	63280911	A	11/1988
JP	S63280911	A	11/1988
JP	2001187064	A	7/2001
JP	2018509273	A	4/2018
WO	WO-9639944	A1	12/1996
WO	WO-2014108898	A1	7/2014
WO	WO-2016160272	A1	10/2016
WO	WO-2017017443	A1	2/2017
WO	WO-2017151887	A1	9/2017
WO	WO-2019177567	A1	9/2019
WO	WO-2019177569	A1	9/2019
WO	WO-2019177570	A1	9/2019

OTHER PUBLICATIONS

“3D-Arm™”, Elekta—Minimally invasive surgery instrument holding arm, [Online]. [Accessed Oct. 16, 2017]. Retrieved from the Internet: <URL: <http://www.medicaexpo.com/prod/elekta/product-70692-509376.html>>, 8 pgs.

“ALLY Uterine Positioning System”, Cooper Surgical, [Online]. [Accessed Oct. 16, 2017]. Retrieved from the Internet: <URL: <https://www.coopersurgical.com/Products/Detail/ALLY-Uterine-Positioning-System>>, 2 pgs.

“Anatomical Shoulder Fracture System”, Zimmer Surgical Technique, 97-4223-003-00 Rev. 1, (2005), 24 pgs.

“Anatomical Shoulder Glenoid”, Zimmer Surgical Technique, (2014), 12 pgs.

“U.S. Appl. No. 15/560,894, Final Office Action dated Nov. 29, 2019”, 8 pgs.

“U.S. Appl. No. 15/560,894, Non Final Office Action dated May 16, 2019”, 9 pgs.

“U.S. Appl. No. 15/560,894, Preliminary Amendment filed Sep. 22, 2017”, 7 pgs.

“U.S. Appl. No. 15/560,894, Response filed Mar. 21, 2019 to Restriction Requirement dated Dec. 31, 2018”, 9 pgs.

“U.S. Appl. No. 15/560,894, Response filed Aug. 16, 2019 to Non Final Office Action dated May 16, 2019”, 11 pgs.

“U.S. Appl. No. 15/560,894, Restriction Requirement dated Dec. 31, 2018”, 7 pgs.

“U.S. Appl. No. 15/560,894, Supplemental Preliminary Amendment filed Sep. 29, 2017”, 7 pgs.

“U.S. Appl. No. 15/918,531, Non Final Office Action dated Sep. 26, 2019”, 12 pgs.

“U.S. Appl. No. 15/918,531, Response filed Dec. 26, 2019 to Non Final Office Action dated Sep. 26, 2019”, 12 pgs.

“U.S. Appl. No. 15/919,150, Non Final Office Action dated Jan. 13, 2020”, 10 pgs.

“U.S. Appl. No. 15/919,161, Non Final Office Action dated Sep. 26, 2019”, 18 pgs.

“U.S. Appl. No. 15/919,161, Response filed Dec. 26, 2019 to Non Final Office Action dated Sep. 26, 2019”, 13 pgs.

“U.S. Appl. No. 29/640,121, Corrected Notice of Allowability dated Jan. 21, 2020”, 4 pgs.

“U.S. Appl. No. 29/640,121, Notice of Allowance dated Nov. 5, 2019”, 8 pgs.

“ASSISTO Arm System”, Geomed GMBH, [Online]. [Accessed Oct. 16, 2017]. Retrieved from the Internet: <URL: <http://www.geomed.de/index.php?id=65&L=1>>, 1 pg.

“Atlas™ Flex Arm System”, Axxess Surgical, [Online]. [Accessed Oct. 16, 2017]. Retrieved from the Internet: <URL: <http://www.axcesssurgical.com/axcess-surgical-innovations-products/atlas-flex-arm-system/>>, 5 pgs.

“Atlas™ Rigid Arm System”, Axxess Surgical, [Online]. [Accessed Oct. 16, 2017]. Retrieved from the Internet: <URL: <http://www.axcesssurgical.com/axcess-surgical-innovations-products/atlas-rigid-arm-system/>>, 6 pgs.

“Bookler® StrongArm™ Holder”, Mediflex, [Online]. [Accessed Nov. 2, 2017]. Retrieved from the Internet: <URL: <http://www.mediflex.com/product/bookler-strongarm-holder-and-positioner-set-12-30cm-post/>>, (2015), 4 pgs.

“Canadian Application Serial No. 3,002,354, Office Action dated Jul. 4, 2019”, 4 pgs.

“Canadian Application Serial No. 3,002,354, Response filed Dec. 20, 2019 to Office Action dated Jul. 4, 2019”, 14 pgs.

“Chinese Application Serial No. 201680027778.9, Office Action dated Jul. 12, 2019”, w/English Translation, 20 pgs.

“Chinese Application Serial No. 201680027778.9, Response filed Oct. 31, 2019 to Office Action dated Jul. 12, 2019”, (w/English Claims), 15 pgs.

“Comprehensive Segmental Revision System, Proximal Humeral Reconstruction, Distal Humeral Reconstruction, Total Humeral Reconstruction”, Zimmer Biomet Surgical Technique, 0097.1-US-en-REV0416, (2016), 68 pgs.

(56)

References Cited

OTHER PUBLICATIONS

“EndoArm”, Olympus, [Online]. [Accessed Nov. 2, 2017]. Retrieved from the Internet: <URL: <https://www.olympus.co.jp/jp/news/2003b/nr030925endoj.html>>, (Sep. 25, 2003), 4 pgs.

“EndoBoy”, LUT—Pneumatic Arm, Grecco, 8 pgs.

“EndoCrane”, Karl Storz—Leroy Retractors for Laparoscopic Colorectal Surgery, [Online]. [Accessed Oct. 16, 2017]. Retrieved from the Internet: <URL: https://www.karlstorz.com/cps/rde/xbrcr/karlstorz_assets/ASSETS/2193800.pdf>, 16 pgs.

“European Application Serial No. 16773696.6, Extended European Search Report dated Nov. 19, 2018”, 8 pgs.

“European Application Serial No. 16773696.6, Response filed Jun. 4, 2018 to Office Action dated Nov. 22, 2018”.

“European Application Serial No. 16773696.6, Response filed Jun. 17, 2019 to Extended European Search Report dated Nov. 19, 2018”, 18 pgs.

“European Application Serial No. 18210813.4, Extended European Search Report dated Apr. 12, 2019”, 7 pgs.

“Genzyme Remote Surgical Retractor Arm Hands Free Pneumatic System”, Renix International/Alibaba.com Copyright 1999-2017, [Online]. [Accessed Nov. 2, 2017]. Retrieved from the Internet: <URL: http://renix.trustpass.alibaba.com/product/50001078652-219532304/Genzyme_Remote_Surgical_Retractor_Arm_Hands_Free_Pneumatic_System.html>, 2 pgs.

“Helping Hand”, Fraunhofer IPA—The helping hand in the operation room Research News, [Online]. [Accessed Oct. 16, 2017]. Retrieved from the Internet: <URL: <https://www.fraunhofer.de/en/press/research-news/2015/november/helping-hand-in-the-operation-room.html>>, (Nov. 2015), 2 pgs.

“International Application Serial No. PCT/US2016/021076, International Preliminary Report on Patentability dated Oct. 12, 2017”, 11 pgs.

“International Application Serial No. PCT/US2016/021076, International Search Report dated Aug. 11, 2016”, 4 pgs.

“International Application Serial No. PCT/US2016/021076, Invitation to Pay Add'l Fees and Partial Search Report dated May 25, 2016”, 2 pgs.

“International Application Serial No. PCT/US2016/021076, Written Opinion dated Aug. 11, 2016”, 8 pgs.

“International Application Serial No. PCT/US2018/021988, International Search Report dated Dec. 20, 2018”, 4 pgs.

“International Application Serial No. PCT/US2018/021988, Written Opinion dated Dec. 20, 2018”, 6 pgs.

“International Application Serial No. PCT/US2018/022004, International Search Report dated Feb. 14, 2019”, 8 pgs.

“International Application Serial No. PCT/US2018/022004, Invitation to Pay Additional Fees mailed Dec. 19, 2018”, 15 pgs.

“International Application Serial No. PCT/US2018/022004, Written Opinion dated Feb. 14, 2019”, 14 pgs.

“International Application Serial No. PCT/US2018/022006, International Search Report dated Feb. 8, 2019”, 8 pgs.

“International Application Serial No. PCT/US2018/022006, Invitation to Pay Additional Fees dated Dec. 12, 2018”, 16 pgs.

“International Application Serial No. PCT/US2018/022006, Written Opinion dated Feb. 8, 2019”, 15 pgs.

“IronIntern”, Automated Medical, [Online]. [Accessed Oct. 16, 2017]. Retrieved from the Internet: <URL: <http://ironintern.com/iron-intern%E2%84%A2>>, 1 pg.

“Japanese Application Serial No. 2018-501138, Notification of Reasons for Refusal dated Nov. 5, 2019”, (w/English Translation), 15 pgs.

“Jarit Endoscope Holder”, Integra, [Online]. [Accessed Oct. 16, 2017]. Retrieved from: <URL: <https://www.integralife.com/endoscope-instrument-holder-set/product/surgical-instruments-hospitals-surgery-centers-tissue-banks-jarit-laparoscopic-endoscopes-endoscope-instrument-holder-set>>, 18 pgs.

“M-Trac”, Aesculap / B Braun, [Online], [Accessed—Oct. 16, 2017], Retrieved from the Internet: <URL: <https://www.bbraun.com/en/products/b/m-trac.html>>, 2 pgs.

“Martin’s Arm”, Hayden Medical (& others), [Online]. [Accessed Oct. 16, 2017], Retrieved from the Internet: <URL: <http://haydenmedical.com/surgical-retractors-martins-arm-retractors/>>, 2 pgs.

“Mechanical Arm—Mod. 8470”, Ansabere Surgical, [Online]. [Accessed Oct. 16, 2017]. Retrieved from the Internet: <URL: <http://www.ansaberesurgical.com/en/productos/brazos-mecanicos/brazo-mecanico-mod-8470/>>, 5 pgs.

“Phantom ML”, TeDan Surgical Innovations, [Online]. [Accessed Nov. 14, 2017]. Retrieved from the Internet: <URL: <http://www.tedansurgical.com/spine/articulating-arms/>>, 2 pgs.

“Point Setter”, Mitaka Kohki Co., Ltd. Operating / User’s Manual Model: PSMS2, (Feb. 14, 2010), 28 pgs.

“PositionOR”, Surgical Concept Designs, [Online]. [Accessed Nov. 14, 2017]. Retrieved from the Internet: <URL: <http://surgical-concepts.com/products/PositionOR/>>, 1 pg.

“Positioning Arm”, Civco—Laparostat™ Kit, [Online]. [Accessed Oct. 16, 2017]. Retrieved from the Internet: <URL: <http://www.civco.com/mmi/resources/ifu/043687.pdf>>, 16 pgs.

“SaphLITE | RadLITE”, Teleflex Medical, [Online], [Accessed Nov. 14, 2017]. Retrieved from the Internet: <URL: https://www.teleflex.com/en/usa/prod_saphlite-radlite.php>, 1 pg.

“Saphlite/Saphliff”, Genzyme Surgical Products (Jan. 7, 1999), [Online]. [Accessed Oct. 16, 2017] Retrieved from the Internet: <URL: https://www.accessdata.fda.gov/cdrh_docs/pdf/K990062.pdf>, 5 pgs.

“Speed-Tract”, Integra—Table Mounted Speed—Tract Retractor System, [Online]. [Accessed Oct. 16, 2017]. Retrieved from the Internet: <URL: <http://occ.integralife.com/products%2Fpdfs%2FIntegra%20table%20mounted%20speed-tract%20retractor%20system%20brochure.pdf>>, 6 pgs.

“Spider2 Limb Positioner”, Smith & Nephew, [Online]. [Accessed Nov. 14, 2017]. Retrieved from the Internet: <URL: <http://www.smith-nephew.com/new-zealand/advanced-surgical-devices/key-products/sports-medicine/spider2-limb-positioner-for-shoulder--hip--knee--/>>, 2 pgs.

“Spine Endoscope & Endoscope Holder”, Maxer, [Online]. [Accessed Nov. 2, 2017]. Retrieved from the Internet: <URL: http://www.maxerendoscopy.com/index.php?option=com_content&view=article&id=190:spine-endoscope-endoscope-holder&catid=81:spine-endoscopy&Itemid=858>, (2013).

“SurgiAssist Camera Holder”, SurgiToolsMIS, [Online]. [Accessed Nov. 14, 2017]. Retrieved from the Internet: <URL: <https://www.surgitools.com/surgiassist-camera-holder.html>>, 4 pgs.

“Synaptive BrightMatter Drive Robotic Surgical Video Arm System”, Synaptive, [Online]. [Accessed Nov. 14, 2017]. Retrieved from the Internet: <URL: <https://www.medgadget.com/2016/05/synaptive-brightmatter-drive-robotic-surgical-videoarm-system.html>>, 3 pgs.

“TEE Transducer Holder”, Civco, [Online]. [Accessed Oct. 16, 2017]. Retrieved from the Internet: <URL: http://www.civco.com/mmi/resources/product-support/TEE-Holder-Brochure_2008P-2339-Rev-2_low-res-8l9rv5.pdf>, 8 pgs.

“The Freehand System”, Freehand—V1.2, [Online]. [Accessed Oct. 16, 2017]. Retrieved from the Internet: <URL: <http://freehandsurgeon.com/Products/Detail?id=2>>, 3 pgs.

“TiREX® Retractor System”, Orion Surgical, [Online]. [Accessed Nov. 2, 2017]. Retrieved from the Internet: <URL: <http://www.orion-surgical.com/english/tirex-retractor-system/components-of-the-tirex.html>>, (2017), 2 pgs.

“TRIMANO 3D Support Arm”, Maquet, [Online]. [Accessed Oct. 16, 2017]. Retrieved from the Internet: <URL: <https://www.maquet.com/int/products/trimano-3d-support-arm/>>, 3 pgs.

“UniARM Surgical Support System”, Mitaka Kohki Co., Ltd. Operating / User Manual Version 1.1, [Online]. [Accessed Nov. 2, 2017]. Retrieved from the Internet: <URL: <http://mitakausa.com/uniarml/>>, (Mar. 20, 2009), 19 pgs.

“Unitrac Retraction & holding system for open & minimally invasive surgery”, Aesculap Surgical Technologies—Surgical Instruments, (2010), 12 pgs.

(56)

References Cited

OTHER PUBLICATIONS

“Unitrac® Pneumatic Holding Arm”, Aesculap / B Braun, [Online]. [Accessed Oct. 16, 2017]. Retrieved from the Internet: <URL: <https://www.bbraun.com/en/products/b/unitrac-pneumaticholdingarm.html>>, 3 pgs.

“Vertek Articulating Arm”, Medtronic—Copyright 2013, [Online]. [Accessed Nov. 2, 2017]. Retrieved from the Internet: <URL: <http://global.medtronic.com/xg-en/healthcare-professionals/products/neurological/surgical-navigation-imaging/neurosurgery-imaging-surgical-navigation/surgical-procedures.html>>, 2 pgs.

“Viky”, Endocontrol Medical, [Online]. [Accessed 2014], Retrieved from the Internet: <URL: <http://www.endocontrol-medical.com/en/viky-en/>>, 5 pgs.

“Wingman Scope Holder”, Stryker, [Online]. [Accessed Nov. 14, 2017]. Retrieved from the Internet: <URL: <http://www.stryker.com/cn/products/OREquipmentTelemedicine/EndoscopicSurgeryEquipment/Laparoscopy/Accessories/ScopeHolder/index.htm#>>>, 3 pgs.

“U.S. Appl. No. 15/560,894, Notice of Allowance dated Feb. 13, 2020”, 8 pgs.

“U.S. Appl. No. 15/560,894, Response filed Jan. 28, 2020 to Final Office Action dated Nov. 29, 2019”, 7 pgs.

“U.S. Appl. No. 15/918,531, Corrected Notice of Allowability dated May 20, 2020”, 2 pgs.

“U.S. Appl. No. 15/918,531, Notice of Allowance dated Feb. 19, 2020”, 11 pgs.

“U.S. Appl. No. 15/919,150, Notice of Allowance dated May 12, 2020”, 5 pgs.

“U.S. Appl. No. 15/919,150, Response filed Apr. 10, 2020 to Non Final Office Action dated Jan. 13, 2020”, 11 pgs.

“U.S. Appl. No. 15/919,150, Supplemental Notice of Allowability dated Jul. 6, 2020”, 2 pgs.

“U.S. Appl. No. 15/919,150, Supplemental Notice of Allowability dated Jul. 29, 2020”, 2 pgs.

“U.S. Appl. No. 15/919,161, Corrected Notice of Allowability dated Jul. 29, 2020”, 2 pgs.

“U.S. Appl. No. 15/919,161, Corrected Notice of Allowability dated Aug. 26, 2020”, 4 pgs.

“U.S. Appl. No. 15/919,161, Final Office Action dated Feb. 19, 2020”, 7 pgs.

“U.S. Appl. No. 15/919,161, Notice of Allowance dated Jun. 4, 2020”, 9 pgs.

“U.S. Appl. No. 15/919,161, Repsonse filed May 18, 2020 to Final Office Action dated Feb. 19, 2020”, 10 pgs.

“U.S. Appl. No. 16/210,787, Response filed Jun. 15, 2020 to Restriction Requirement dated Apr. 16, 2020”, 6 pgs.

“U.S. Appl. No. 16/210,787, Restriction Requirement dated Apr. 16, 2020”, 5 pgs.

“U.S. Appl. No. 16/877,023, Preliminary Amendment filed Jul. 31, 2020”, 7 pgs.

“U.S. Appl. No. 16/879,500, Preliminary Amendment filed Jun. 19, 2020”, 6 pgs.

“Australian Application Serial No. 2016243292, First Examination Report dated Apr. 7, 2020”, 4 pgs.

“Australian Application Serial No. 2016243292, Response filed Jun. 29, 2020 to First Examination Report dated Apr. 7, 2020”, 30 pgs.

“Australian Application Serial No. 2016243292, Subsequent Examiners Report dated Jul. 30, 2020”, 5 pgs.

“Canadian Application Serial No. 3,002,354, Office Action dated Apr. 27, 2020”, 3 pgs.

“Canadian Application Serial No. 3,002,354, Response filed Aug. 4, 2020 to Office Action dated Apr. 27, 2020”, 18 pgs.

“Chinese Application Serial No. 201680027778.9, Office Action dated Feb. 6, 2020”, with English translation, 6 pages.

“Chinese Application Serial No. 201680027778.9, Response filed Jun. 12, 2020”, with English translation, 18 pages.

“Chinese Application Serial No. 201680027778.9, Response filed Mar. 19, 2020 to Office Action dated Feb. 6, 2020”, with English claims, 8 pages.

“Chinese Application Serial No. 201680027778.9, Response filed Jul. 15, 2020 to Office Action dated Jun. 12, 2020”, with English claims, 71 pages.

“Japanese Application Serial No. 2018-501138, Response filed Apr. 22, 2020 to Notification of Reasons for Refusal dated Nov. 5, 2019”, with English claims, 15 pgs.

“Korean Application Serial No. 10-2017-7030940, Notice of Preliminary Rejection dated Aug. 10, 2020”, with English translation, 13 pages.

“U.S. Appl. No. 16/210,787, Non Final Office Action dated Sep. 15, 2020”, 7 pages.

“International Application Serial No. PCT US2018 022006, International Preliminary Report on Patentability dated Sep. 24, 2020”, 15 pages.

“International Application Serial No. PCT US2018 021988, International Preliminary Report on Patentability dated Sep. 24, 2020”, 8 pages.

“International Application Serial No. PCT US2018 022004, International Preliminary Report on Patentability dated Sep. 24, 2020”, 14 pages.

* cited by examiner

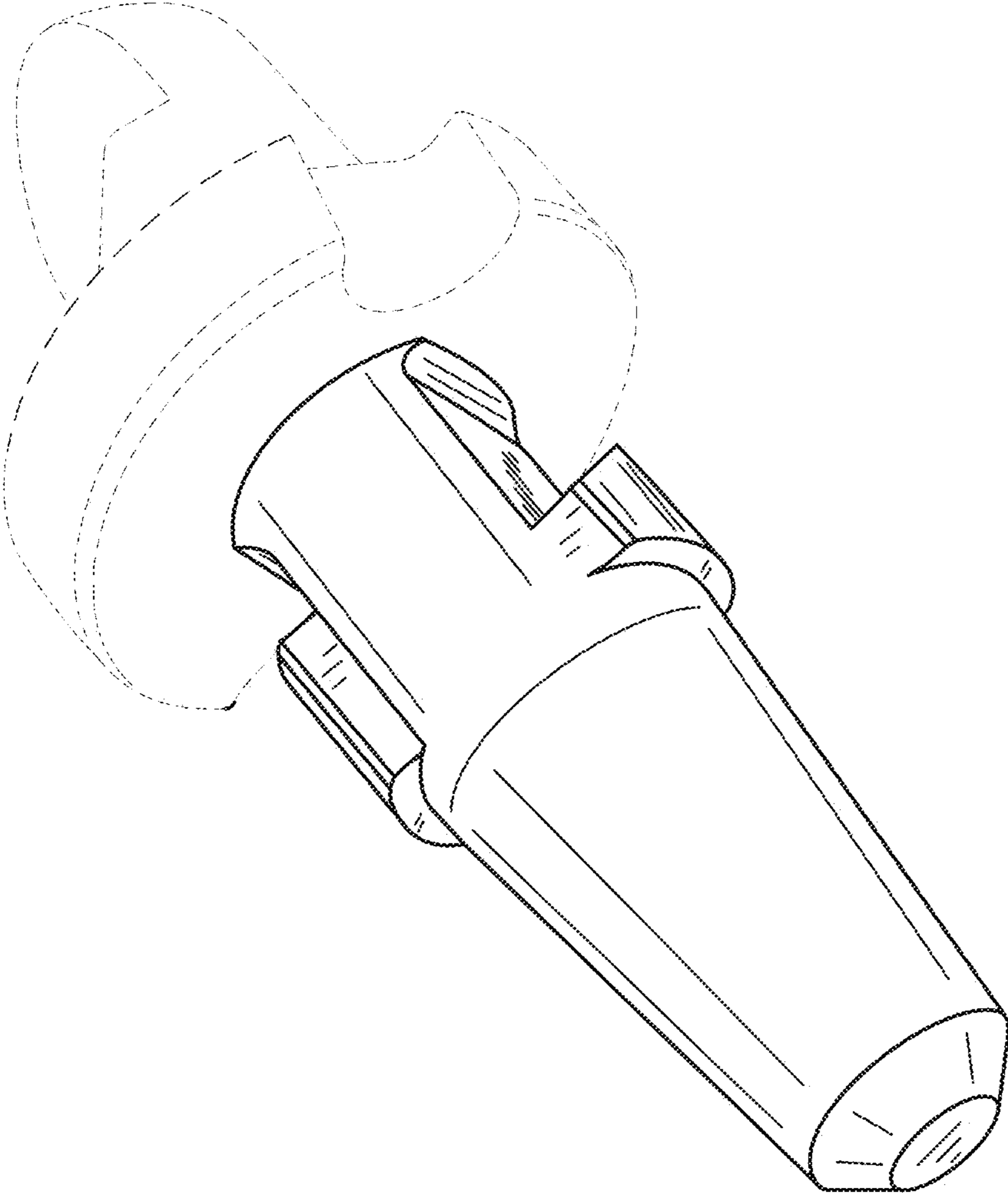


FIG. 1

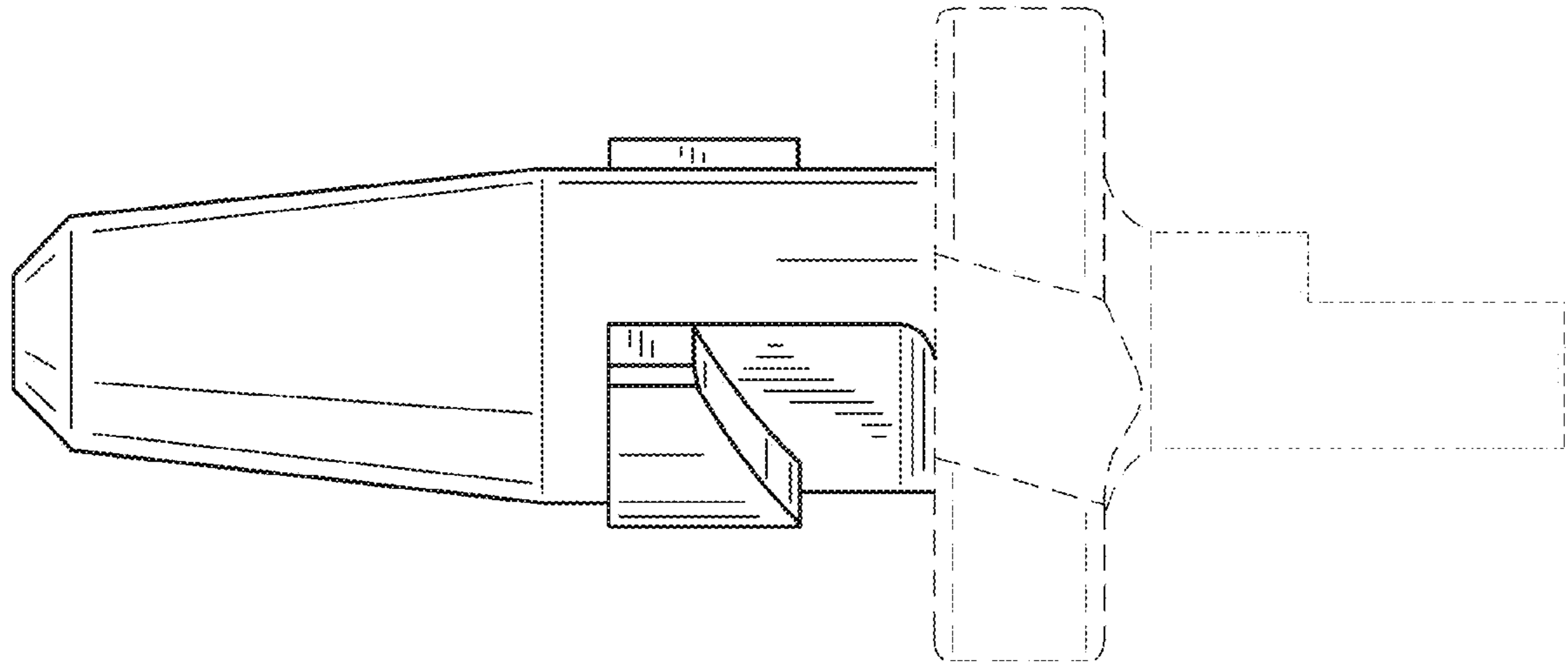


FIG. 2

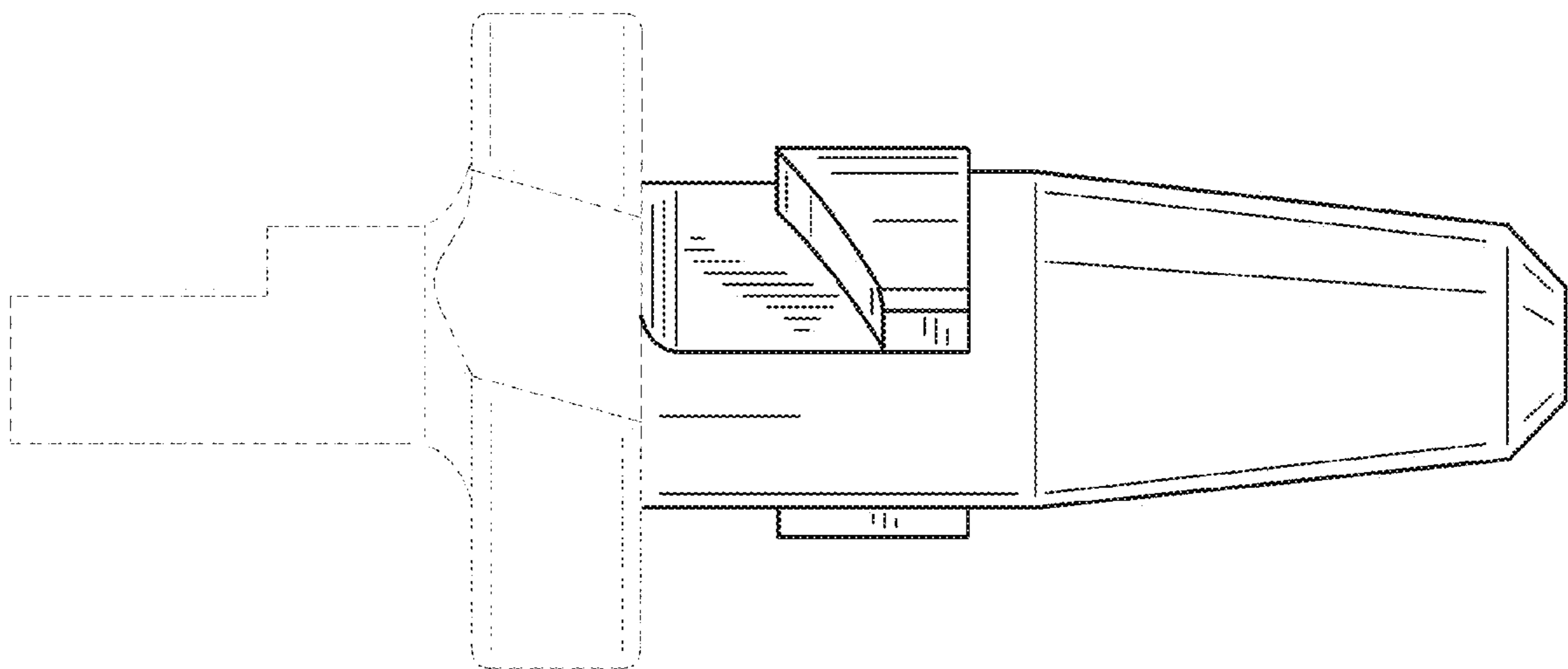


FIG. 3

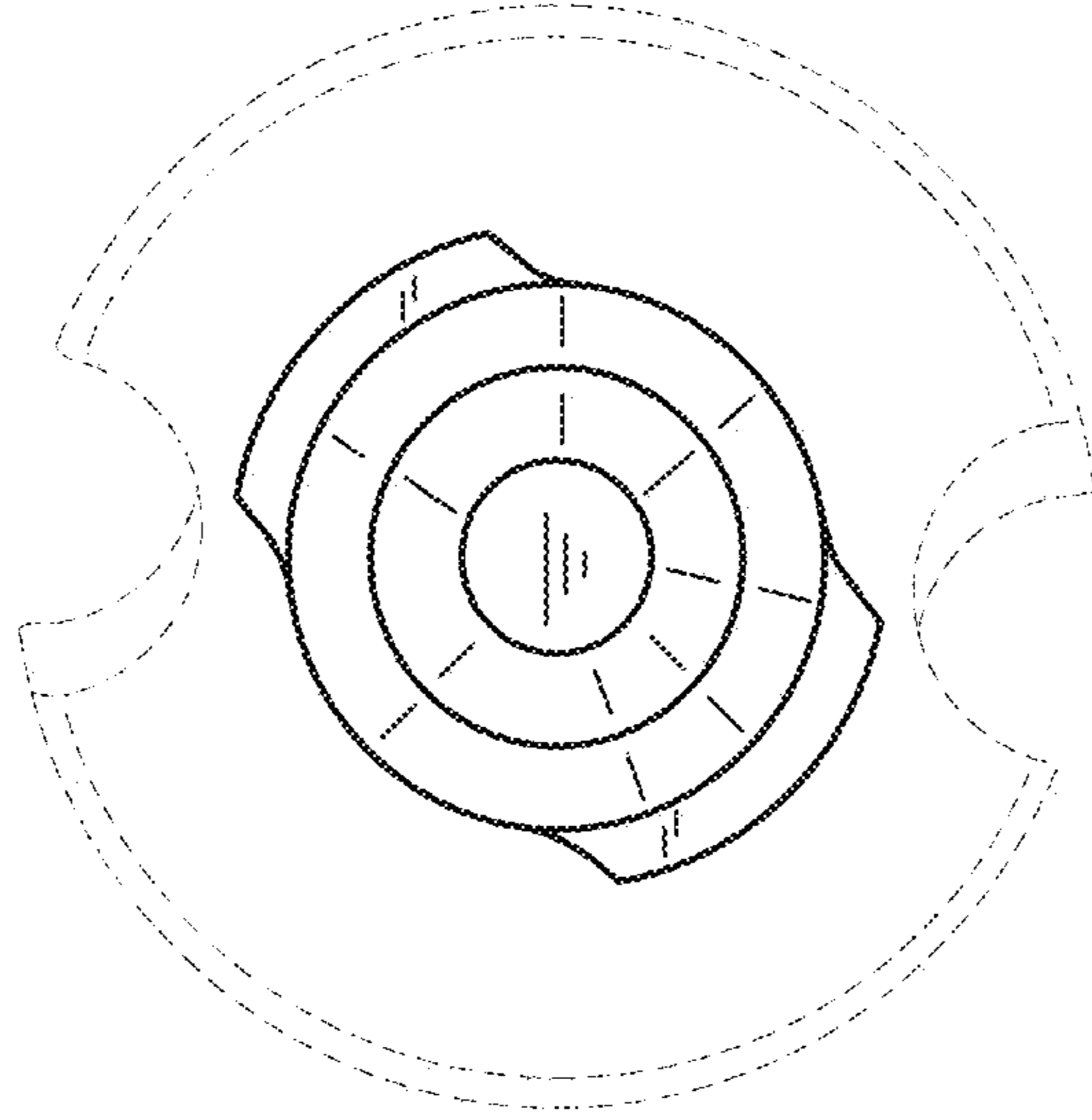


FIG. 4

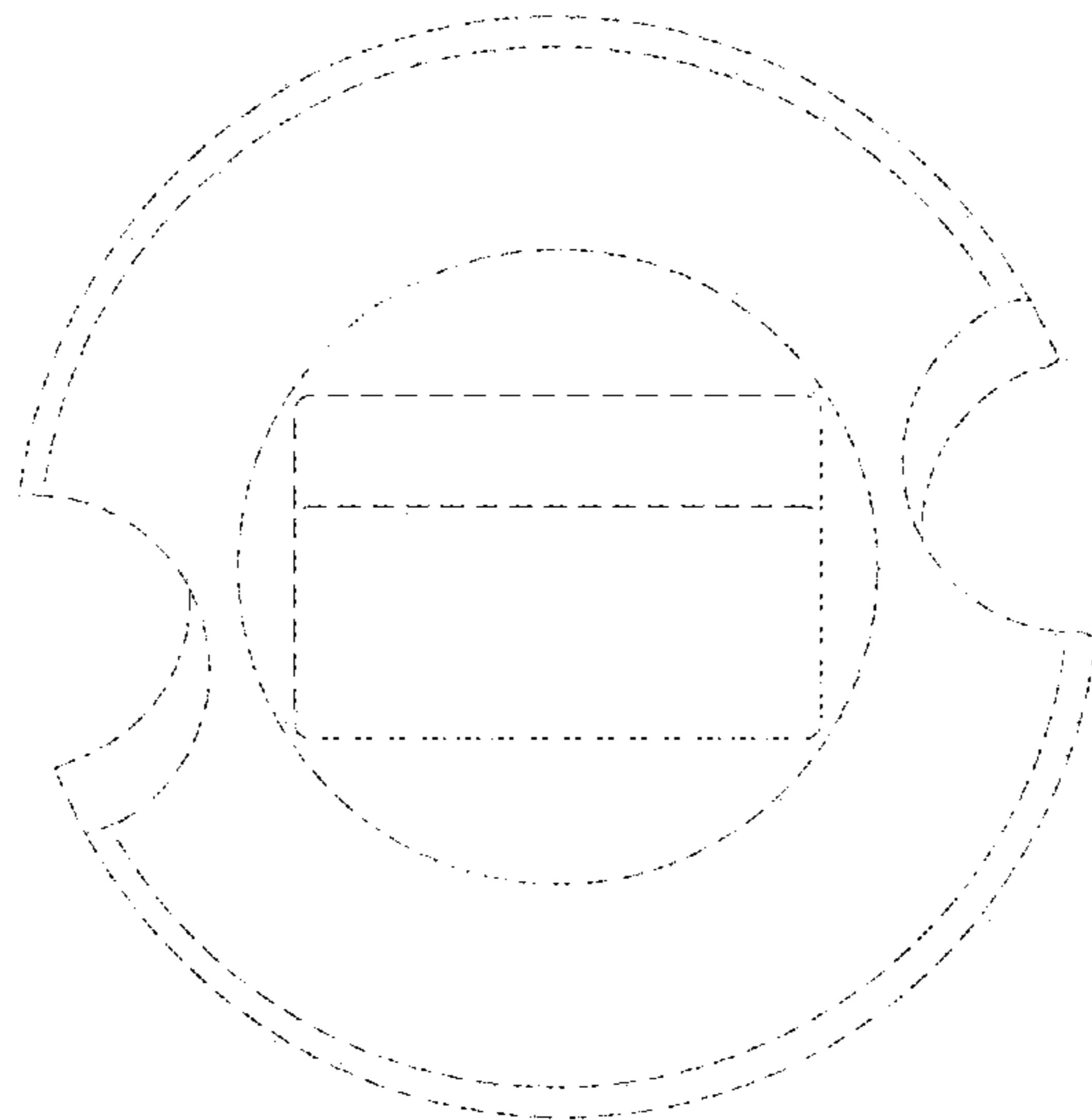


FIG. 5

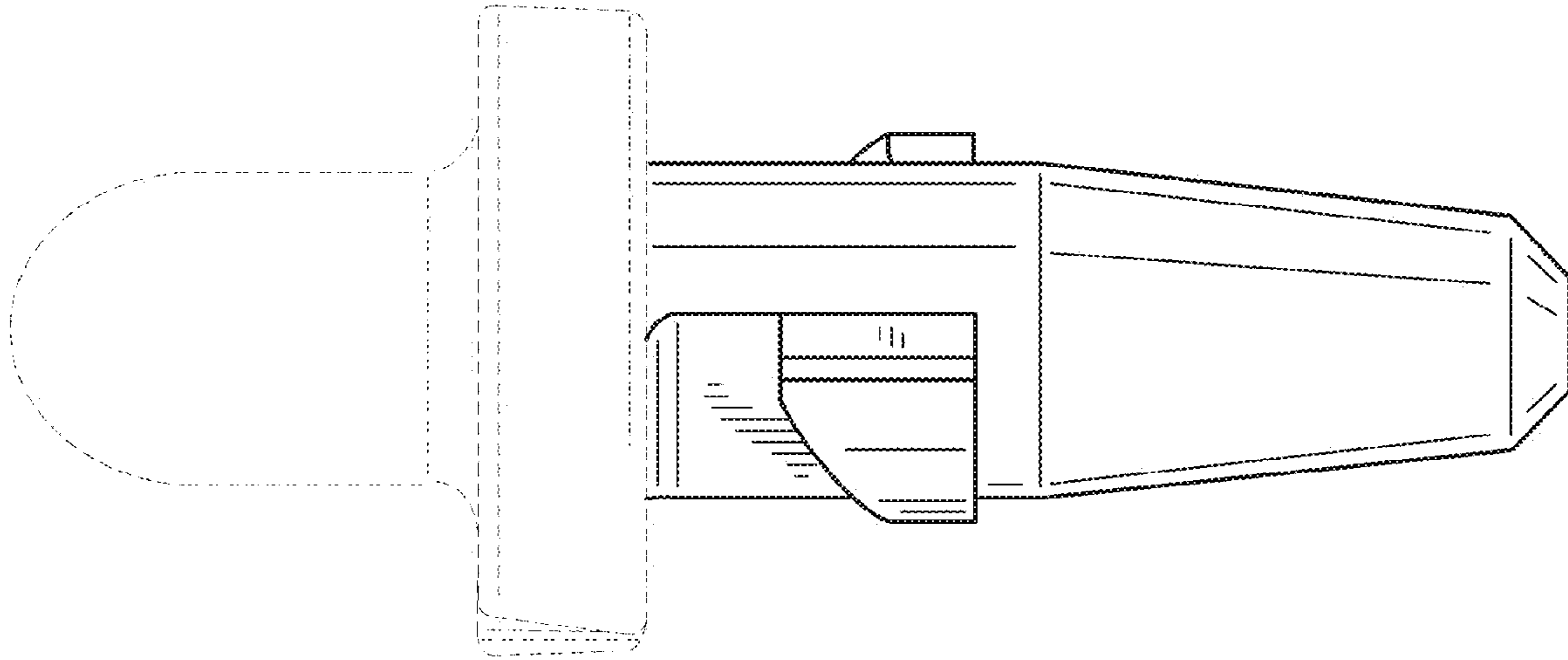


FIG. 6

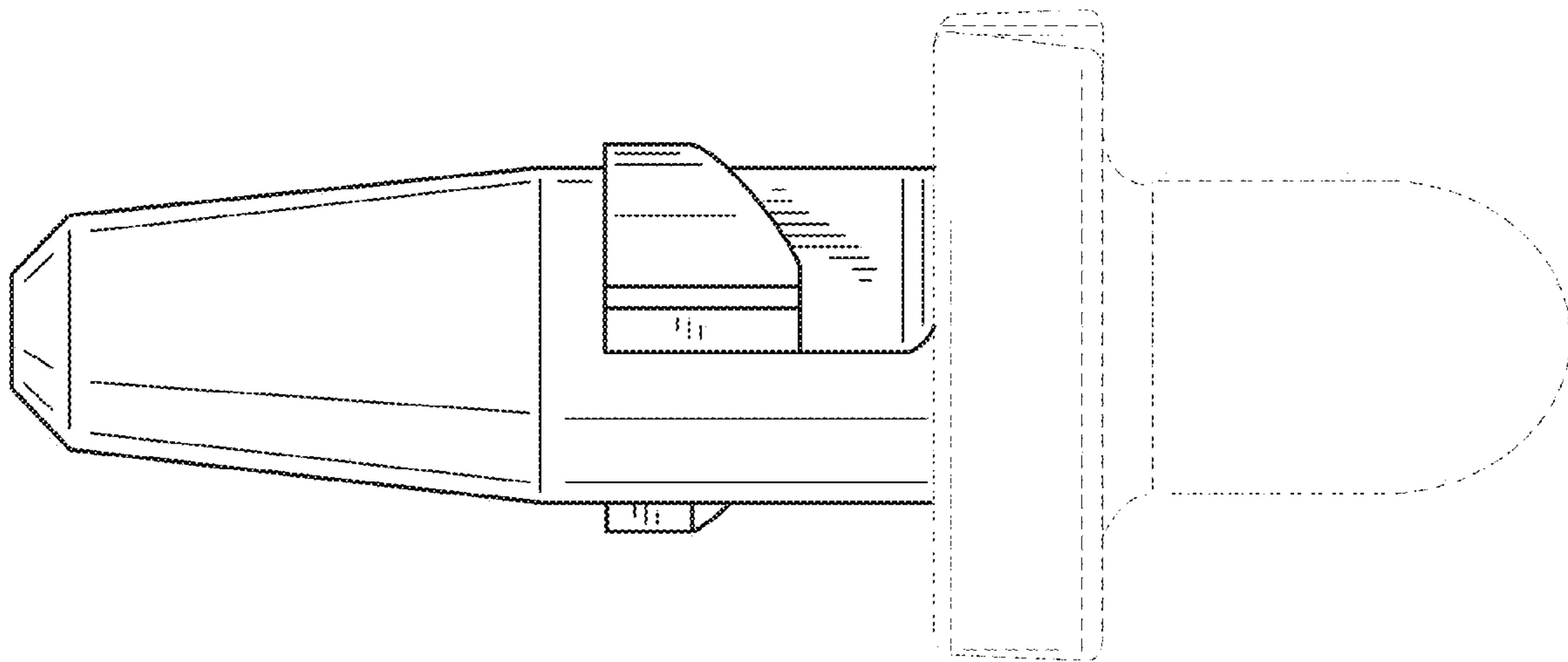


FIG. 7

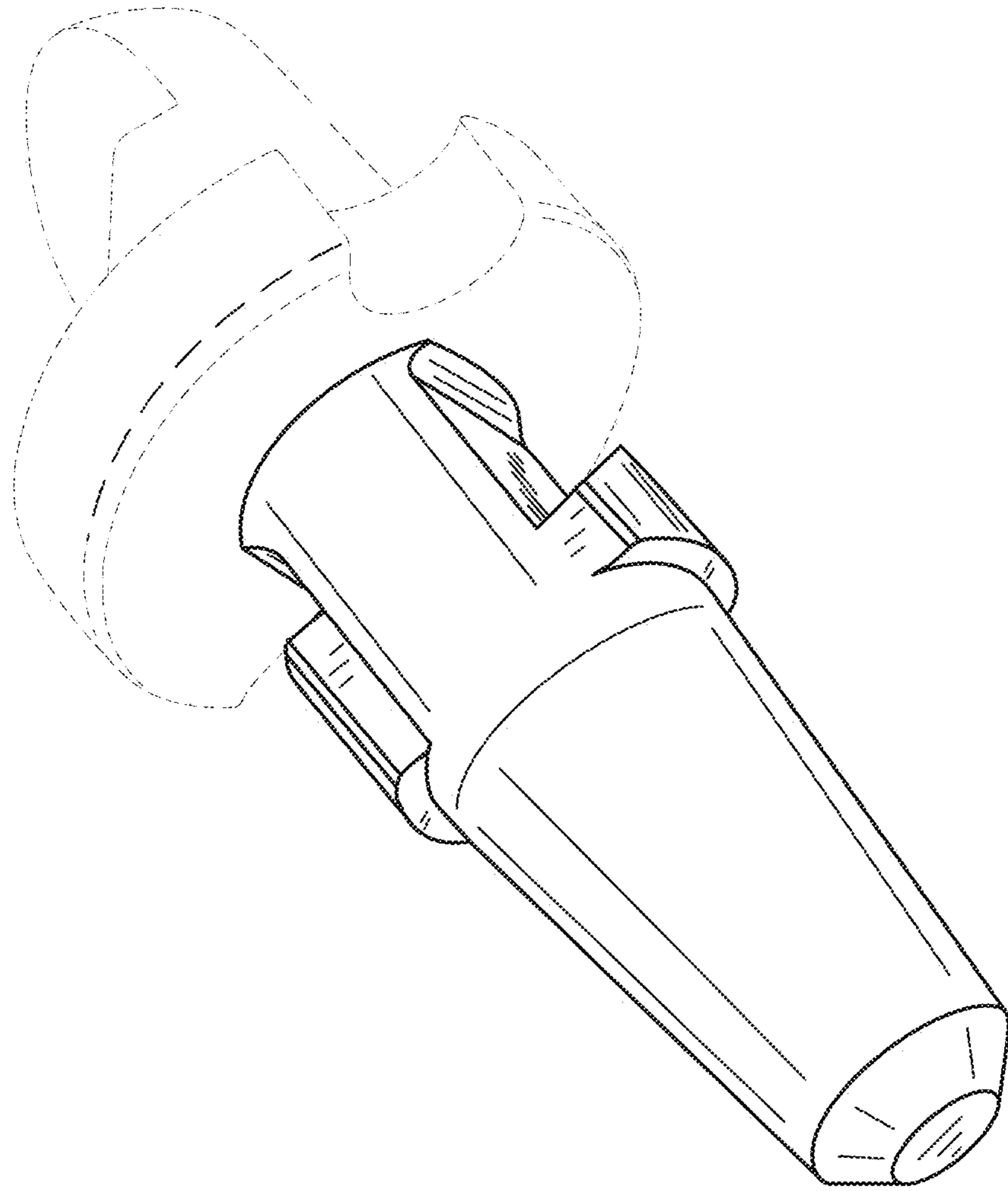


FIG. 8

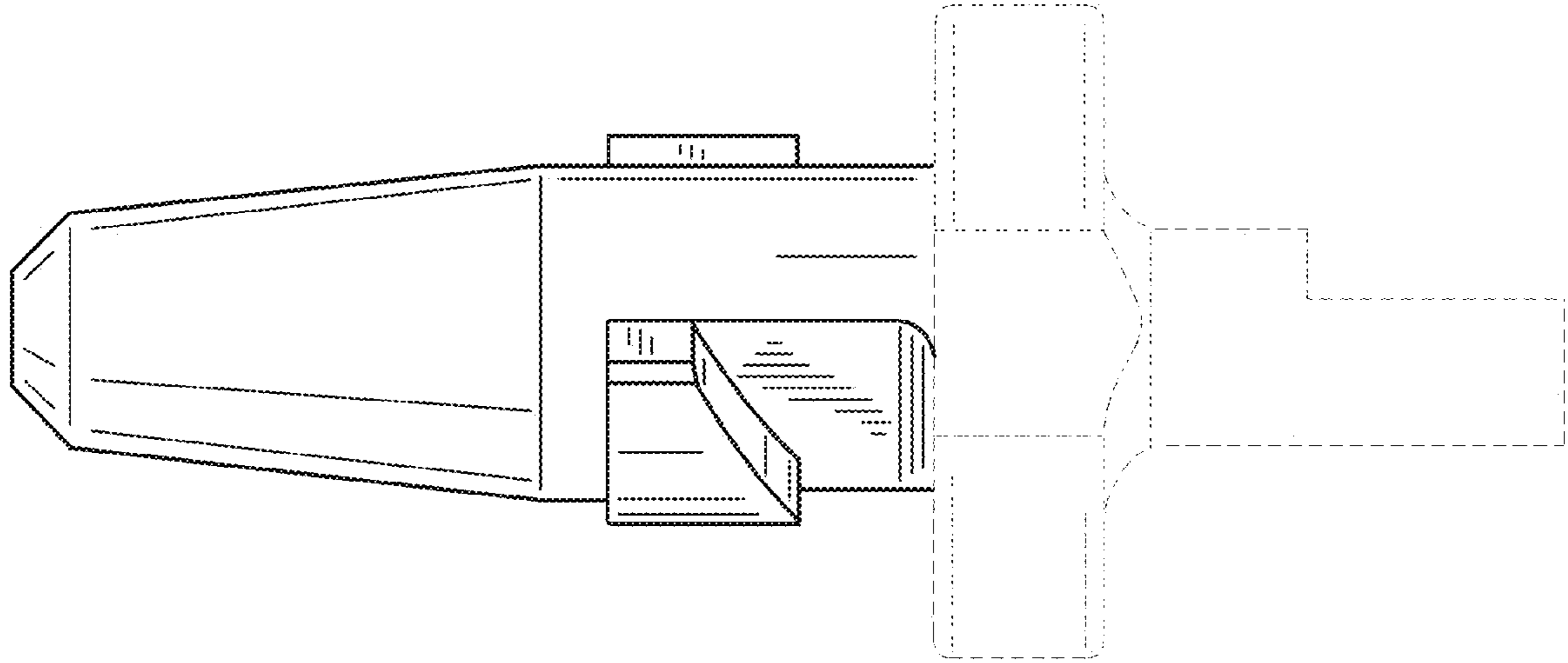


FIG. 9

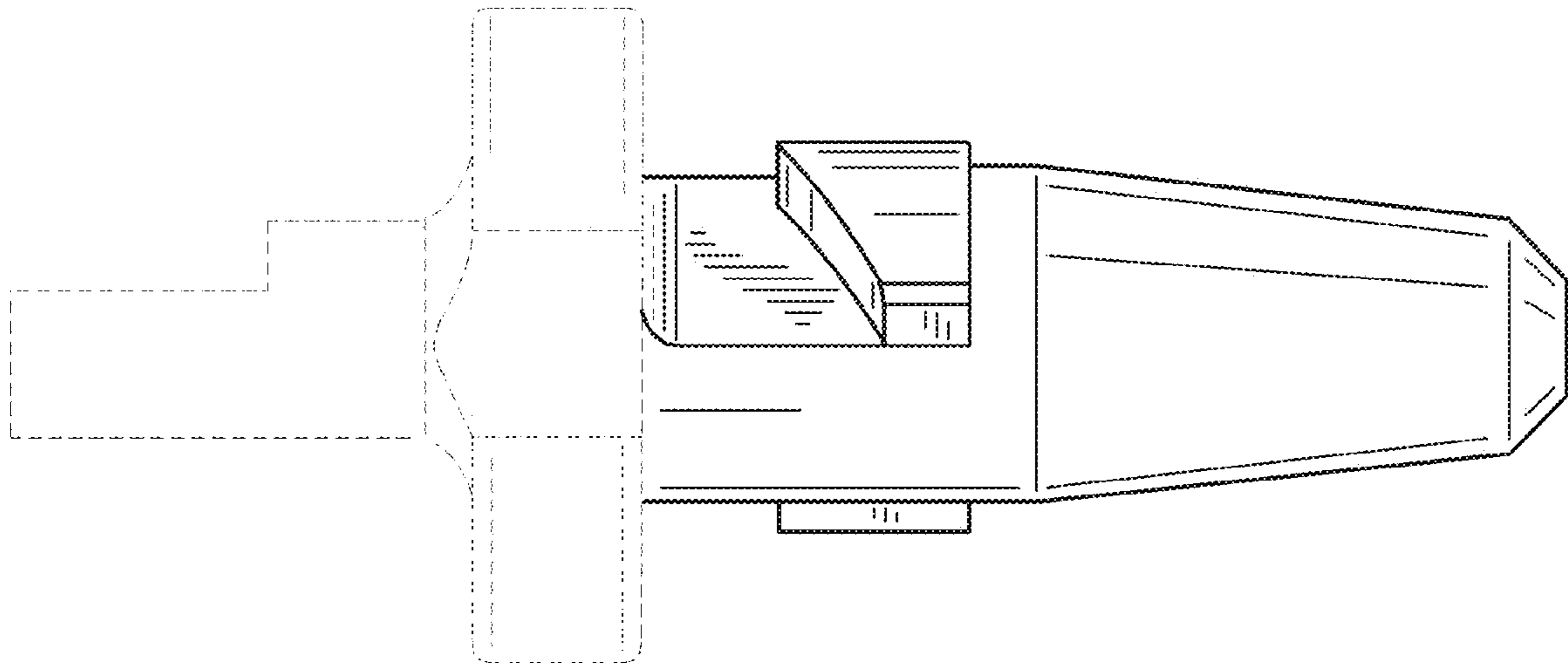


FIG. 10

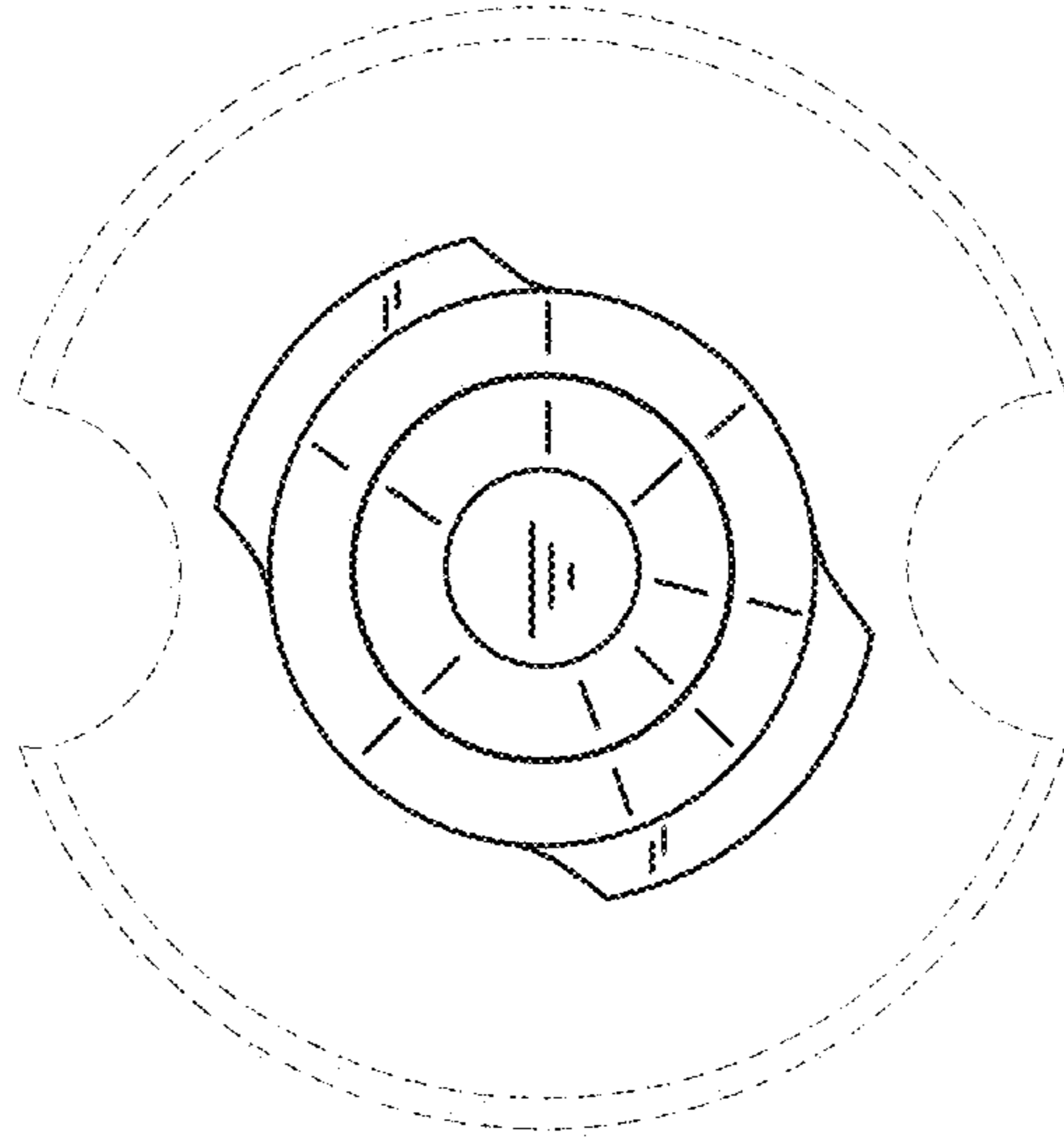


FIG. 11

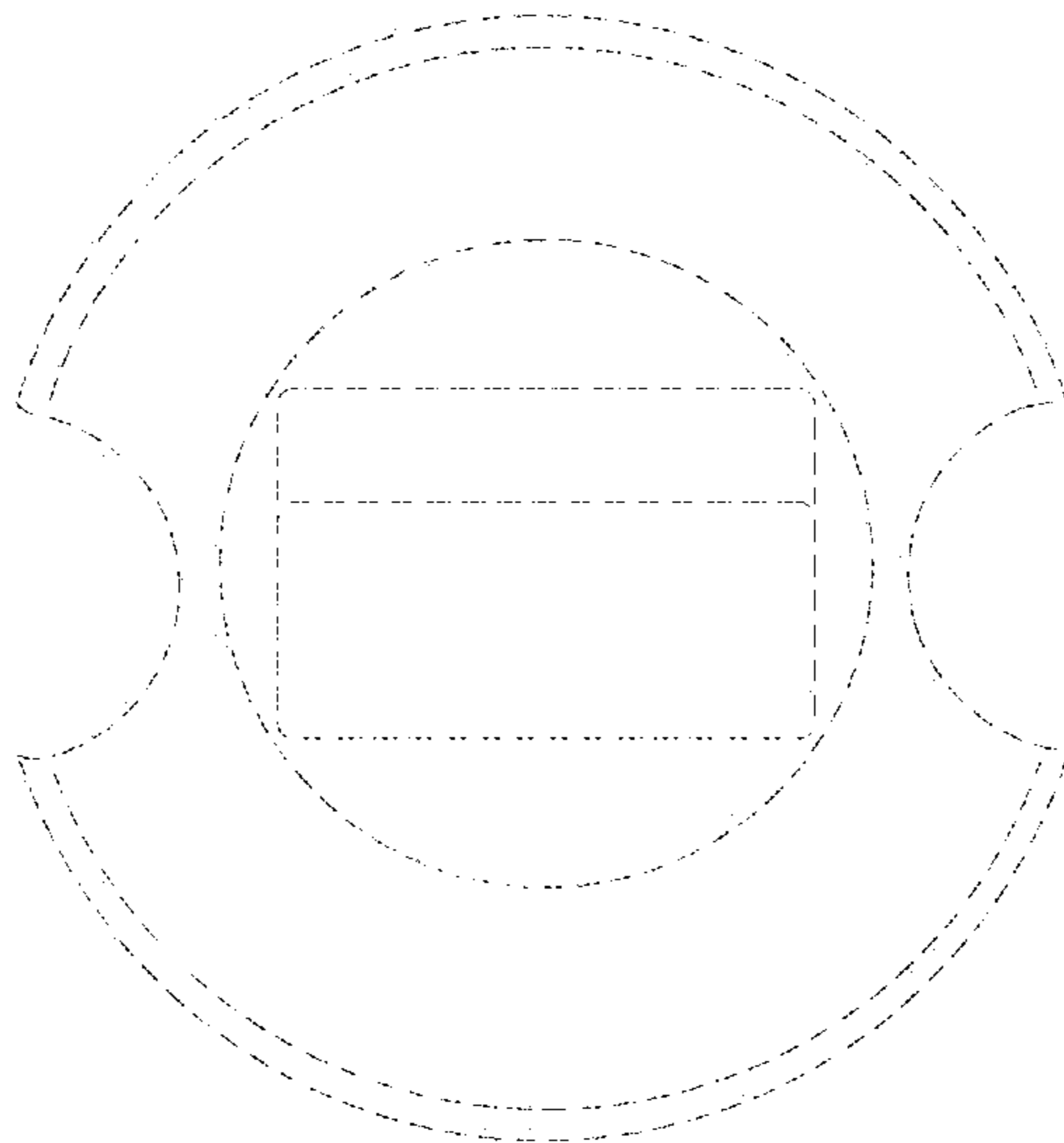


FIG. 12

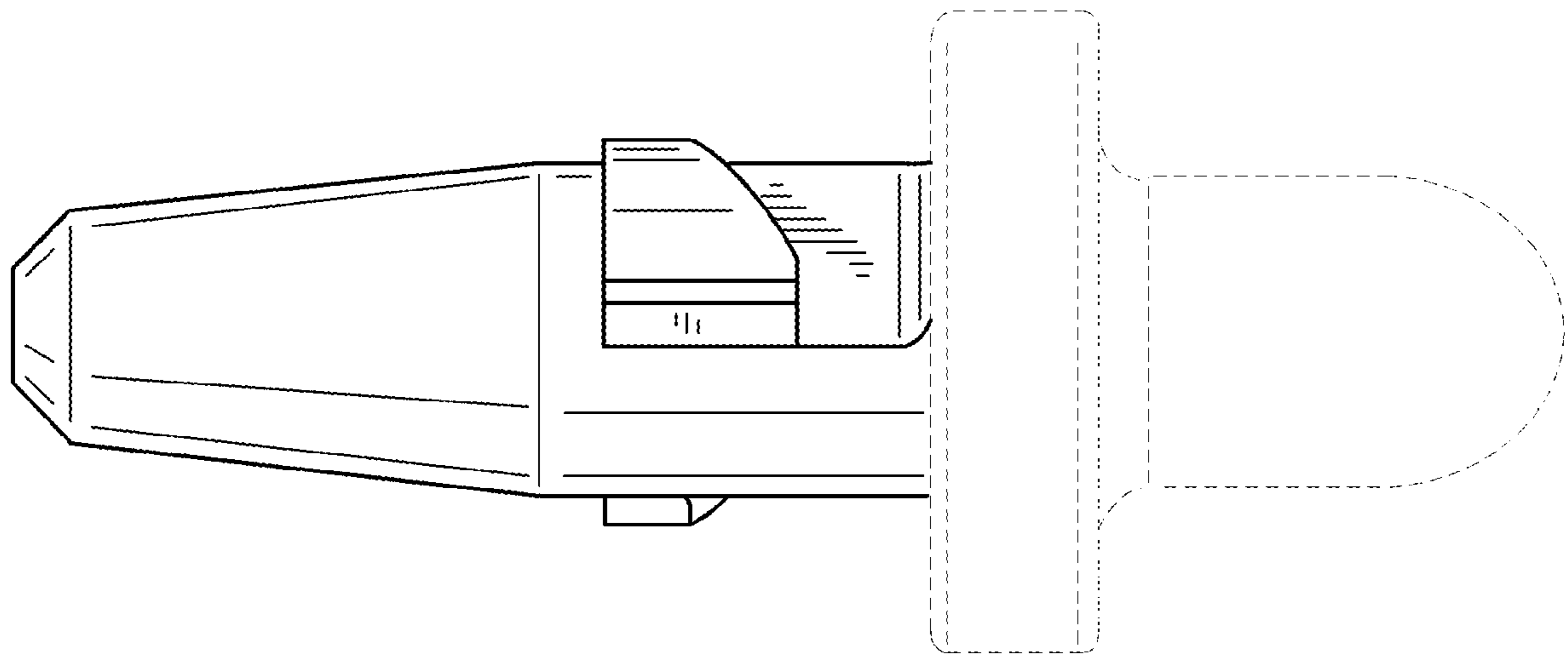


FIG. 13

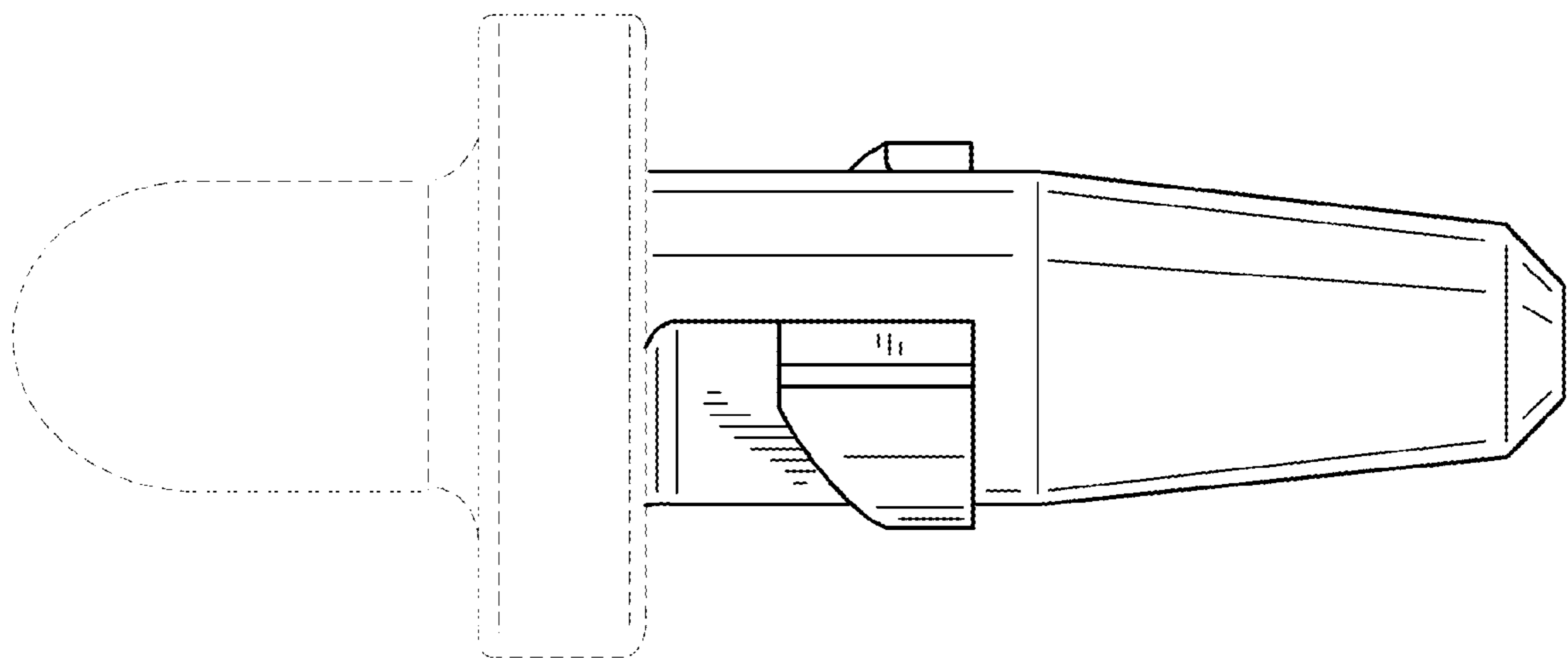


FIG. 14