

(54) Title of the Invention: Toothbrush sterilization system

(51) INT CL: A46B 17/06 (2006.01) A61L 2/10 (2006.01)

(21) Application No: 1613363.9 (22) Date of Filing: 25.01.2015 Date Lodged: 03.08.2016 (30) Priority Data: (31) 61934500 (32) 31.01.2014 (33) US (31) 14604729 (32) 25.01.2015 (33) US (86) International Application Data: PCT/US2015/012803 En 25.01.2015 (87) International Publication Data: WO2015/116506 En 06.08.2015 (43) Date of Reproduction by UK Office 10.05.2017	(72) Inventor(s): Ryan Mongan Simon Ghahary (73) Proprietor(s): TAO Clean, LLC 984 N Ridgeline Road, Orange 92869, California, United States of America (74) Agent and/or Address for Service: Barker Brettell LLP 100 Hagley Road, Edgbaston, BIRMINGHAM, B16 8QQ, United Kingdom
(56) Documents Cited: GB 1195209 A CN 201253363 Y US 7213603 B2 US 3820251 A KR20120066508 (58) Field of Search: As for published application 2544141 A viz: INT CL A45D, A46B, A47K, A61L, F26B Other: Patbase; Google (RTM) Patents; Google (RTM) Web updated as appropriate Additional Fields Other: None	

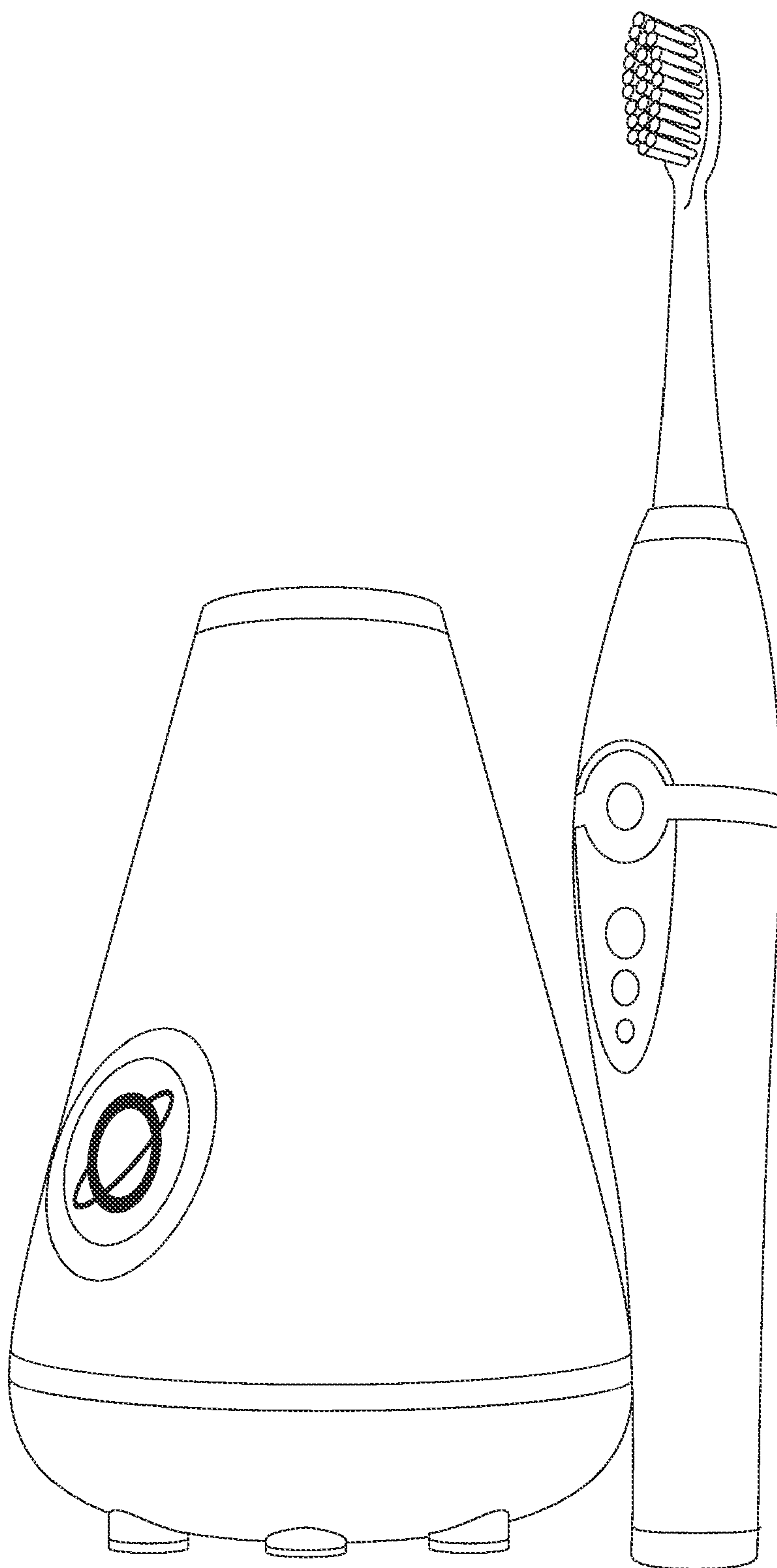


FIG. 1

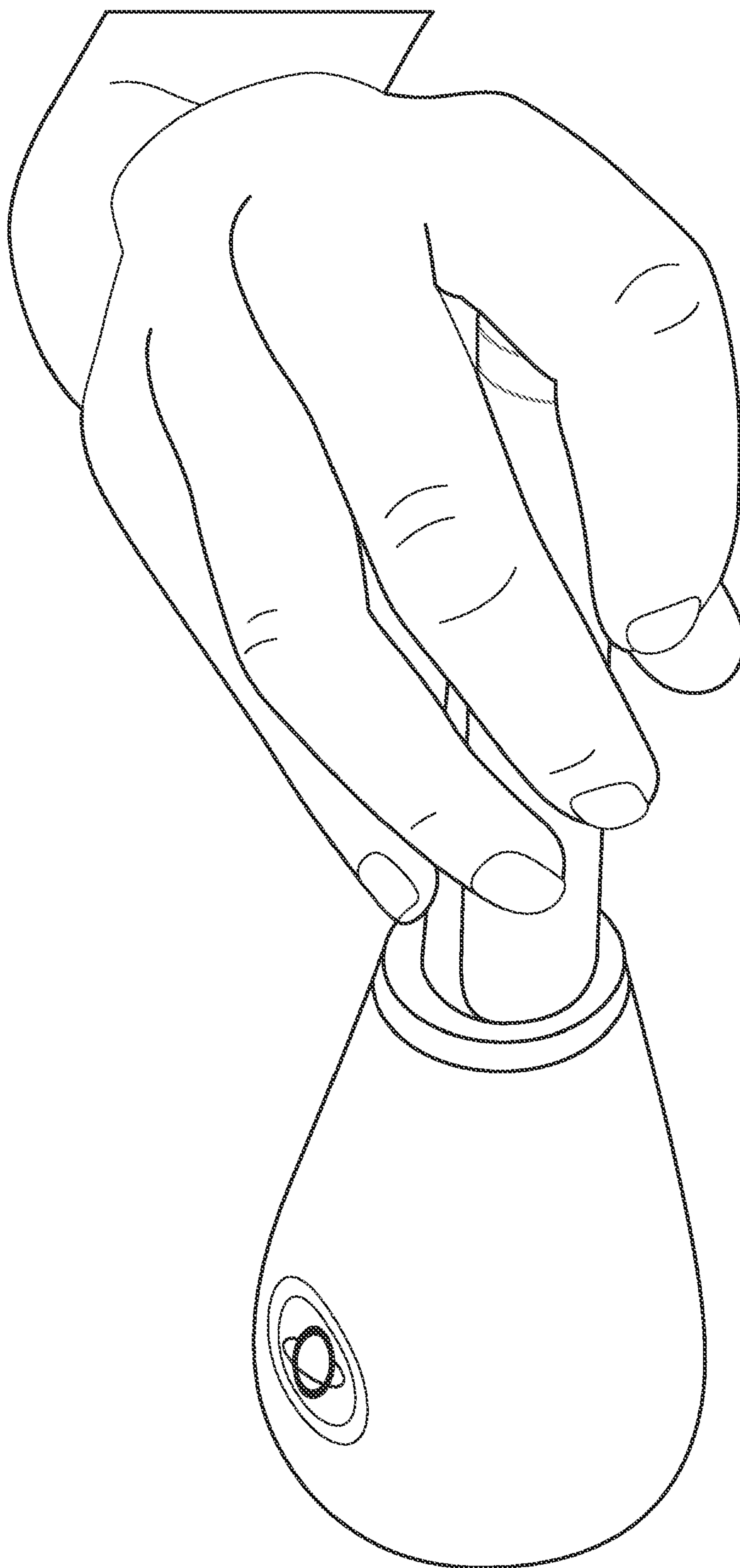


FIG. 2

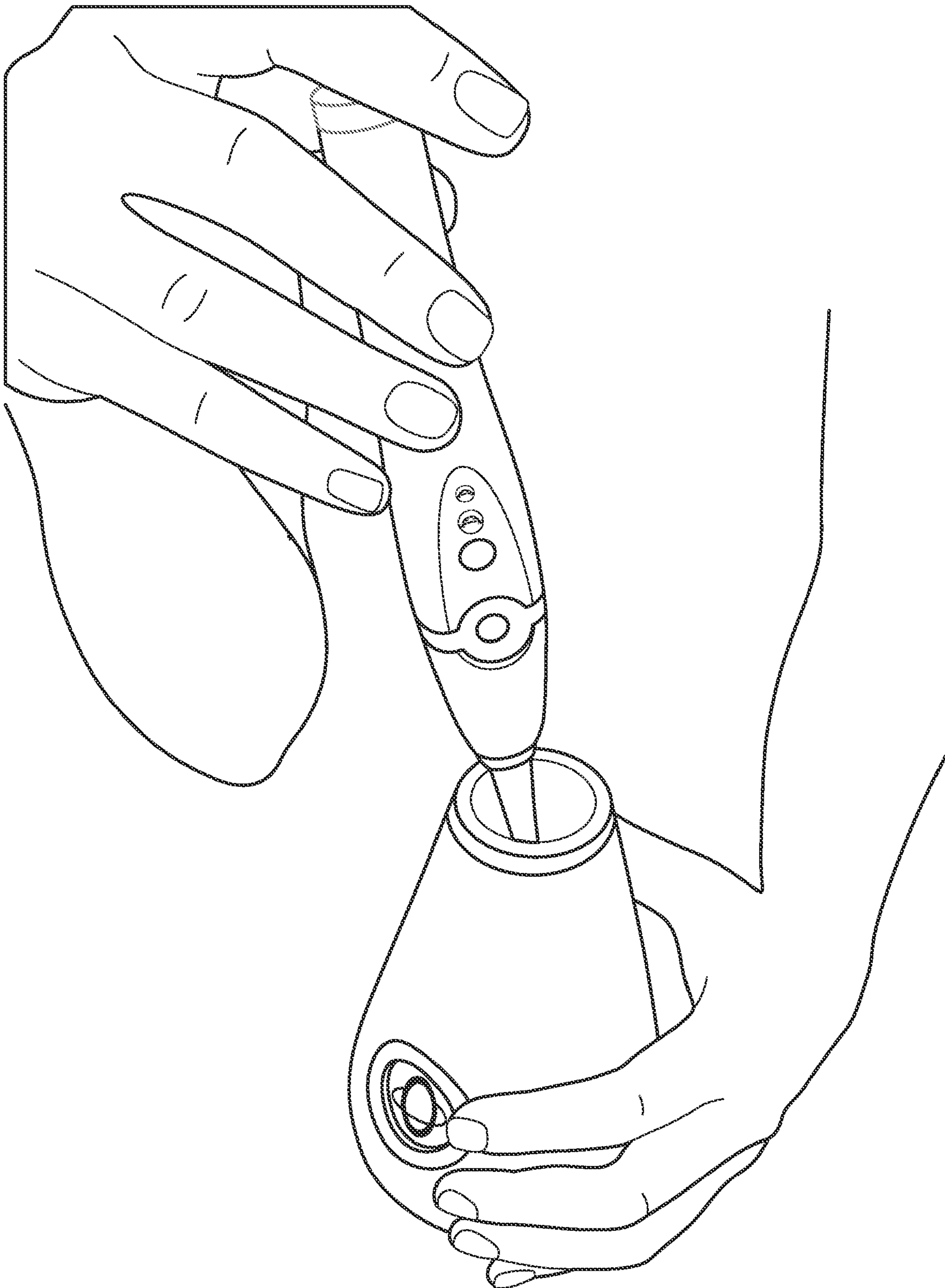


FIG. 3

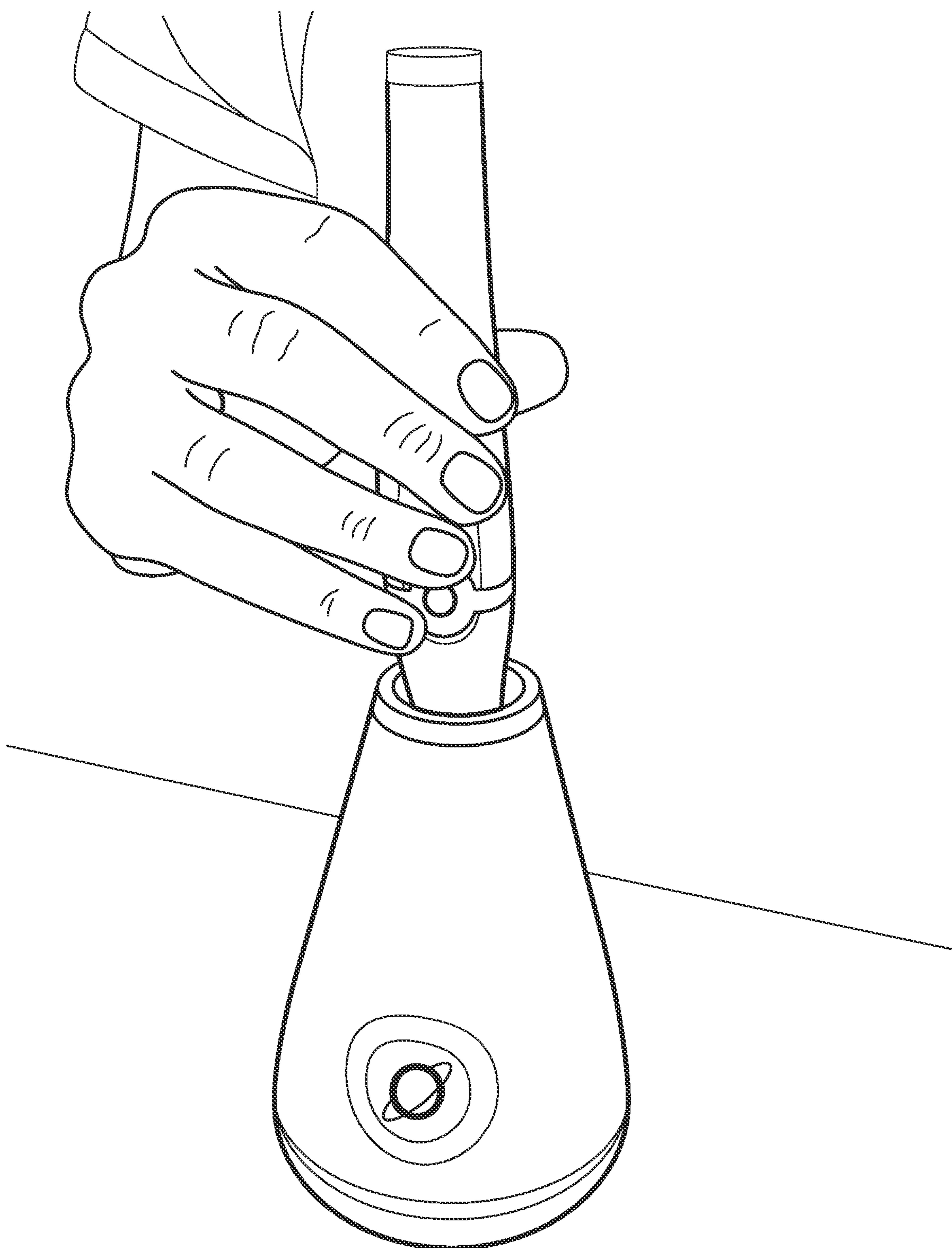


FIG. 4

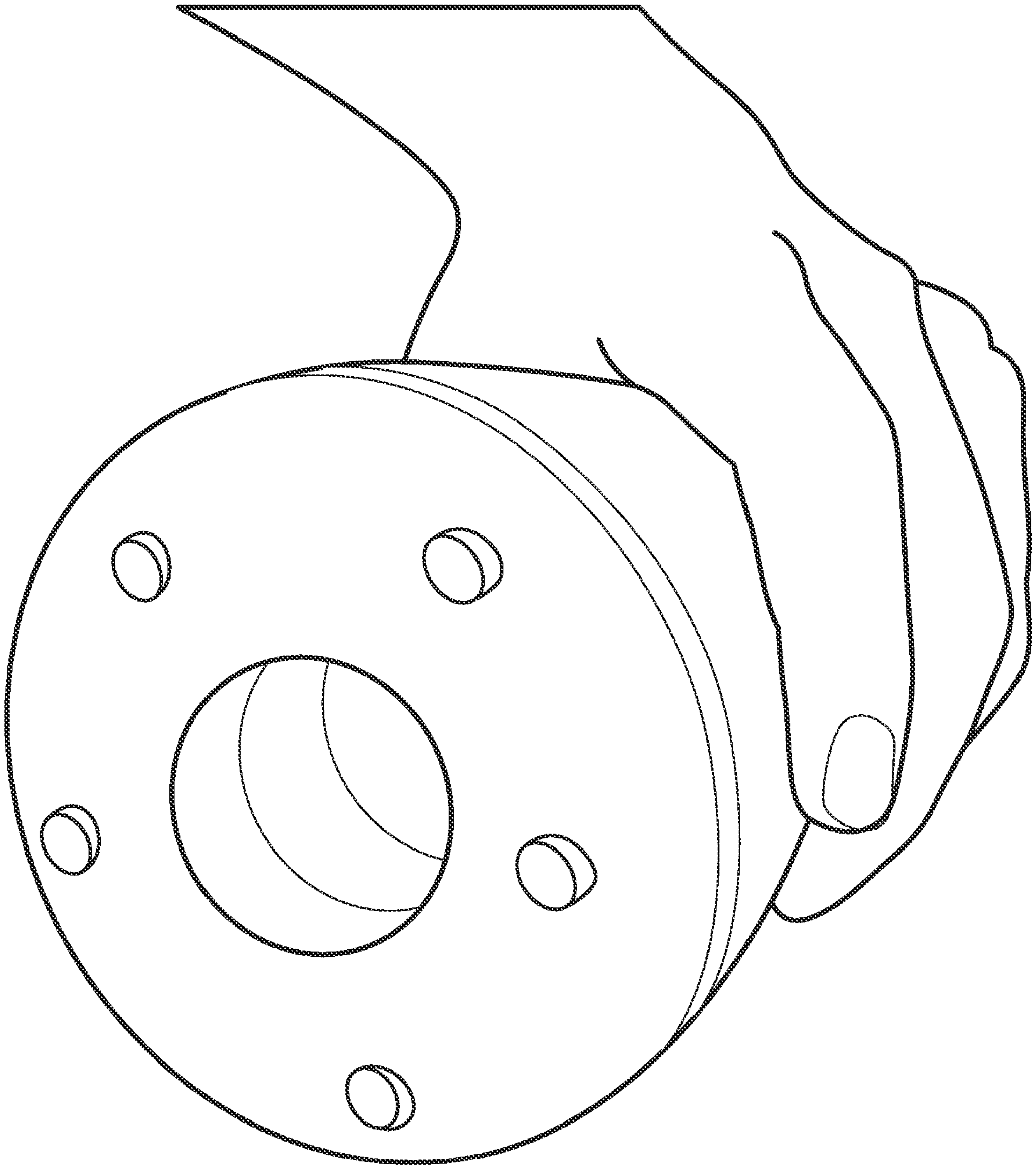


FIG. 5

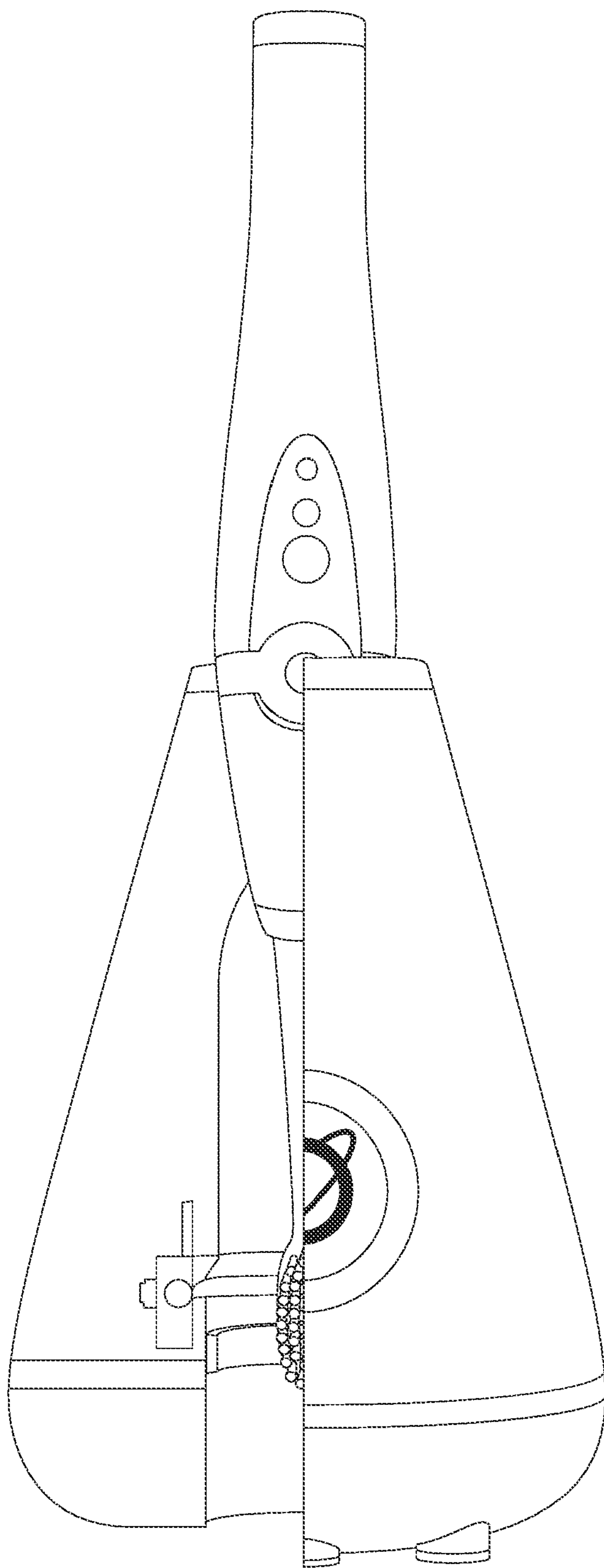


FIG. 6

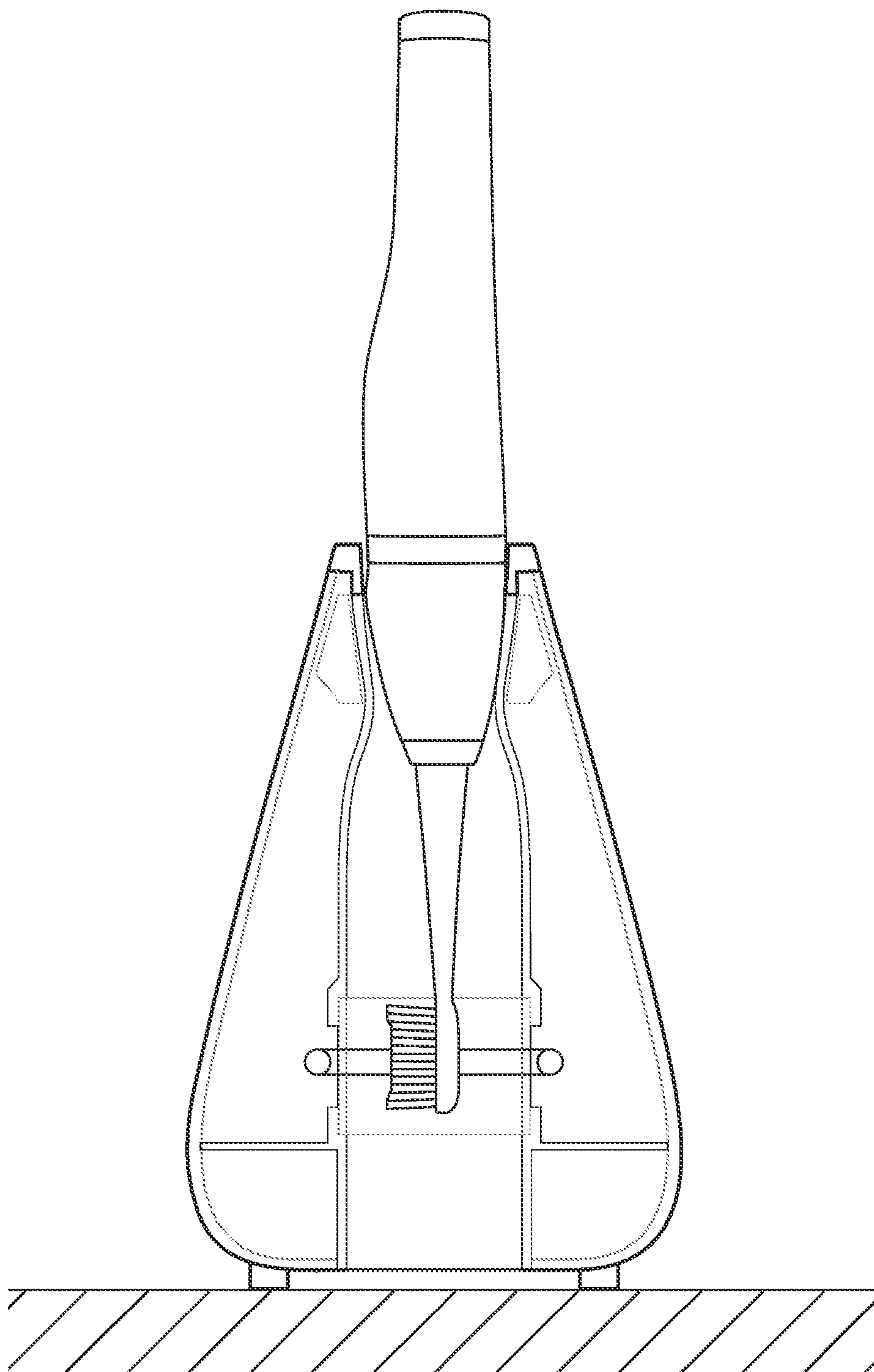


FIG. 7

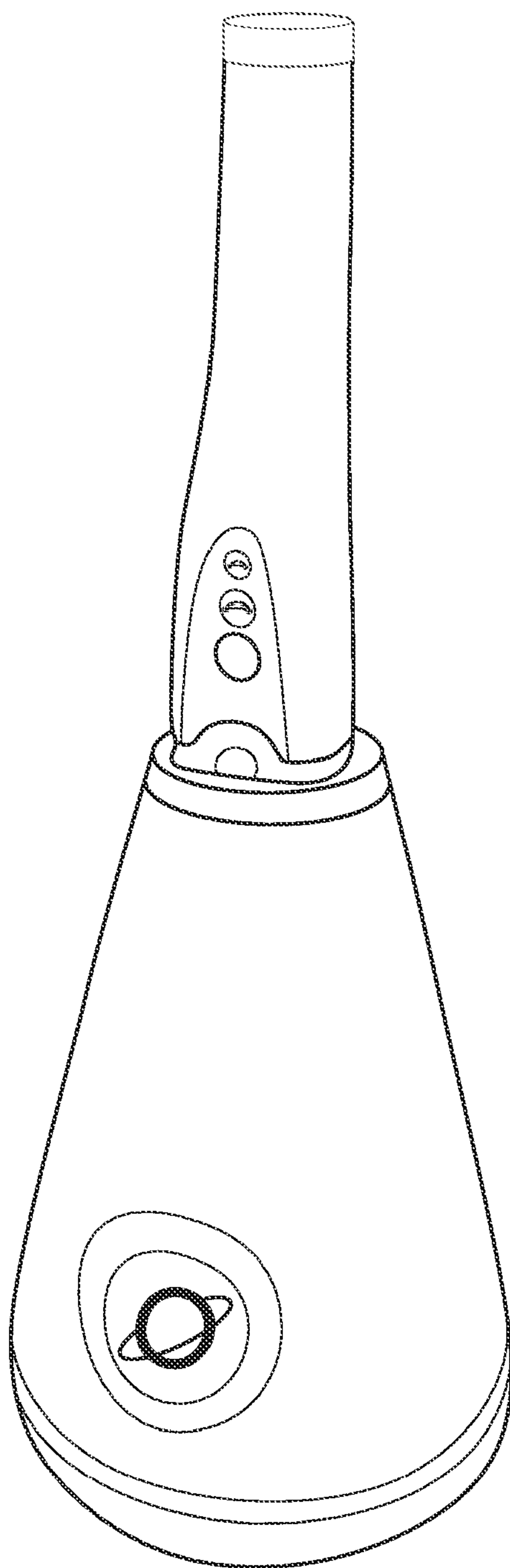


FIG. 8

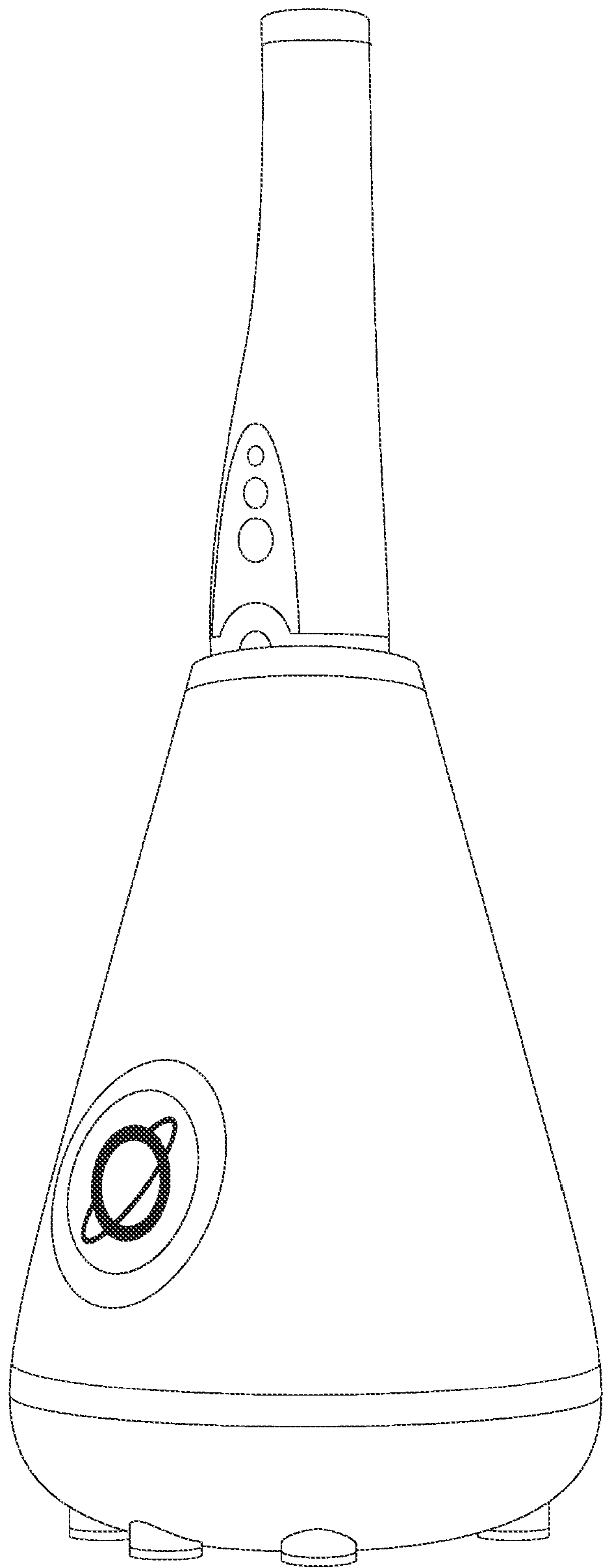


FIG. 9

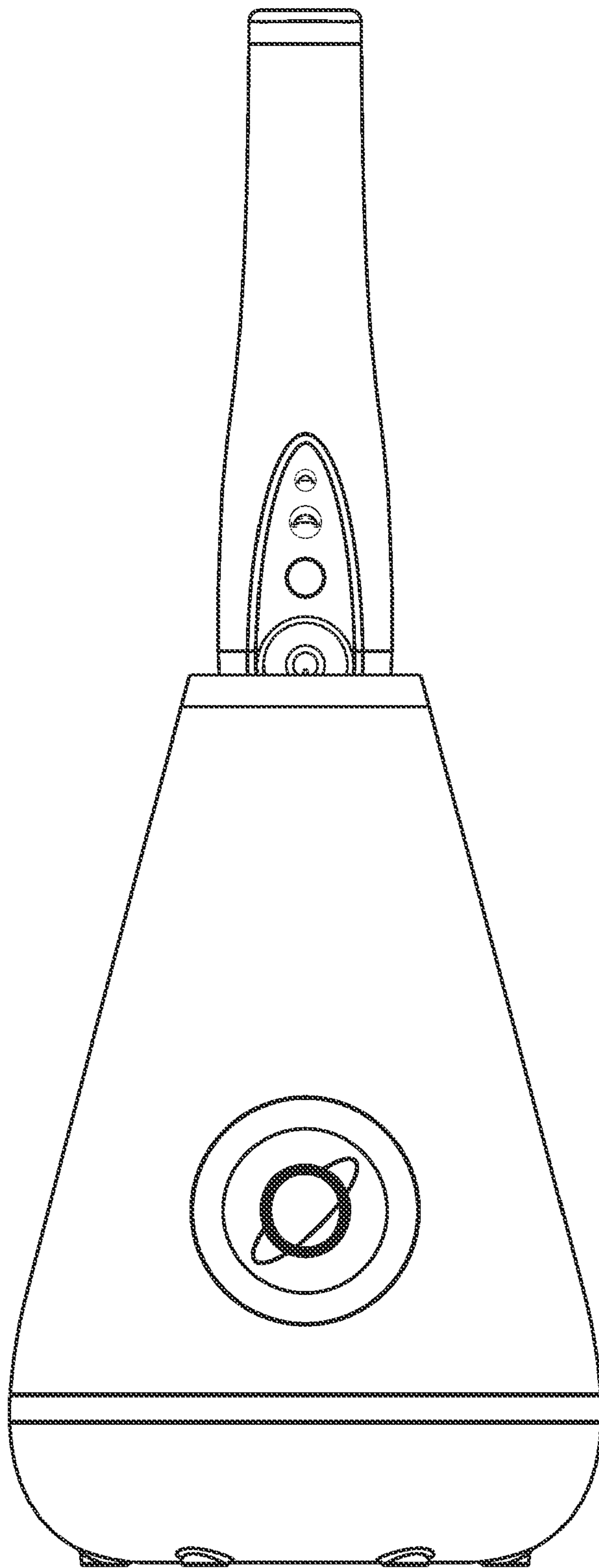


FIG. 10

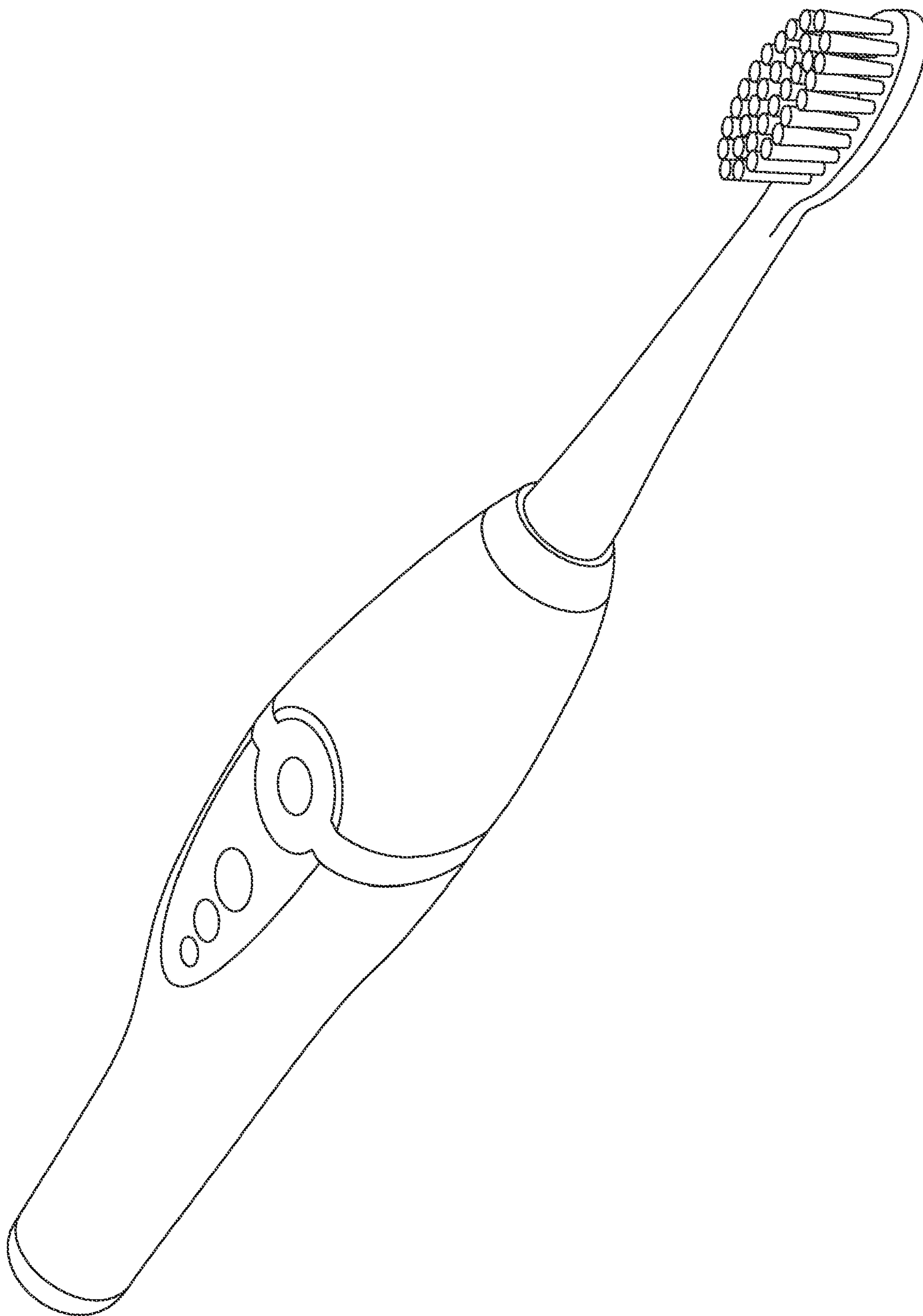


FIG. 11

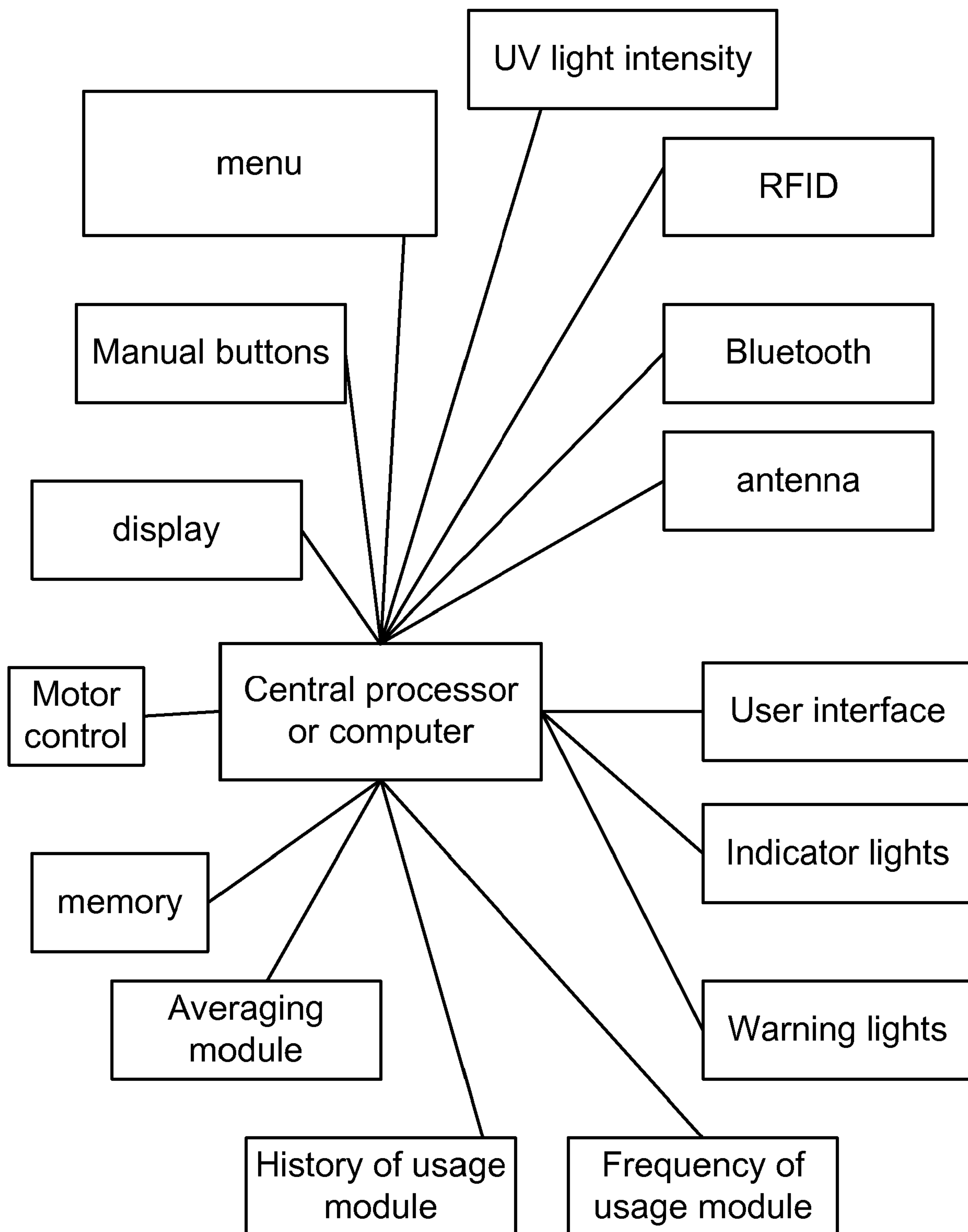


FIG 12

Toothbrush Sterilization System

RELATED APPLICATIONS

This application is related and gets the benefit of the priority date and filing date of the prior (provisional) US patent application, titled “Toothbrush Sterilization System”, filed 1/31/2014, SN 61/934,500, with the same assignee. All of the teachings of the provisional case are incorporated herein, by reference.

BACKGROUND OF THE INVENTION

[00001] Toothbrushes are proven to be important for the general health and dental health of an individual. Because of the intimacy that the user shares with this particular product, the toothbrush can be a factor which promotes or extends illnesses. Because of their frequent wet nature, the portion of the brush that the user places in his/her mouth may harbor pathogens. Even a brush used exclusively by a healthy individual may have an unhealthy germ build-up over a period of time. Such germs may come from the user's own mouth and/or from the environment in which the toothbrush is kept between uses.

[00002] Most toothbrushes are kept in bathrooms, which are often fertile environments for germs. In addition to being wet, it is difficult to remove all traces of food particles from a brush after usage. These organic particles may serve as a culture for the promotion of molds and bacteria. In addition to between usage cleanliness, there is a need to ensure brushes are clean prior to their initial use. Regulations do not currently exist to require a particular level of sterilization or sanitation of toothbrushes

prior to packaging and sale.

[00003] Accordingly, there is a great need for a device that effectively sanitizes toothbrushes before and between uses by consumers. And, in fact, inventions that attempt to achieve this have been known in the literature for over a century. The vast majority of these inventions involve a toothbrush and chamber. The user returns the brush to the chamber between uses. Within the chamber resides a sterilization means. Over the years, the exact nature of this sterilization means has changed – sometimes due to technology advancements, while other times due to efficacy, safety, manufacturing cost, or convenience.

Table 1. The table below lists several inventions that are typical of various sterilization means.

Patent No. or SN	Issue Date or Publication Date	Inventor	Sterilization Means
615357	6-Dec-1898	Guilfoyle	Gas blanket
757885	3-Aug-1903	Cochkane	Liquid immersion
2579242	18-Dec-51	Pask	Ultraviolet lamp
3342544	18-Sep-63	Raymond	Aerosol or liquid spray
3884635	20-May-75	Sloan	Dryer
4400357	23-Aug-83	Hoffman	Autoclave
5725091	9-Mar-94	Knoebel	Vacuum

[00004] One undesirable aspect of some of the prior art is that they necessitate the bristles of the brush, or a portion of the brush in close proximity to the bristles which re-enters the user's mouth and touches on some part of the sterilization chamber, on insertion, extraction, or during the sterilization process. This undesirable contact could

transfer pathogens or debris from the chamber back onto the brush and vice/versa. This causes a cross-contamination, going back-and-forth, with some residual pathogens or debris always remaining in the system. An example of this type of invention can be seen in Athon, US PN 1,696,706. This invention relies on the bristles to be in frictional contact with the inside of the chamber, in order to keep the brush from falling out. Similarly, Farrar US PN 2,592,131 creates a lip on which the bristles rest. The following inventions all suffer from this undesirable contact.

Table 2. The prior art with similar problems (as mentioned above).

Pat # or SN	Issue or Publ. Date	Inventor
615357	6-Dec-1898	Guilfoyle
1070858	19-Aug-1913	Trayne
1262465	9-Apr-18	Dohrmann
1283403	29-Oct-18	Eustis
1486957	18-Mar-24	England
1696706	25-Dec-28	Athon
1743646	13-Jan-26	Alderman
2099336	16-Nov-37	Hart
2180213	13-Nov-35	Willis
<u>2280431</u>	20-Apr-38	Hart
2457500	28-Dec-48	Seandura
2554156	22-May-51	Rosenthal
2592131	8-Apr-52	Farrar
2817104	24-Dec-57	Hartzell
3100842	13-Aug-63	Tellefsen
3114038	10-Dec-63	Meader
<u>3342544</u>	18-Sep-63	Raymond
3309159	14-Mar-67	Le Sueur
3353905	21-Nov-67	Douglas
3574879	13-Apr-71	Werding
<u>3741378</u>	26-Jun-73	Parker
<u>3748094</u>	23-Jul-69	Scheidell
3955922	11-May-76	Moulthrop
4088445	9-May-78	<u>Ellis</u>
4473152	25-Sep-84	Jump
<u>4585119</u>	28-Apr-82	Boyinton
4816648	28-Mar-89	Dusbabek

<u>4915219</u>	9-Apr-86	Ottimo
4995509	26-Feb-91	<u>Kornfeind</u>
5126572	30-Jun-92	Chu
<u>5690214</u>	24-Nov-93	<u>Gaines</u>
5922292	13-Jul-99	Duczek
5960801	5-Oct-99	Vermooten
<u>6565819</u>	19-May-99	<u>Herrera</u>
6728990	4-May-04	Jones
7063822	20-Jun-06	Goertz
<u>7213603</u>	8-May-07	Pinsky
7511283	31-Mar-09	Chor
<u>7581638</u>	31-Aug-05	Shaw
7838846	22-Nov-06	Pinsky
2004/0155201 A1	12-Aug-04	Russell
2005/0276736 A1	15-Dec-05	Miller
2006/0011209 A1	19-Jan-06	Mehes
2006/0204416 A1	14-Sep-06	Hayes
2007/0295916 A1	27-Dec-07	Reuben
DE 19606136 A1	21-Aug-97	Fritz

[00005] Many of the prior art inventions necessitate the user to perform additional actions to put the brush into the chamber, remove it, or activate the sterilization cycle. For example, Fowler US1,074,169 teaches an enclosure that fully encloses the brush. In order to insert the brush or to remove it, the user needs to open a door to gain access. This can be inconvenient if the user is already holding a container of dentifrice in one hand. Thompson US1,553,648 is a typical of a class of solutions where the brush can be accessed without opening a door. In these solutions the seal between the chamber and the brush assembly is accomplished by the use of a compliant stopper or a compliant chamber. The user then needs to either hold onto the chamber to keep it steady while extracting the brush or the chamber needs to be mounted to a fixed surface, e.g., a wall. Mounting is an additional action that can be inconvenient or impractical in many environments. MacShane US1,708,423 requires the user to perform a separate action in

order to start the sterilization process.

Table 3. The following inventions all suffer from the effect that the user needs to perform an additional action in order to load the brush into the chamber, remove it, or start the sterilization process.

Patent # or SN	Issue or Publ. Date	INVENTOR
757885	3-Aug-1903	Cochkane
827308	31-Jul-06	Hitch
880432	25-Feb-08	Weidhaas
1051433	28-Jan-13	Moseley
1062961	27-May-13	Funcke
1074169	30-Sep-13	Fowler
1122881	29-Dec-14	Dye
1212335	16-Jan-17	Fineberg
<u>1278789</u>	10-Sep-18	Thompson
1283403	29-Oct-18	Eustis
1303884	20-May-19	Goodnow
1336345	6-Apr-20	Lackey
1364557	4-Jan-21	Hurley
1448231	13-Mar-23	Morrison
<u>1451425</u>	10-Apr-23	Hurley
<u>1507466</u>	2-Sep-24	Collins
1553648	15-Sep-25	Thompson
1562348	17-Nov-25	Lockery
1625202	19-Apr-27	Gindick
1708423	9-Apr-29	MacShane
1811732	23-Jun-31	Pfeifer
1981383	8-Jan-35	Feldon
1987472	8-Jan-35	Feldon
2099336	16-Nov-37	Hart
2180213	14-Nov-39	Peake
2195935	2-Apr-40	Nuyts
2280431	21-Apr-42	Hart
2424036	15-Jul-47	Jackel
2457500	28-Dec-48	Seandura
2554156	22-May-51	Rosenthal
2579242	18-Dec-51	Pask
2584042	29-Jan-52	Ober
2587131	26-Feb-52	Ficken
2592131	8-Apr-52	Farrar

2817104	24-Dec-57	Hartzell
2822476	4-Feb-58	Osgood
3114038	10-Dec-63	Meadar
3207296	21-Sep-65	Goodall
3309159	14-Mar-67	Le Sueur
3342544	19-Sep-67	Curiel
3683638	15-Aug-72	Devon
3748094	24-Jul-73	Scheidell
3820251	28-Jun-74	Abernathy
3881868	6-May-75	Duke
<u>3884635</u>	20-May-75	Sloan
3904362	9-Sep-75	Dipaolo
3954407	4-May-76	Andary
3955922	11-May-76	Moulthrop
4214657	29-Jul-80	Winston
4400357	23-Aug-83	Hoffman
4552728	12-Nov-85	Taylor
4570652	18-Feb-86	Chavez
4625119	25-Nov-86	Murdock
4740706	26-Apr-88	Murdock
4759383	26-Jul-88	Phillips
4803364	7-Feb-89	Ritter
4806770	21-Feb-89	Hylton
4816648	28-Mar-89	Dusbabek
4845859	11-Jul-89	Evans
4884688	5-Dec-89	Hurst
4888487	19-Dec-89	Ritter
4906851	6-Mar-90	Beasley
4950902	21-Aug-90	Ritter
4973847	27-Nov-90	Lackey
4997629	5-Mar-91	Marchand
5023460	11-Jun-91	Foster
5086916	11-Feb-92	Gray
5107987	28-Apr-92	Palazzolo
5127521	7-Jul-92	Bourque
5295575	22-Mar-94	Gonzalez
5377824	3-Jan-95	Seymour
5402810	4-Apr-95	Donley
5405587	11-Apr-95	Fernandez
5487877	30-Jan-96	Choi
<u>5566823</u>	22-Oct-96	Summers
5620622	15-Apr-97	Lang
5692603	2-Dec-97	Stotesbury

5725091	10-Mar-98	Knoebel
5772015	30-Jun-98	Musiel
5852879	29-Dec-98	Schumaier
5882613	16-Mar-99	Gipson
5919416	6-Jul-99	Auger
5922292	13-Jul-99	Duczek
5960801	5-Oct-99	Vermooten
6099813	8-Aug-00	Gipson
6119854	19-Sep-00	Prentice
6135279	24-Oct-00	Dryer
6213777	10-Apr-01	Seitzinger
6253773	3-Jul-01	Ingemann
6360884	26-Mar-02	Smith
6558640	6-May-03	Nottingham
6601699	5-Aug-03	Naredo
6702113	9-Mar-04	Marino
6753537	22-Jun-04	Woo
6874247	5-Apr-05	Hsu
6966441	22-Nov-05	Barham
6967337	22-Nov-05	Fonowich
7063822	20-Jun-06	Goertz
7213603	8-May-07	Pinsky
7951343	31-May-11	Davis
8399853	29-Mar-13	Roiniotis
2002/0031461 A1	14-Mar-02	Knipp
2002/0121449 A1	5-Sep-02	Bowie
2004/0129580	8-Jul-04	Cochran
2004/0134800 A1	15-Jul-04	Pigeon
2004/0155201	12-Aug-04	Russell
2004/0155201 A1	12-Aug-04	Russell
2004/0159330 A1	19-Aug-04	Anemone
20050274906 A1	15-Dec-05	Riddell
2006/0204416 A1	14-Sep-06	Hayes
20080219883 A1	11-Sep-08	Thur
20090322190 A1	31-Dec-09	Kitagawa
US20120138491	7-Jun-12	Goss
JP H09-225012,A	2-Sep-97	KYOJI
JP H11-318566,A	24-Nov-99	KASAI KUNIO
CN 202801404 U	20-Mar-13	Zhang
EP0925794 A2	30-Jun-99	Beghelli

[00006] Hecker US6,123,477 teaches a sterilizer that does not include a chamber.

In this invention, a second brush is used to wipe down the bristles of the toothbrush. This has the obvious shortcoming that the toothbrush is exposed to the ambient environment between sterilizations instead of being protected in a chamber. In addition, the efficacy seems highly dependent on user technique. It also is only focused on sterilization of the bristles as opposed to conditioning of all the surfaces that will enter the user's mouth.

Table 4. The table below lists inventions that teach self-contained toothbrush sterilization and have the shortcomings described above.

Patent No. or SN	Issue/Publ. Date	INVENTOR
2527741	31-Oct-50	Lamonde
5832940	10-Nov-98	Embry
6123477	26-Sep-00	Hecker
6669390	30-Dec-03	Porter
8168963	1-May-12	Ratcliffe

[00007] Lamonde, Embry, and Porter do not teach sterilization. These inventions deliver dentifrice or mouthwash. However, a sterilization fluid could be envisioned as a substitute for the dentifrice.

[00008] In all of the prior inventions that include a sterilization chamber, there is either contact between elements of the toothbrush that the user puts into his or her mouth (mentioned previously), or there exists portions of the chamber immediately below the bristles and toothbrush shaft that enter the mouth. The disadvantage with this is that fluid or particles that fall off the brush end up inside the chamber. Since the brush is put into the chamber immediately after usage, it goes in loaded with a certain amount of water. A drop of two of this water can fall off the brush, bringing along with it food particles, dentifrice, or even pathogens that have come from the user's mouth or the environment

around the brush.

[00009] Some of the inventions allow for the presence of a dryer in order to drive water from the chamber (e.g. Choi US5,487,877). Even if the water is driven from the chamber, the particles contained within the water will remain behind. At best, this will lead to a buildup of particulates in the chamber requiring frequent cleanings. At worst, it may become a breeding ground for germs exposing the brush to a more adverse environment than if it had never entered the chamber. Many of the prior inventions rely on a completely closed chamber to ensure the sterilization means does not leak into the surrounding environment (e.g., Hurley US 1,364,557, Eckhardt US 6,461,568, and Barham US 6,966,441).

[00010] Thus, in summary, the prior art (shown below) are design patents, or are not toothbrush sterilizers, or have some disadvantages with respect to our invention described here in this disclosure.

Table 5. List of the related prior art, which, e.g., do not have the advantages of our invention (described here in this disclosure).

Patent No. or SN	Issue/Public. Date	INVENTOR
615357	6-Dec-98	Guilfoyle
757885	3-Aug-03	Cochkane
827308	31-Jul-06	Hitch
880432	25-Feb-08	Weidhaas
942058	27-Feb-09	DeGowin
1050864	21-Jan-13	Smith
1051433	28-Jan-13	Moseley
1062961	27-May-13	Funcke
1070858	19-Aug-13	Trayne
1074169	30-Sep-13	Fowler
1079618	25-Nov-13	Trayne
1122881	29-Dec-14	Dye
1137651	27-Apr-15	Metivier

1212335	16-Jan-17	Fineberg
1262465	9-Apr-18	Dohrmann
1278789	10-Sep-18	Thompson
1283403	29-Oct-18	Eustis
1303884	20-May-19	Goodnow
1336345	6-Apr-20	Lackey
1364557	4-Jan-21	Hurley
1424434	1-Aug-22	Ausubel
1448231	13-Mar-23	Morrison
1451425	10-Apr-23	Hurley
1480814	15-Jan-24	Bright
1486957	18-Mar-24	England
1507466	2-Sep-24	Collins
1553648	15-Sep-25	Thompson
1562348	17-Nov-25	Lockery
1584261	11-May-26	Vuolo
1588781	15-Jun-26	Stoddard
1625202	19-Apr-27	Gindick
1696706	25-Dec-28	Athon
1708423	9-Apr-29	MacShane
1713379	14-May-29	Fromwiller
1743646	13-Jan-26	Alderman
1811732	23-Jun-31	Pfeifer
1981383	8-Jan-35	Feldon
1987472	8-Jan-35	Feldon
2046606	7-Jul-36	Borba
2099336	16-Nov-37	Hart
2180213	14-Nov-39	Frederick Willis
2195935	2-Apr-40	Hippolyte
2280431	21-Apr-42	Hart
2424036	7/15/1947	Victor
2448603	9/7/1948	Thomas D. Kevin
2457500	12/28/1948	Seandura
2527741	10/31/1950	Lamonde
2554156	5/22/1951	Rosenthal
2579242	12/18/1951	Pask
2584042	29-Jan-52	Ober
2587131	2/26/1952	Ficken
2592131	8-Apr-52	Farrar
2608294	26-Aug-52	Ward
2817104	24-Dec-57	Hartzell
2822476	4-Feb-58	Osgood
3100842	13-Aug-63	Tellefsen

3114038	10-Dec-63	Meadar
3207296	21-Sep-65	Goodall
3321796	30-May-67	Lelicoﬀ
3309159	14-Mar-67	Le Sueur
3342544	19-Sep-67	Curiel
3353905	21-Nov-67	Douglas
3371260	27-Feb-68	Jackson
3538616	10-Nov-70	Mailing
3574879	13-Apr-71	Werding
3683638	15-Aug-72	Devon
3727748	17-Apr-73	Brown
3741378	6/26/1973	Parker
3746162	7/17/1973	Bridges
3748094	24-Jul-73	Scheidell
3820251	6/28/1974	Abernathy
3881868	5/6/1975	Duke
3884635	5/20/1975	Sloan
3904362	9/9/1975	Dipaolo
3954407	5/4/1976	Andary
3955922	5/11/1976	Moulthrop
4021197	5/3/1977	Brooks
4088445	5/9/1978	Ellis
4121107	10/17/1978	Bachmann
4121600	10/24/1978	Riddick
4135269	1/23/1979	Laurel L. Marston
4214657	29-Jul-80	Winston
4219035	26-Aug-80	Deconinck
4400357	23-Aug-83	Hoffman
4473152	25-Sep-84	Jump
4552728	12-Nov-85	Taylor
4570652	18-Feb-86	Chavez
4585119	29-Apr-86	Boyington
4625119	25-Nov-86	Murdock
4740706	26-Apr-88	Murdock
4756412	12-Jul-88	Graves
4759383	26-Jul-88	Phillips
4803364	7-Feb-89	Ritter
4806770	21-Feb-89	Hylton
4816648	28-Mar-89	Dusbabek
4817826	4-Apr-89	Judge
4845859	11-Jul-89	Evans
4884688	5-Dec-89	Hurst
4888487	19-Dec-89	Ritter

4906851	6-Mar-90	Beasley
4915219	10-Apr-90	Ottimo
4950902	21-Aug-90	Ritter
4973847	27-Nov-90	Lackey
4978003	18-Dec-90	Foster
4995509	26-Feb-91	Kornfeind
4995511	26-Feb-91	Evans
4997629	5-Mar-91	Marchand
5017790	21-May-91	Kojima
5023460	11-Jun-91	Foster
5086916	11-Feb-92	Gray
5107987	28-Apr-92	Palazzolo
5126572	30-Jun-92	Chu
5127521	7-Jul-92	Bourque
5139142	18-Aug-92	Simon
5145095	8-Sep-92	Loudon
5215193	1-Jun-93	Dennis
5295575	22-Mar-94	Gonzalez
5333742	2-Aug-94	Piedmont
5377824	3-Jan-95	Seymour
5402810	4-Apr-95	Donley
5405587	11-Apr-95	Fernandez
5409841	25-Apr-95	Chow
5487877	30-Jan-96	Choi
5502900	2-Apr-96	Hui
5522497	4-Jun-96	Stacy
5566823	22-Oct-96	Summers
5611206	18-Mar-97	Sargent
5620622	15-Apr-97	Lang
5630505	20-May-97	Garcia
5660285	26-Aug-97	Tooma
5662130	2-Sep-97	Wiltshire
5690214	25-Nov-97	Gaines
5692603	2-Dec-97	Stotesbury
5701921	30-Dec-97	Father
5725091	10-Mar-98	Knoebel
5772015	30-Jun-98	Musiel
5832940	10-Nov-98	Embry
5852879	29-Dec-98	Schumaier
5865195	2-Feb-99	Carter
5881876	16-Mar-99	Nonomura
5882613	16-Mar-99	Gipson
5919416	6-Jul-99	Auger

5922292	13-Jul-99	Duczek
5960801	5-Oct-99	Vermooten
6099813	8-Aug-00	Gipson
6119854	19-Sep-00	Prentice
6123477	26-Sep-00	Hecker
6135279	24-Oct-00	Dryer
6142318	7-Nov-00	Tooma
6186324	13-Feb-01	Catterson
6213777	10-Apr-01	Seitzinger
6253773	3-Jul-01	Ingemann
6360884	26-Mar-02	Smith
6488942	3-Dec-02	Ingemann
6461568	8-Oct-02	Eckhardt
6558640	6-May-03	Nottingham
6565819	20-May-03	Herrera
6601699	5-Aug-03	Naredo
6669390	30-Dec-03	Porter
6702113	9-Mar-04	Marino
6722498	20-Apr-04	Westfield
6728990	4-May-04	Jones
6769828	3-Aug-04	Clark
6753537	22-Jun-04	Woo
6782999	31-Aug-04	McCoy
6861047	1-Mar-05	Carnell
6874247	5-Apr-05	Hsu
6935515	30-Aug-05	Sookoo
6966441	22-Nov-05	Barham
6967337	22-Nov-05	Fonowich
7063822	20-Jun-06	Goertz
7204957	17-Apr-07	Tozer
7213603	8-May-07	Pinsky
7452714	18-Nov-08	Eversdijk
7484629	3-Feb-09	Cottrell
7511283	31-Mar-09	Chor
7547893	16-Jun-09	Tantillo
7581638	1-Sep-09	Shaw
7838846	23-Nov-10	Pinsky
7856738	28-Dec-10	Camacho
7888656	15-Feb-11	Freedgood
7951343	31-May-11	Davis
8168963	1-May-12	Ratcliffe
8235619	7-Aug-12	Meredith
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D542929	15-May-07	Shin
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D543750	5-Jun-07	Hines
D545062	26-Jun-07	Nagoya
D549024	21-Aug-07	Fuentes
D626364	2-Nov-10	Fretwell
D648539	15-Nov-11	Wai
D657986	24-Apr-12	Climer

[00011] However, the invention and embodiments described here, below, have not been addressed or presented, in any prior art, including all the above, with all the advantages mentioned here.

SUMMARY OF THE INVENTION

[00012] In one embodiment, we describe a method and system where the brush head and the shaft that enter the user's mouth are never contacted by the chamber. Also, below the brush head and shaft, there is no chamber. If any drops of water were to fall off the brush head, they would fall all the way through the chamber and reside on the counter on which the chamber rests. While this does not eliminate the particulate, it ensures the particulate does not reside in a chamber, which may be inaccessible or hard to clean. All particulate can be removed from the counter during regular counter cleaning routines.

[00013] In one embodiment of the present invention, our sterilization means is a UV-C lamp. This selection has advantages over the other sterilizations means. Some of

them are: no spilling of fluids (vs. liquid and spray sterilization), no leakage of dangerous substances into the atmosphere (vs. gas blanket sterilization), no hot surfaces (vs. autoclave sterilization), rapid (vs. drier sterilization), and quiet (vs. vacuum sterilization). One disadvantage that UV sterilization has with respect to some of the other solutions is that it utilizes light, and light is usually associated with inherent shadows. That is, if a portion of the brush head intended for sterilization is in a shadow, the efficacy of the sterilization will be greatly reduced. Some of the prior art (e.g. Pinsky US7,213,603) mention multiple UV lamps as a solution to get greater coverage. This, of course, directly increases manufacturing cost and would require a significant number of bulbs in order to achieve uniform coverage. Other prior art address this shortcoming by introducing reflective surfaces on the inside of the chamber. This also increases manufacturing costs. A typical method to create surfaces such as this is to sputter metal onto molded plastic surfaces. While effective, composite parts like this are difficult to recycle.

[00014] In the present invention, we show a single lamp, but that lamp is in a ring configuration (otherwise known as annular, torus, or donut), which is unique from the prior art. The brush end of the toothbrush is placed within the ring so that light approaches the brush head from a greater number of angles, and shadows are much reduced or eliminated. In practice, because of the end conditions of the lamp, the ring is interrupted. However, this interruption is minor (small distance) and most of the lamp retains the toroidal shape and the advantages thereof (with good coverage of the toothbrush, from all angles).

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is for one embodiment of our device, as an example, for a view of the chamber with a toothbrush nearby.

Fig. 2 is for one embodiment of our device, as an example, for a view of the chamber with a toothbrush in it.

Fig. 3 is for one embodiment of our device, as an example, for a view of the chamber with a toothbrush in the process of being inserted or extracted from it.

Fig. 4 is for one embodiment of our device, as an example, for a view of the chamber residing on a countertop with a toothbrush in it.

Fig. 5 is for one embodiment of our device, as an example, for a view of the bottom of the chamber.

Fig. 6 is for one embodiment of our device, as an example, for a view of the chamber with a toothbrush in it, as a partial cross section.

Fig. 7 is for one embodiment of our device, as an example, for a view of the cross section of the chamber with a toothbrush in it.

Fig. 8 is for one embodiment of our device, as an example, for a view of the chamber with a toothbrush in it.

Fig. 9 is for one embodiment of our device, as an example, for a view of the chamber with a toothbrush in it.

Fig. 10 is for one embodiment of our device, as an example, for a view of the chamber with a toothbrush in it.

Fig. 11 is for one embodiment of our device, as an example, for a view of the toothbrush.

Fig. 12 is for one embodiment of our system, as an example, for a view of the components of our system.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[00015] The attached invention describes an electronic toothbrush sterilization system that is used by consumers. This invention introduces many new features that allow for improved cleanliness, convenience, and robustness. Toothbrush sterilization systems are known in the industry and have been available for quite some time. Originally, the toothbrushes were manual, just comprised of a handle and bristles. The sterilization source has changed over the years.

[00016] Originally, the brushes were immersed in a sterilization fluid (Fig. 1, Appendix 1) to kill germs present on the brush. Prior art of this technique was seen as early as 1904. Later (~1918), gases (e.g. formaldehyde) were used (Fig. 2, Appendix 1). There has also been evidence of heat-based sterilization methods (Fig. 18, Appendix 1) and aerosol usage (Fig. 19, Appendix 1). Later (~1940s), because of convenience and effectiveness, the sterilization source was changed to that of a light, which bathes the toothbrush in light in the UVC range (Fig. 3, Appendix 1). This light has a spectral wavelength centered roughly around 240 nm. The wavelength range of UVC light is 100-280 nm. While the light sources may emit light outside of this range (into the visible spectrum, for example), it is the light within this range that has germicidal benefits. A current product that utilizes a manual toothbrush and a UVC light is shown in Fig. 4, Appendix 1.

[00017] In the 1950s the first electronic toothbrushes were introduced. These were

initially targeted toward users with reduced motor skills. Later, it became apparent that many of these devices had a greater effectiveness compared to manual brushes, when it came to cleaning teeth. The earliest brushes were plugged into an AC outlet. However, in the 1960s, battery powered versions were introduced and started being adopted widely.

[00018] Electronic toothbrushes can be categorized into two groups depending on the motion the bristles are driven. One group employs vibration. The majority of these vibration toothbrushes today are called ultrasonic toothbrushes, since the vibration of the bristles is above 20kHz (which is the upper limit of human hearing) (Fig. 5, Appendix 1).

[00019] The second major category of electronic toothbrushes is rotational. With these, the bristles rotate continuously or oscillate in a rotating manner about an axis (Fig. 6, Appendix 1).

[00020] Products that sterilize electronic toothbrushes have been known for some time as well (Fig. 7 and Fig. 8, Appendix 1). In these systems, there is a charging circuit that keeps the batteries in the toothbrush handle fully charged. In addition, there is a UVC light source that shines on the bristles. In all the currently shipping products that we are aware of, the brush head is detached from the handle for the sterilization process. The bristles, along with a short section of shaft (which is defined collectively in this document as the brush head), are placed into a separate chamber that contains the UVC light source, and the light is activated.

[00021] The disadvantages of the current state-of-the-art electronic toothbrush sterilization systems are described below:

[00022] (1) When the user has finished brushing his/her teeth, the handle is returned to the charging station. This is very convenient as the station reserves some

countertop real estate for the product, and the user knows precisely where the product is when they need to use it again. However, to actually sterilize the bristles, extra effort is needed to separate the brush head from the handle and place it in the sterilization chamber. While this is not a lot of extra work, it turns out that many users choose not to sterilize the brush head after each brushing. This creates the opportunity for pathogens (e.g. virus, bacteria, parasite, or fungus) to grow on the wet head of the brush, which is a terrible result.

[00023] (2) When the brush head is removed from the handle and placed in the sterilization container, the toothbrush is not immediately ready for use. The handle is present, but there is no brush head attached to it. The brush head needs to be removed from the sterilization container and reattached to the handle.

[00024] (3) When the brush head remains attached to the handle after use and is not placed in the sterilization chamber, it is exposed to the environment. This environment is typically a bathroom environment that has many sources of water flow (e.g. sinks, showers, toilets and bathtubs). These water sources aerosolize water droplets. These water droplets can transport other elements such as urine, feces, and saliva throughout the bathroom. Since the bristles are exposed to this environment, they can become inadvertently contaminated.

[00025] (4) In the existing devices, the sterilization chamber has a closed bottom with one opening where the brush head is inserted and removed. In addition, this chamber often has many acute internal angles within and between various parts (i.e., nooks and crannies). Bristles that are placed in this environment are wet (having just been used). This water can and does drip off the bristles and stays behind in the chamber. These pools

of water, if not in direct line of sight to the UVC light source can fester and grow a community of pathogens.

[00026] (5) The light source in the existing sterilization chamber is either a point light source or a line light source (Fig. 9, Appendix 1). This invariably creates shadows in the bristle area, where the light is not as effective as it is not bathing the entirety of the bristles.

[00027] (6) The existing systems go through the same cleaning cycle regardless of the number of times the brush has been used between cleanings.

[00028] (7) The sterilization chamber is very difficult to clean.

[00029] (8) The light source in the existing systems is very accessible to the user.

In fact, the user can inadvertently touch the light source with his/her hand or with the brush head. This could add contaminants (e.g., oil or particulate matter) to the surface of the light, thereby reducing its emission and efficacy.

[00030] One embodiment of the current invention incorporates an integrated charging station and sterilization chamber (Fig. 10, Appendix 1). This base station is either corded to AC power or runs on its own internal batteries. The electronic toothbrush (Fig. 27, Appendix 1) is inserted into the base station with the brush head end down (Fig. 11, Appendix 1). Once it is inserted, the brush head is removed from the environment, which keeps it cleaner and more sterile than being left in the environment between brushings. This helps to solve the issue raised in the current art, mentioned in Section (3) above.

[00031] The toothbrush (Fig. 12, Appendix 1) has an internal charging coil near the brush head end. This creates a non-contact inductive coupling between this coil and a

similar coil in the base (Fig. 13, Appendix 1). Once the base detects the presence of the toothbrush, the charging commences and the sterilization cycle begins. The sterilization is accomplished by means of a UVC light source within the charging station (Fig. 13, Appendix 1). This UVC light source could be a point or a line source similar to the current state of the art. In one embodiment, it is a light source that wraps around the brush head eliminating shadows mentioned in Section (5) above (Fig. 14, Appendix 1).

[00032] This ring light could be a mercury vapor tube light (Fig. 15, Appendix 1).

It could also be a series of point light sources that wrap around the brush head.

Alternatively, there could be a single light source that is brought up to and surrounds the brush head via a light pipe. To further aide in the elimination of shadows, the interior of the sterilization chamber could be made reflective. (Fig. 14, Appendix 1). Aluminum coatings have been shown to reflect UVC light very effectively. During the sterilization cycle, the UVC light turns on for a pre-determined amount of time. The amount of time could vary based on the number of brush cycles that the toothbrush has been through since the last cleaning. This addresses problem in Section (6) above.

[00033] The brush handle can keep track of usage and this information can be communicated to the base station via means such as RFID tracking or Bluetooth communication. Once the brush is inserted in the base, the sterilization cycle commences. Since this takes no additional effort to accomplish from the user, it addresses the shortcomings of the current products referenced in Sections (1) and (2) above.

[00034] The chamber of the preferred design is devoid of crevices that could become water traps. If water drips off the brush head, the water falls through the device through an opening in the bottom of the chamber (Fig. 13, Appendix 1). This addresses

the current problem stated in Section (4) above. This water could reside on the countertop until it evaporates away.

[00035] Alternatively, there could be a hydrophilic pad that resides below the chamber (Fig. 16, Appendix 1). This pad could wick the water throughout its volume or along its surface. Because the water is spread out, it has more evaporative surface area and is lost to the environment at a significantly accelerated rate. This pad could have other functions in that it could cradle and prevent the unit from tipping over. Because the chamber is open on both ends and is lacking in crevices, it is easy to clean with a device such as a baby bottle cleaner, an attachment to the toothbrush or even a towel (Fig. 17, Appendix 1) addressing the concern of Section (7) above.

[00036] Since there can be a communication link between the brush and the base station, either of those could have a display to communicate information to the user (Fig. 16, Appendix 1). This display can show things like charging time remaining, sterilization time remaining, number of brushing cycles completed, life of brush head remaining, and average brushing duration, among others (Figs. 20-23, Appendix 1).

[00037] When the brush is being inserted into the base station, the design is such that the bristles are prevented from touching the light source (Fig. 30, Appendix 1). The light source is also buried deep within the chamber, which minimizes the possibility of the user touching it directly. This goes to addressing problem of Section (8) mentioned above.

[00038] Other elements and further clarification of the invention are shown in Figs. 24-26, 28-29, and 31-33, Appendix 1. All the foregoing could be applied to a manual as well as electrical toothbrush.

[00039] Appendix 1 (in 2 separate files) includes the following “Appendix 1-Figures”: Fig. 10 shows the chamber from different views. Fig. 11 shows brush to chamber docking, the placement, and the gap. Fig. 12 shows RFID chip and the cross section of the brush. Fig. 13 shows the UV light source and inside the chamber. Fig. 14 shows inside the chamber with the reflective surface, like mirror, for maximum effect. Fig. 15 shows the UV bulb, with curvature, circle shaped. Fig. 16 shows the chamber pad, its shape, and its usage, as well as indicator light and/or display options on the chamber’s outside surface, for warning or information for the user, e.g., for charged left on the device, and amount of brushing time or frequency, e.g., with multiple lights or diodes, or bar shaped light or indicator, or sliding scale indicator, or colored lights, or light of varying intensity proportional to the value of the indicated parameter, e.g., light intensity proportional to the charge left on the battery, or using red light as warning for low charge indication. Fig. 17 shows chamber cleaning brush. Fig. 20 shows brush to chamber activation. Fig. 22 shows cleaning cycle sequence, for self-cleaning. Fig. 23 shows charging cycle sequence. Fig. 24 shows the description and advantages of our chamber/ toothbrush system and their designs/ parameters/ components. Fig. 25 shows cleaning procedure (Function 1). Fig. 26 shows charging procedure (Function 2). Fig. 27 shows advanced sonic brush, with components, from different angles. Fig. 28 shows the inside chamber with details. Fig. 29 shows the inside chamber with UV light source ring. Fig. 30 shows the brush placement, in motion. Fig. 31 shows the light pipe inside chamber. Fig. 32 shows the retractable cable or wire for our system, for compact and clean setup, with optional spring to retract the wire, e.g., located at the inside bottom of the chamber, with optional hook to release the spring for retraction process. Fig. 33

shows drying procedure/ sequence (Function 3), with gaps for drying process, with thermal energy or radiant energy, as options, with convection, conduction, or radiation mechanism, with increased airflow, with some air coming from the gaps around the chamber's legs or feet. The units or devices for thermal energy or radiant energy can be inserted into the middle of the chamber cavity, as moveable parts, or they can be stationary, on the walls or in the middle of the chamber.

[00040] Appendix 2, pages 1-11, show different views of the chamber and toothbrush with more details and cross-sectional views.

[00041] In one embodiment, we have multiple chambers on the unit for (to hold) multiple toothbrushes, e.g., with common power supply or battery backup for the toothbrushes and UV light sources. In one embodiment, we have multiple rings for the UV light sources in the same chamber. In one embodiment, the multiple rings for the UV light sources are in parallel to each other. In one embodiment, we have multiple rings for the UV light sources parallel to the ground or countertop. In one embodiment, we have multiple rings for the UV light sources at an angle to the horizontal ground or countertop, e.g., at 15, 30, 40, 45, 55, 60, or 80 degrees, with respect to the horizontal ground.

[00042] In one embodiment, we have some fins or tracks or grooves on the inside body of chamber and/or on the toothbrush handle (or both) to cause some gaps between the toothbrush and inside chamber for air to flow, for better drying process and better drainage of the water, when the toothbrush is set in the chamber after each use (See, e.g., Fig. 11, Appendix 1).

[00043] In one embodiment, we have batteries and charging coil inside the toothbrush body, with RFID chip mounted on or inside the system, for communication

with a computer, smart phone, and chamber, e.g., for transmission of the data, authentication, and identification, e.g., for display of the time of usage, remaining charge of the device, and the like, for both versions of RFID (active & passive). (See, e.g., Fig. 12, Appendix 1) In one embodiment, we have Bluetooth devices for short range communications, one being installed on toothbrush and/or chamber.

[00044] In one embodiment, the source of the UV is inside the chamber. In one embodiment, the source of the UV is outside the chamber, e.g., coming from the fiber optics or waveguides to the chamber. In one embodiment, the light gets split to multiple rays by a splitter on its way, for a better coverage of the object to be cleaned. (See, e.g., Fig. 31, Appendix 1) In one embodiment, there is a mirror or sets of mirror or reflection surface or curved reflective surface inside the chamber, focusing the light or directing the light on the toothbrush for cleaning, e.g. spherical or cylindrical or conical shape, as concave mirror or surface, e.g., using metal coating. (See, e.g., Fig. 13, Appendix 1)

[00045] In one embodiment, the focus area is on focal point of the mirror. In one embodiment, the source can be a ring or thick ring or multiple rings or parallel rings or horizontal rings or array of rings or rings with various wavelengths in UV range (or diodes or lasers or other light sources). (See, e.g., Fig. 14, Appendix 1)

[00046] In one embodiment, the chamber cleaning brush, with multiple brush heads, exchangeable on the device or on the toothbrush body or on a separate rod or stick, is used to clean the chamber by the user. (See, e.g., Fig. 17, Appendix 1) It can have multiple brushes on the same stick or bar or rod, with different shapes, for better cleaning.

[00047] In one embodiment, the chamber light, menu, or display can give choices

to the user for functionalities, e.g., inputting data by user, or give information or warning to user, e.g., using color lights or diodes, to indicate the charging stages for the toothbrush, or malfunction of a component, using a warning red light. (See, e.g., Fig. 20, Appendix 1)

[00048] Fig. 21, Appendix 1 shows cleaning cycle sequence. Note that the selective cleaning intensity is based on the frequency of the brush insertion, e.g.: The higher the frequency, the higher the intensity. This intensity (I) can be linear proportional (with k as coefficient) or non-linear proportional to the frequency value (f), for different embodiments. For example, one case may be: $(I = k \cdot f)$, where I is the intensity of the light, and f is the frequency or number of brushing or length of time of brushing per unit time, e.g., per week or month or day (or average value, or running-average, or cumulative average), wherein * denotes the multiplication operation. The intensity can be based on: Radiant intensity, measured in watts per steradian (W/sr), or Luminous intensity, measured in lumens per steradian (lm/sr), or candela (cd), or Irradiance or Intensity, measured in Watts per meter squared (W/m^2), or Radiance, measured in ($W \cdot sr^{-1} \cdot m^{-2}$).

[00049] In one embodiment, the charging is done by direct metal contact and wiring, with backup battery or rechargeable battery. In one embodiment, the charging is done by inductive coil, remotely, with no direct or metal contact. The material of the chamber can be any synthetic or natural material, as in the prior art, e.g., plastic. In one embodiment, the brush and contour of the inside chamber are designed such that they do not touch or cross-contaminate. (See, e.g., Fig. 30, Appendix 1)

[00050] Figs. 1-11 correspond to pages 1-11 (Figs. 1-11) of Appendix 2. Fig. 5 is for one embodiment of our device, as an example, for a view of the chamber. Figs. 1-4,

8-10 are for embodiments of our device, as examples, for views of the chamber with a toothbrush. Fig. 6 (or Fig. 7) is for one embodiment of our device, as an example, for a view of the chamber with a toothbrush in it, as a cross section. Fig. 11 is for one embodiment of our device, as an example, for a view of the toothbrush.

[00051] Fig. 12 is for one embodiment of our system, as an example, for a view of the components of our system, comprising: menu, manual buttons, and display; RFID, Bluetooth, and antenna; user-interface, indicator lights, and warning lights; frequency of usage, history of usage, averaging module (to average values for comparisons, for baseline values, or for history or performance values, so far), and memory; motor control; UV lamp; brush dryer; mode lights; charging circuit; and external power supply.

[00052] **Other embodiments are, with their variations and examples:**

[00053] A dental hygiene system, comprising of:

- An oral care implement with a handle at one end, a mouth care end effect at the distal end, and a shaft between the two.
- The mouth care end effect and said shaft enter the user's mouth during normal usage.
- A free-standing chamber for storing said oral care implement.
- Said chamber contains a sterilization means.
- While stored or during sterilization, if debris were to fall from said mouth care end effect or said shaft, said debris would not contact any part of said chamber.

- Said mouth care end effect resides below said handle, while stored.
- A heater to drive moisture from the said end effect.
- The oral care implement is electronic and battery powered.
- Said chamber includes a charging circuit to charge the batteries of said oral care implement.

[00054] A dental hygiene system, comprising of:

- An oral care implement with a handle at one end, a mouth care end effect at the distal end, and a shaft between the two.
- Said mouth care end effect and said shaft enter the user's mouth during normal usage.
- A free-standing chamber for storing said oral care implement, where said mouth care end effect and said shaft reside inside the chamber, while at least a portion of said handle resides outside.
- Said chamber contains a sterilization means.
- Said chamber does not contact said mouth care end effect, nor said shaft, when inserting, removing, or storing within said chamber.
- Said oral care implement can be inserted or removed from said chamber without additional actions taken upon said chamber or said oral care implement.

- Said chamber is open to the environment (gravitationally) below said mouth care end effect and said shaft, during sterilization and storage.
- Said mouth care end effect resides below said handle, while stored.
- A heater to drive moisture from the said end effect.
- The oral care implement is electronic and battery powered.
- Said chamber includes a charging circuit to charge the batteries of said oral care implement.

[00055] A dental hygiene system, comprising of:

- An oral care implement.
- A free-standing chamber for storing said oral care implement.
- Said chamber contains a sterilization means.
- Said sterilization means is comprised of at least one lamp that emits light in the ultraviolet spectrum.
- At least one of said lamps is a singular light source, where the majority of its geometry can be described as a torus.

[00056] Any variations of the above teaching are also intended to be covered by this patent application.

Figure 9.

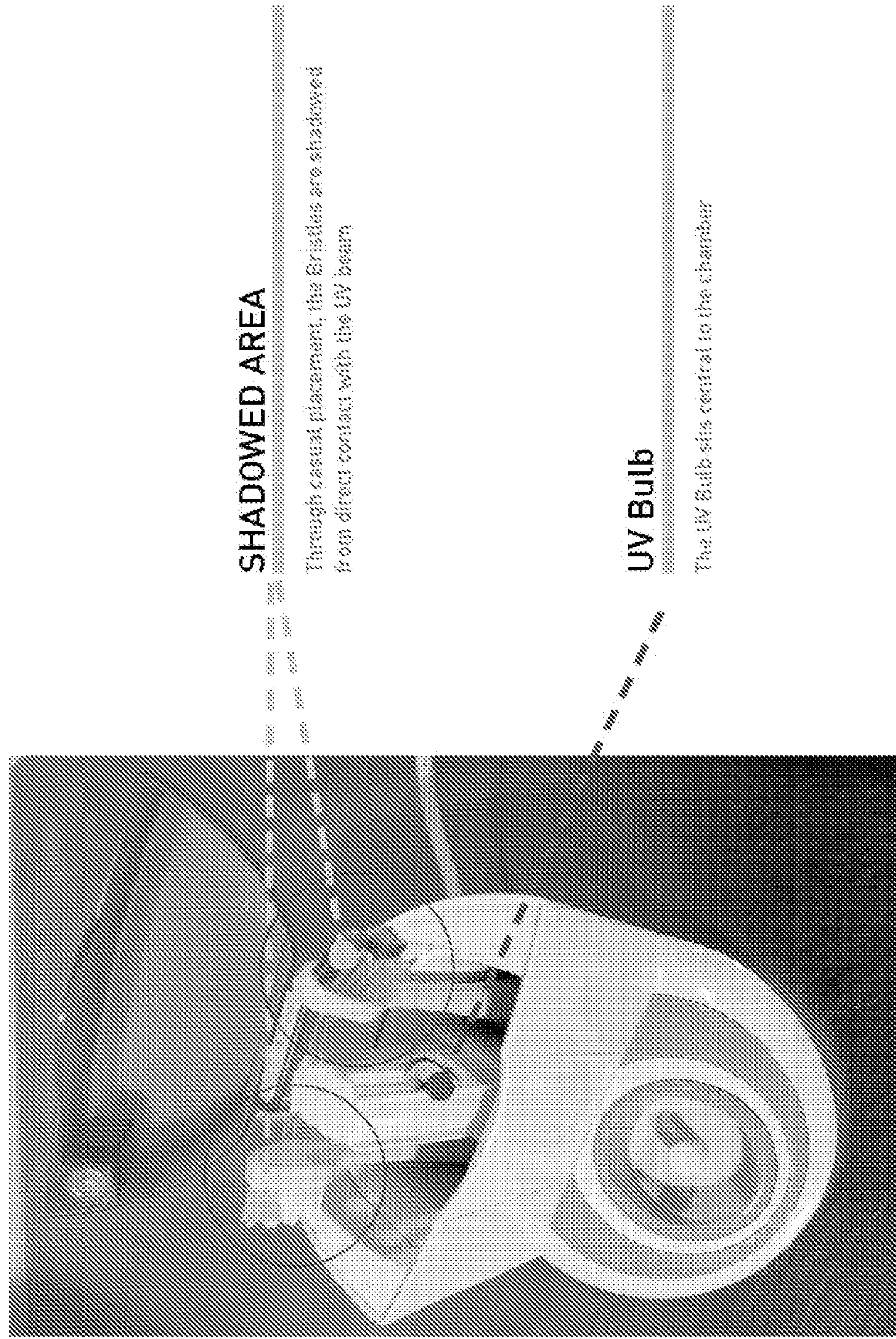
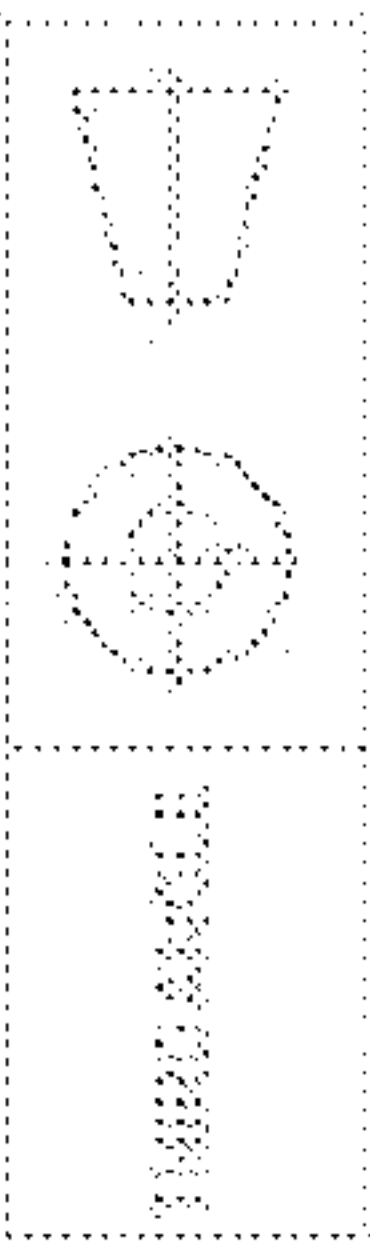
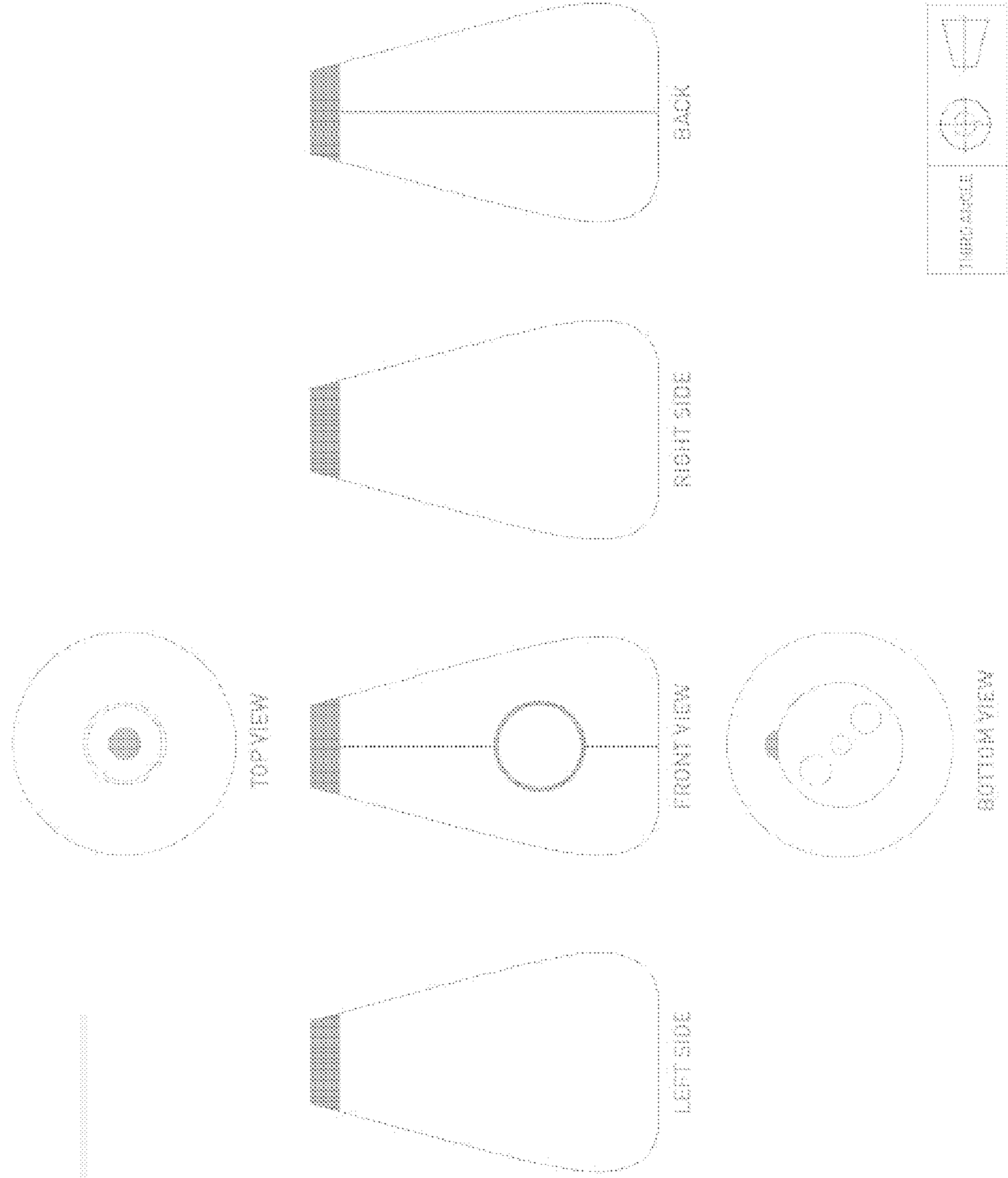


Figure 10.
THE CHAMBER



ORTHOGRAPHIC PROJECTION

- FORM ☐ ACTION ☐
- FUNCTION ☐ ACTIVATION ☐
- EXPERIENCE ☐

THE CHAMBER

The chamber is a cleaning apparatus using ultraviolet rays enhanced within a parabolic light acceleration chamber that comprises a light source and a light guide member capable of transmitting ultraviolet rays from an even light source to become a

brush head for total immersion and maximum sterilization effect. The cleaning apparatus has a timed operation to activate the ultraviolet rays and operates as a charge station for the Sonic enhanced tooth brush.

Figure 11.

BRUSH TO CHAMBER DOCKING

Placing the Advanced sonic tooth brush docks the brush to the chamber

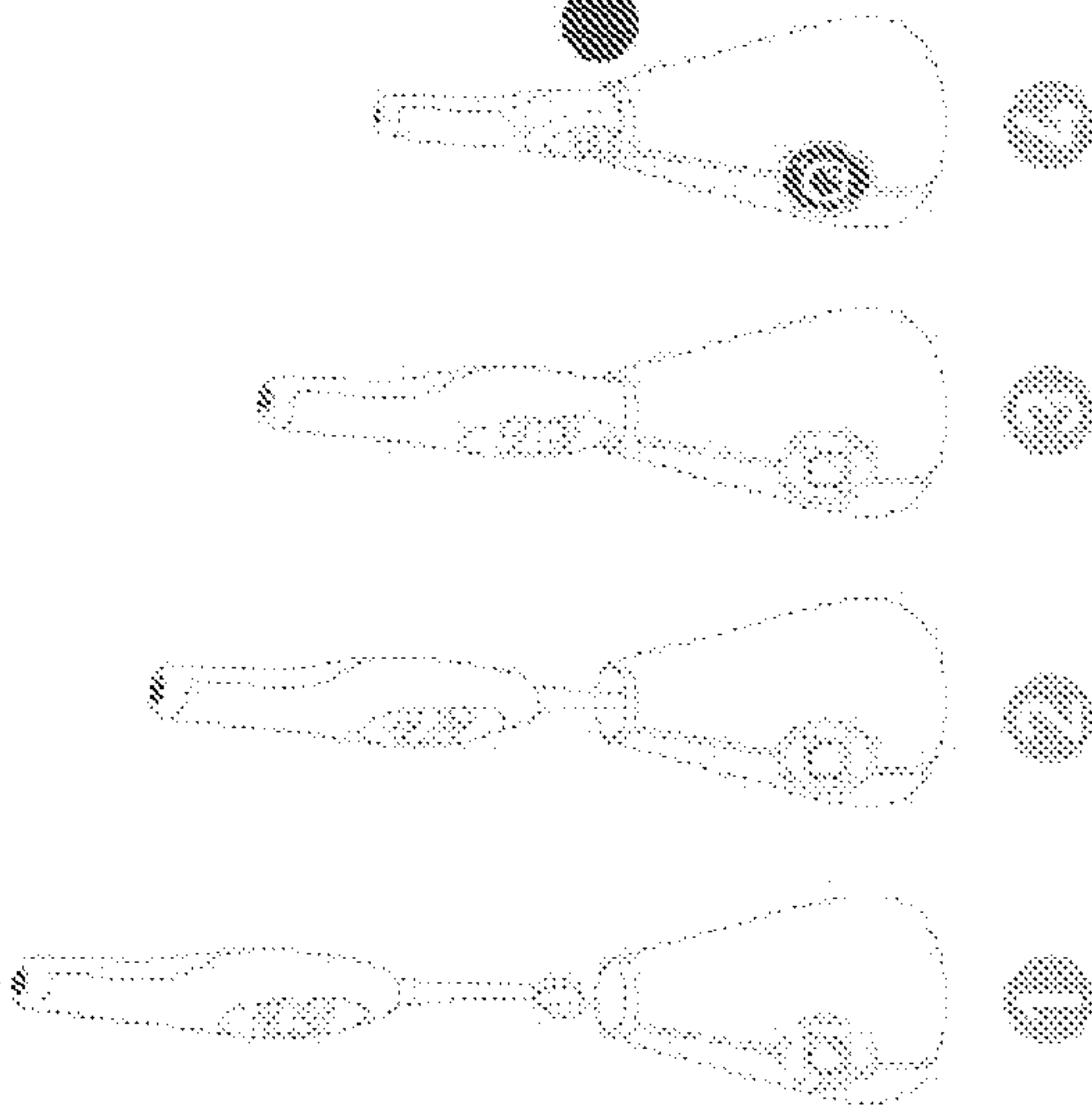


DIAGRAM No. 1 HANDLE PLACEMENT SEQUENCE

PLACEMENT

The two distinct shapes of the design fit together. The tapered cylindrical handle and the fluted aperture of the chamber allow the brush occluding the vast majority of the opening and the toothbrush head to be covered. It also reduces any escaped pollution caused by stray UV Rays activated from the Sterilizing light frequencies of the UV Cold cathode bulb fit within.

The brush handle has a small but non-zero gap between the handle and the chamber base

FORM ☐
FUNCTION ☐
EXPERIENCE ☐

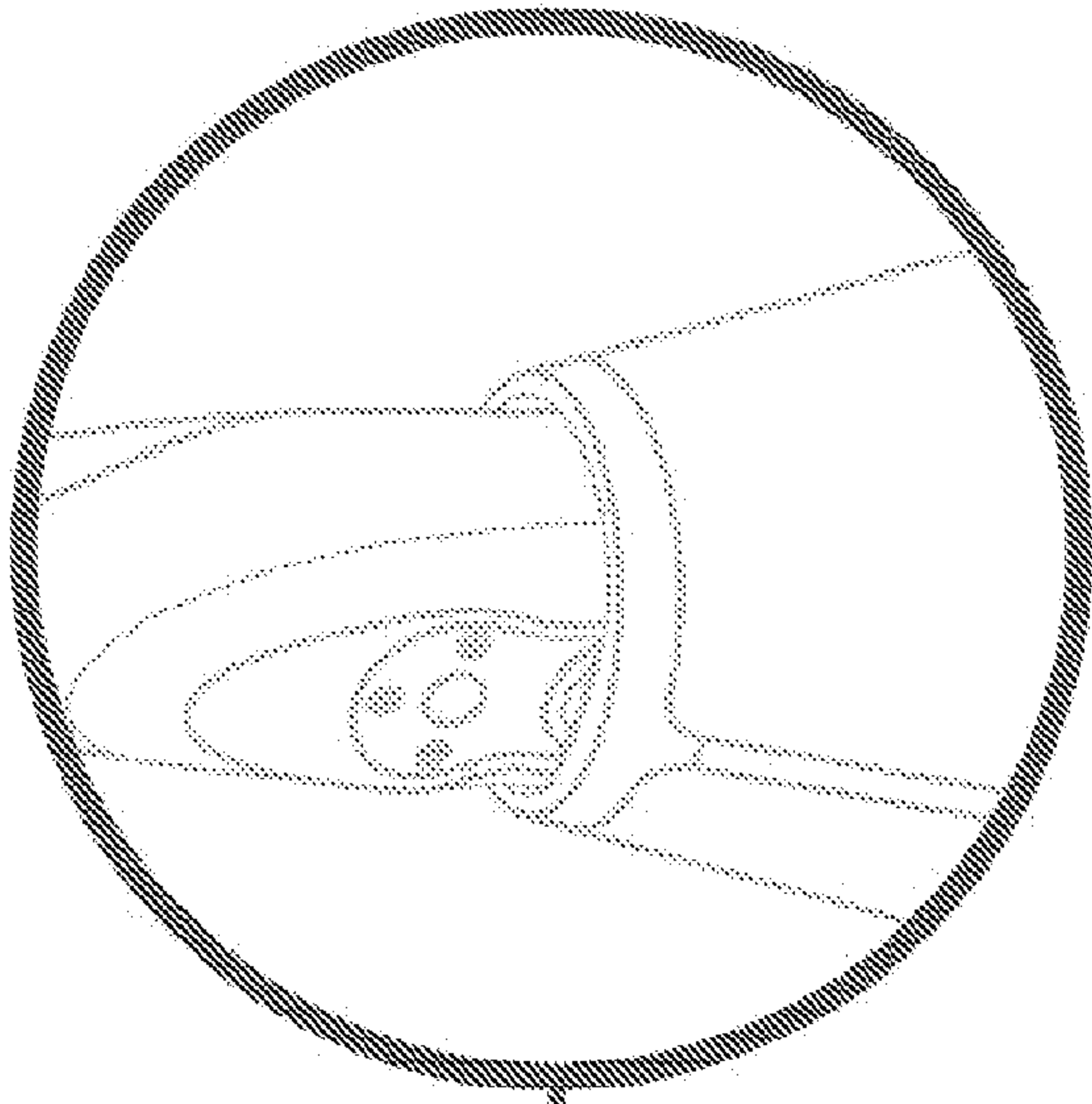


DIAGRAM No. 2 CLOSE UP OF HANDLE AND CHAMBER BASE

THE GAP

The small gap around the brush handle and neck of the chamber is achieved through fins strategically placed on the inside of the inner chamber entrance wall (see diagram no. 3).

This allows for brush handle to be supported on the fins creating a gap with even distance between the handle and inner chamber wall.

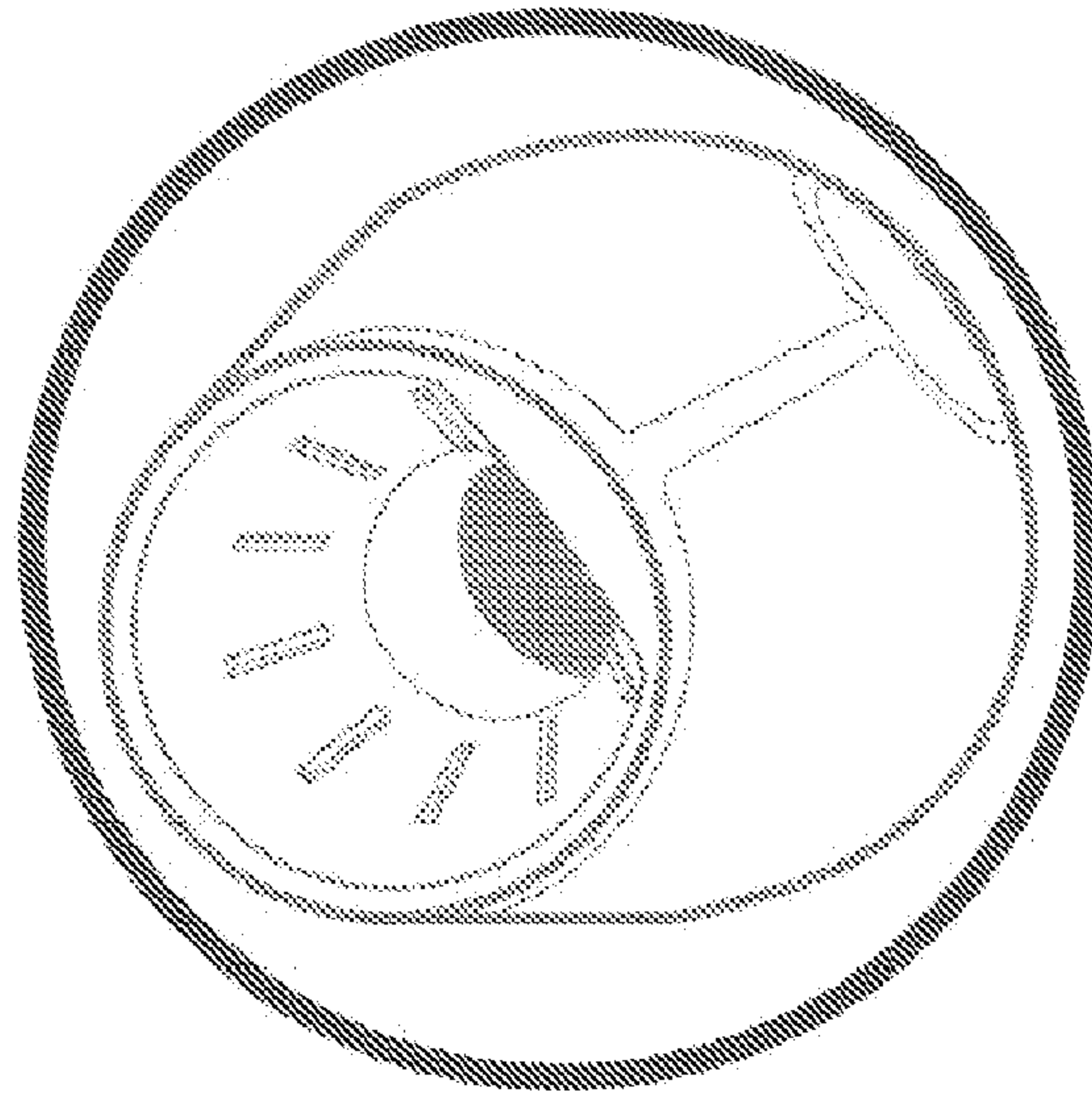


DIAGRAM No. 3 CLOSE UP OF INNER CHAMBER DETAIL

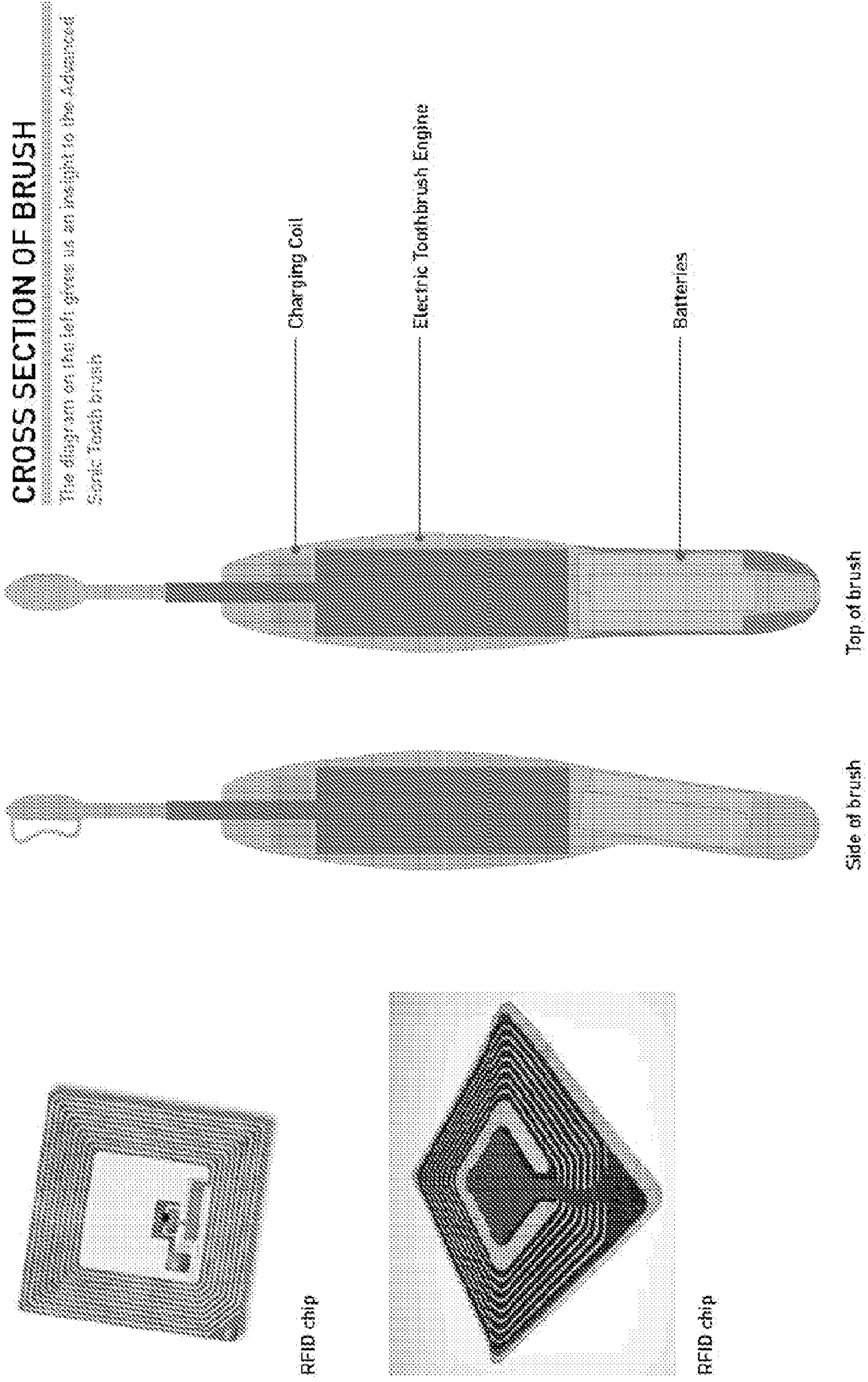
This gap fit between the two parts creates two advantages.

1. It allows the user to remove the brush handle with one hand. The base does not have to be held down, fixed or otherwise excessively weighted.
2. It allows a path for water vapor to escape the chamber base. This is advantageous in that it aids in drying the toothbrush head.

CLAIM

Brush docks with Chamber base to cover the toothbrush head, reduce stray UV rays when during the sterilizing process and allow airflow to circulate around the toothbrush head and to help with water vapor to escape the chamber base

Figure 12.



CLAIM

RFID in Advanced Sonic Brush head

FORM ☐
FUNCTION ☐
EXPERIENCE ☐

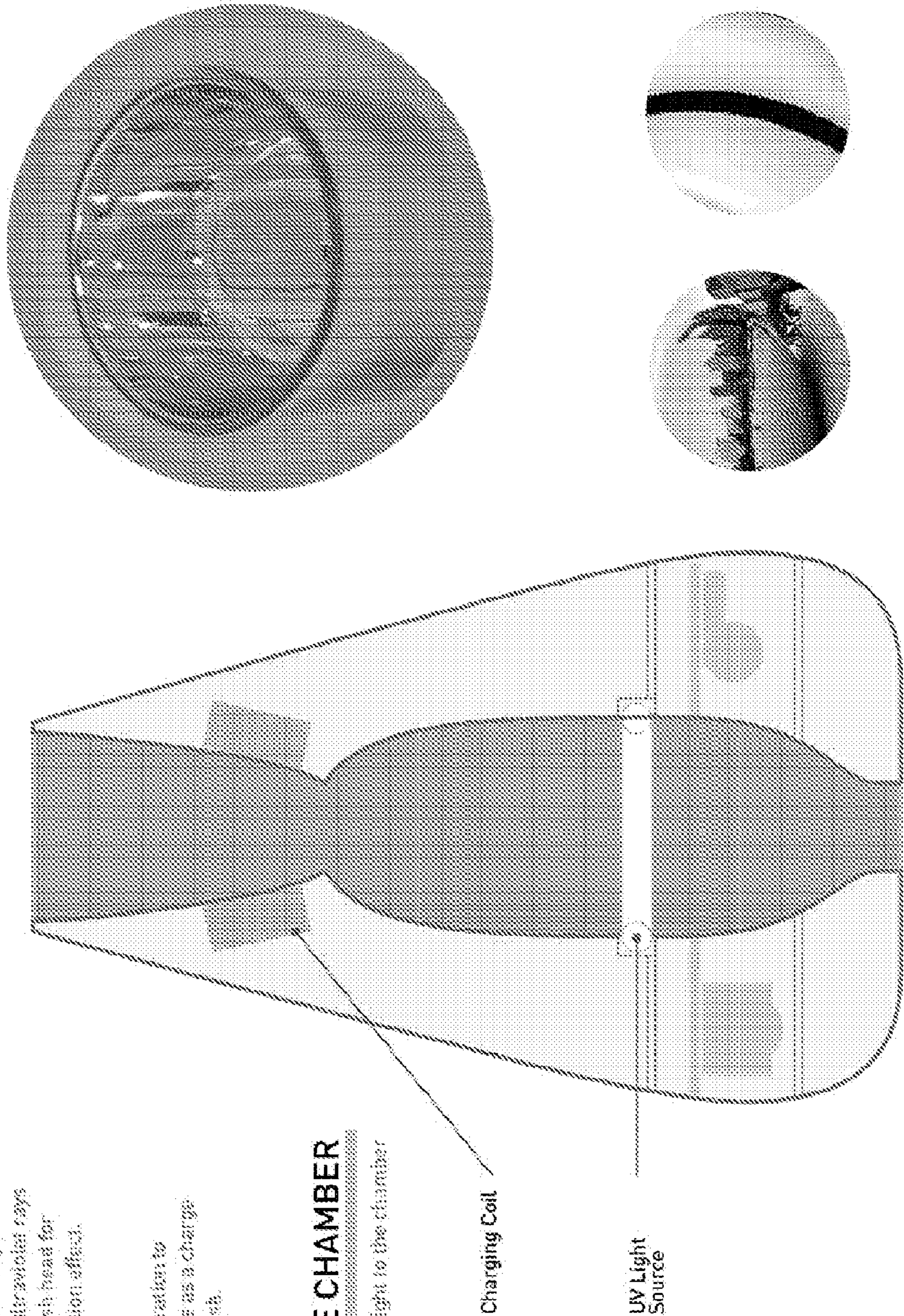
Figure 13.
THE CHAMBER

The chamber is a cleaning apparatus using ultraviolet rays enhanced within a parabolic light acceleration chamber that comprises a light source and a light guide member capable of transmitting ultraviolet rays from an even light source to bathe a brush head for total immersion and maximum sterilization effect.

The cleaning apparatus has a timed operation to activate the ultraviolet rays and operates as a charge station for the Sonic enhanced tooth brush.

CROSS SECTION OF THE CHAMBER

The diagram on the right gives us an insight to the chamber



ORTHOGRAPHIC PROJECTION

FORM ☐ ACTION ☐
 FUNCTION ☐ ACTIVATION ☐
 EXPERIENCE ☐

No Hard Edges

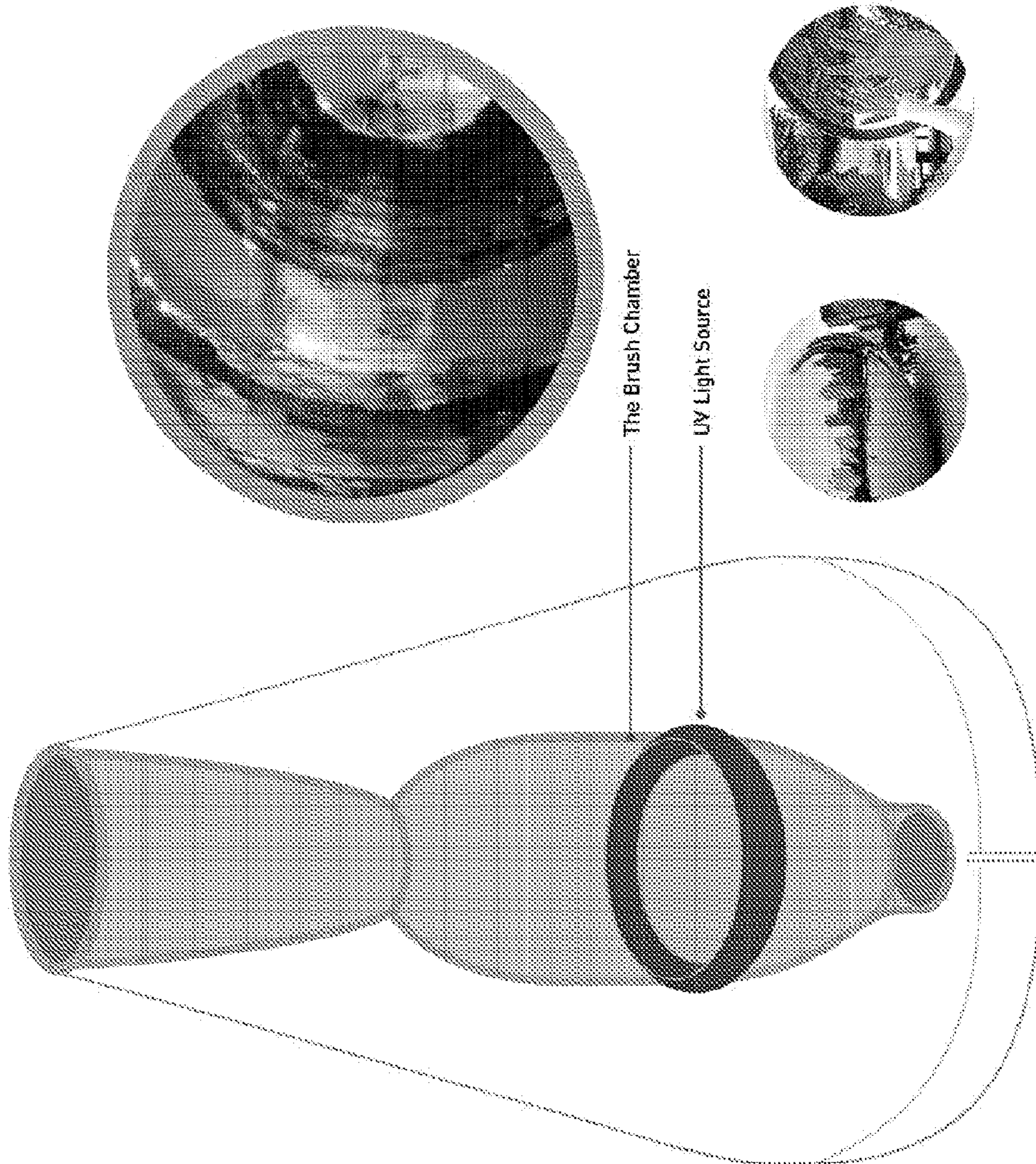
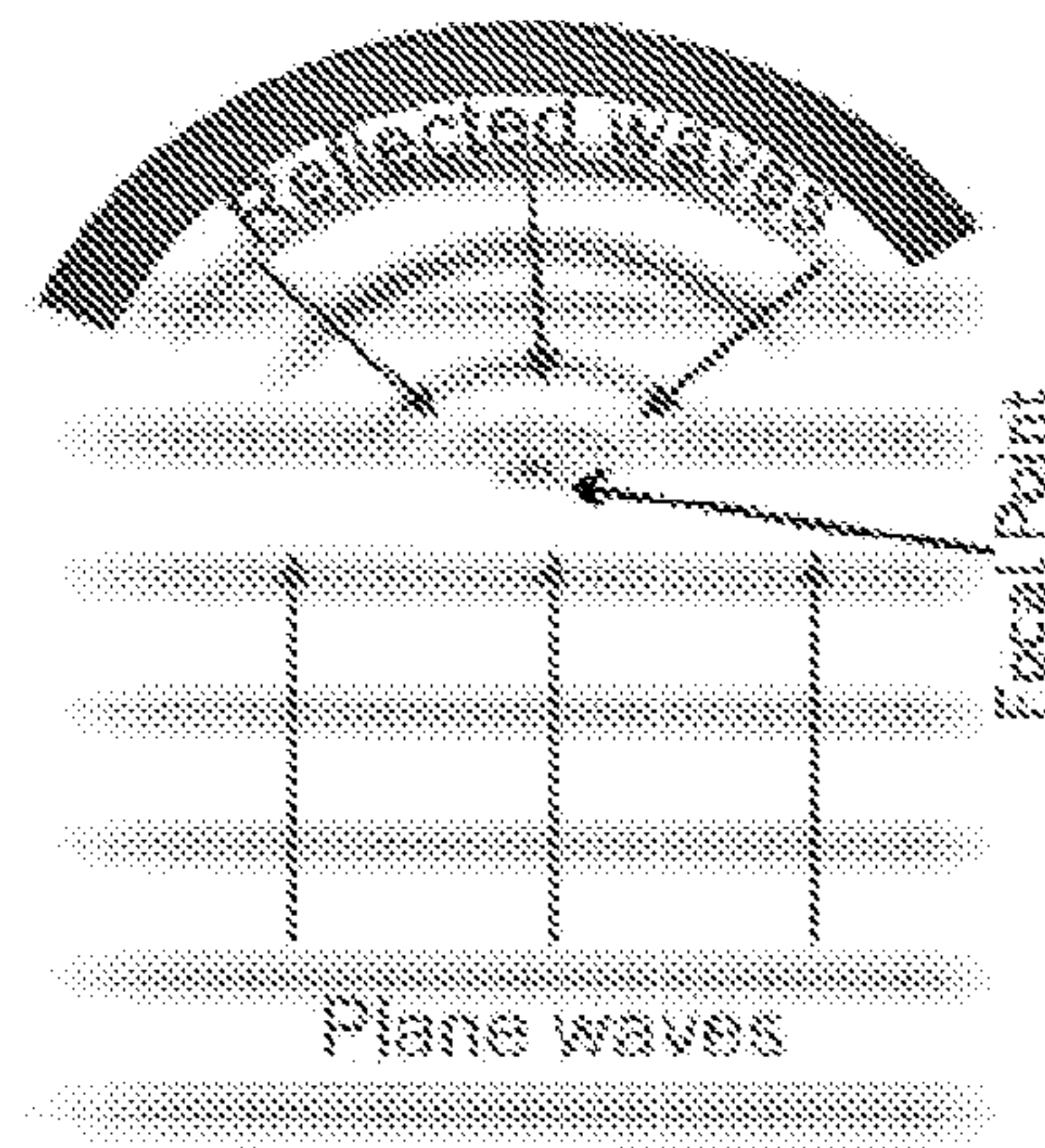
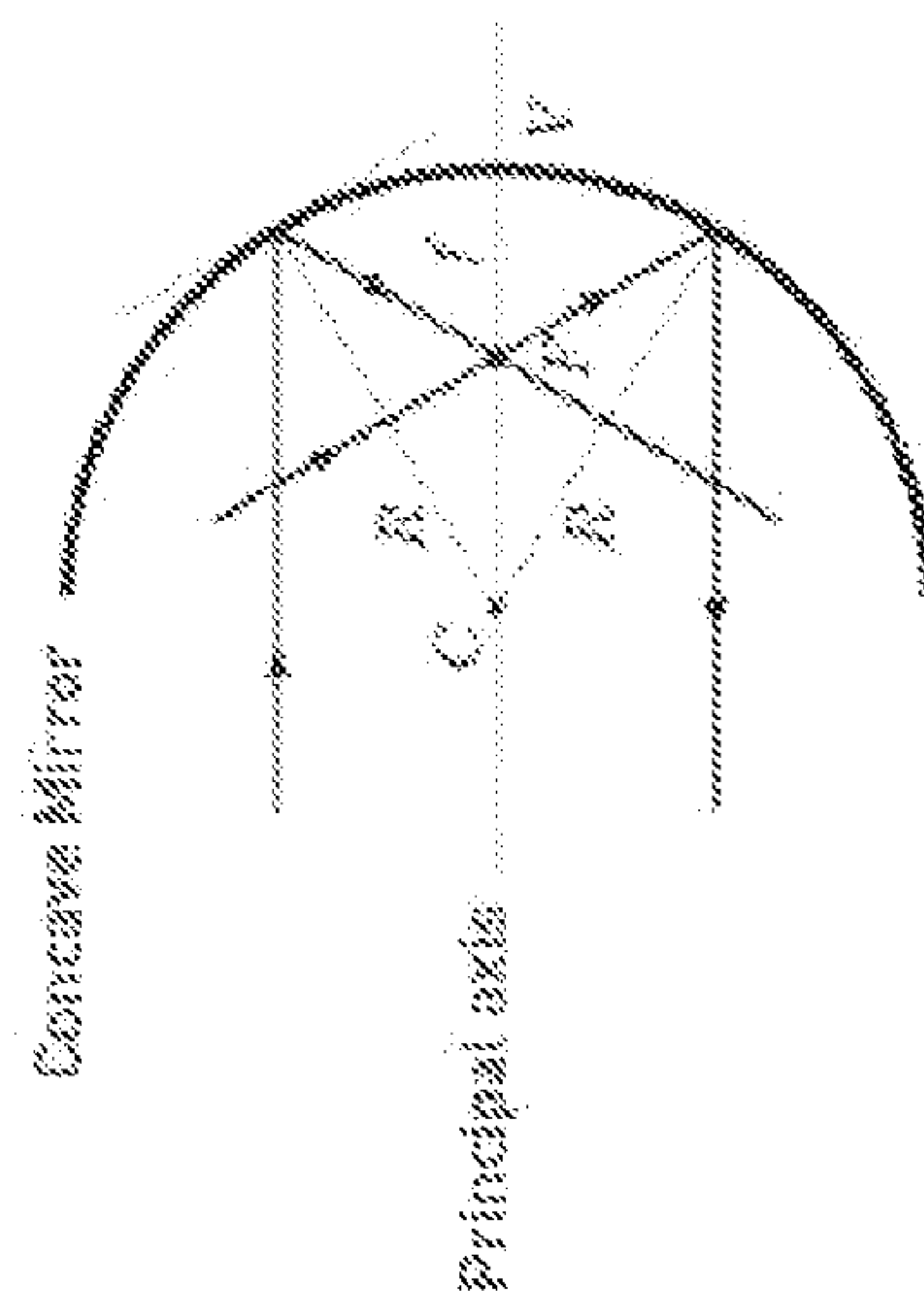
The chamber is a cleaning apparatus using ultraviolet rays enhanced within a parabolic light acceleration chamber that comprises a light source and a light guide member capable of transmitting ultraviolet rays from an even light source to bathe a

brush head for total immersion and maximum sterilization effect. The cleaning apparatus has a timed operation to activate the ultraviolet rays and operates as a charge station for the Sonic enhanced tooth brush.

Figure 14.

INSIDE THE CHAMBER

A parabolic light acceleration chamber comprised of an even light source to bathe a brush head for total immersion and maximum electrization effect.



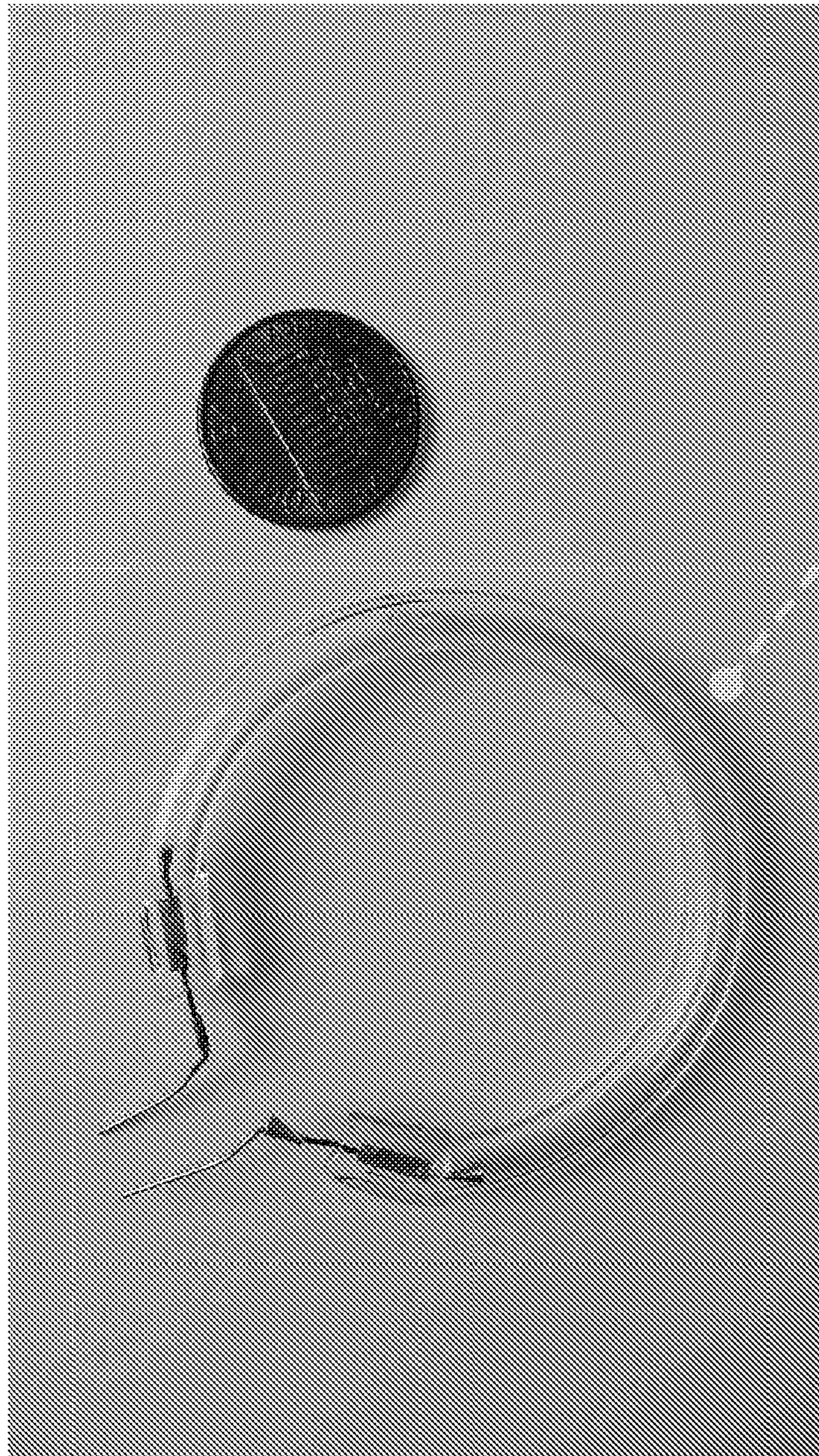
ORTHOGRAPHIC PROJECTION

FORM ☐ ACTION ☐
 FUNCTION ☐ ACTIVATION ☐
 EXPERIENCE ☐

CLAIM

A reflective surface within the chamber intensifies the light source/ An even light source surrounds the brush head for total immersion

Figure 15.



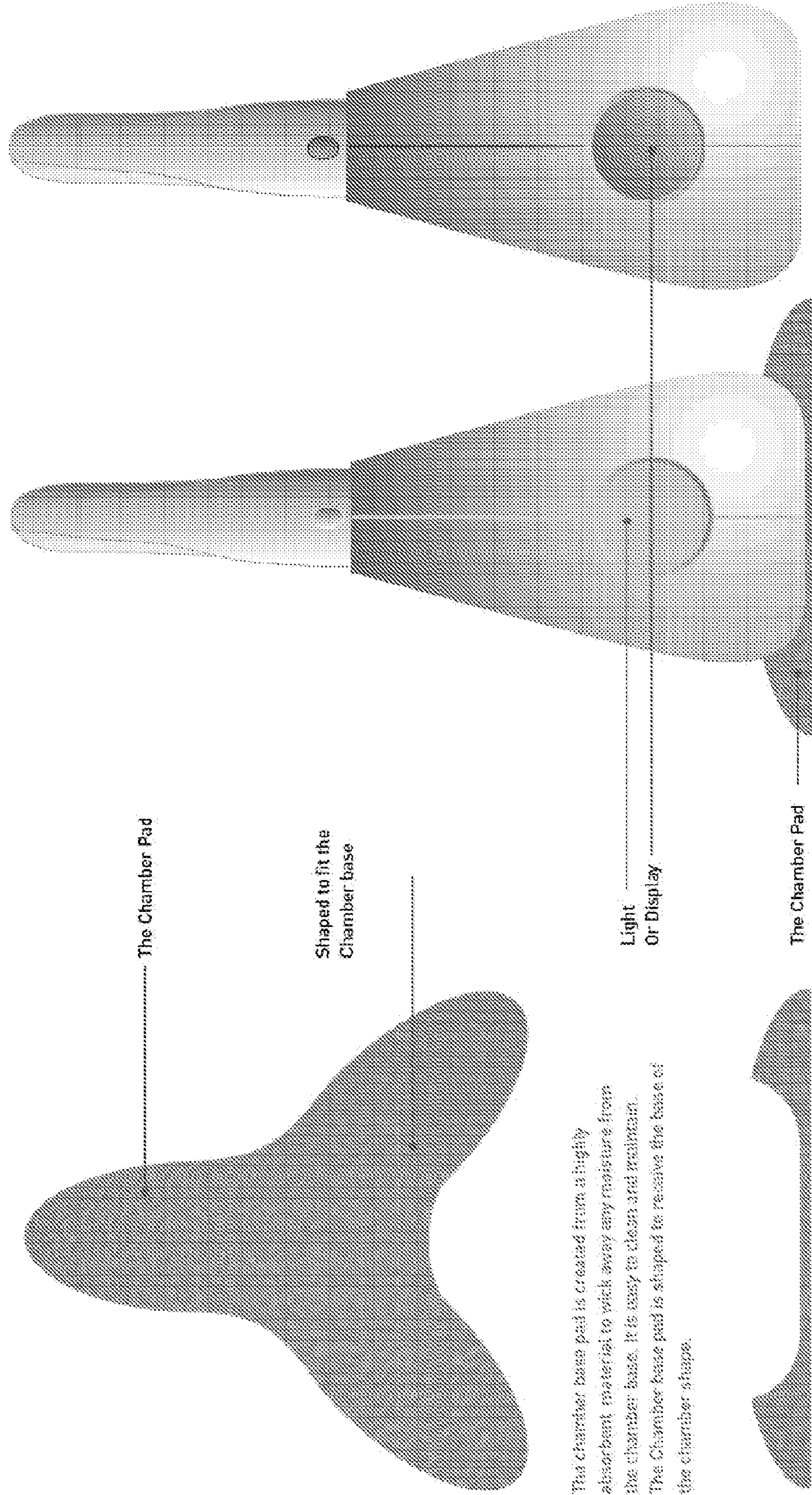
UV Bulb

With penny for scale

Figure 16.

THE CHAMBER PAD

The chamber sits on a unique absorbent pad.



The chamber base pad is created from a highly absorbent material to wick away any moisture from the chamber base. It is easy to clean and maintain. The Chamber base pad is shaped to receive the base of the chamber shape.

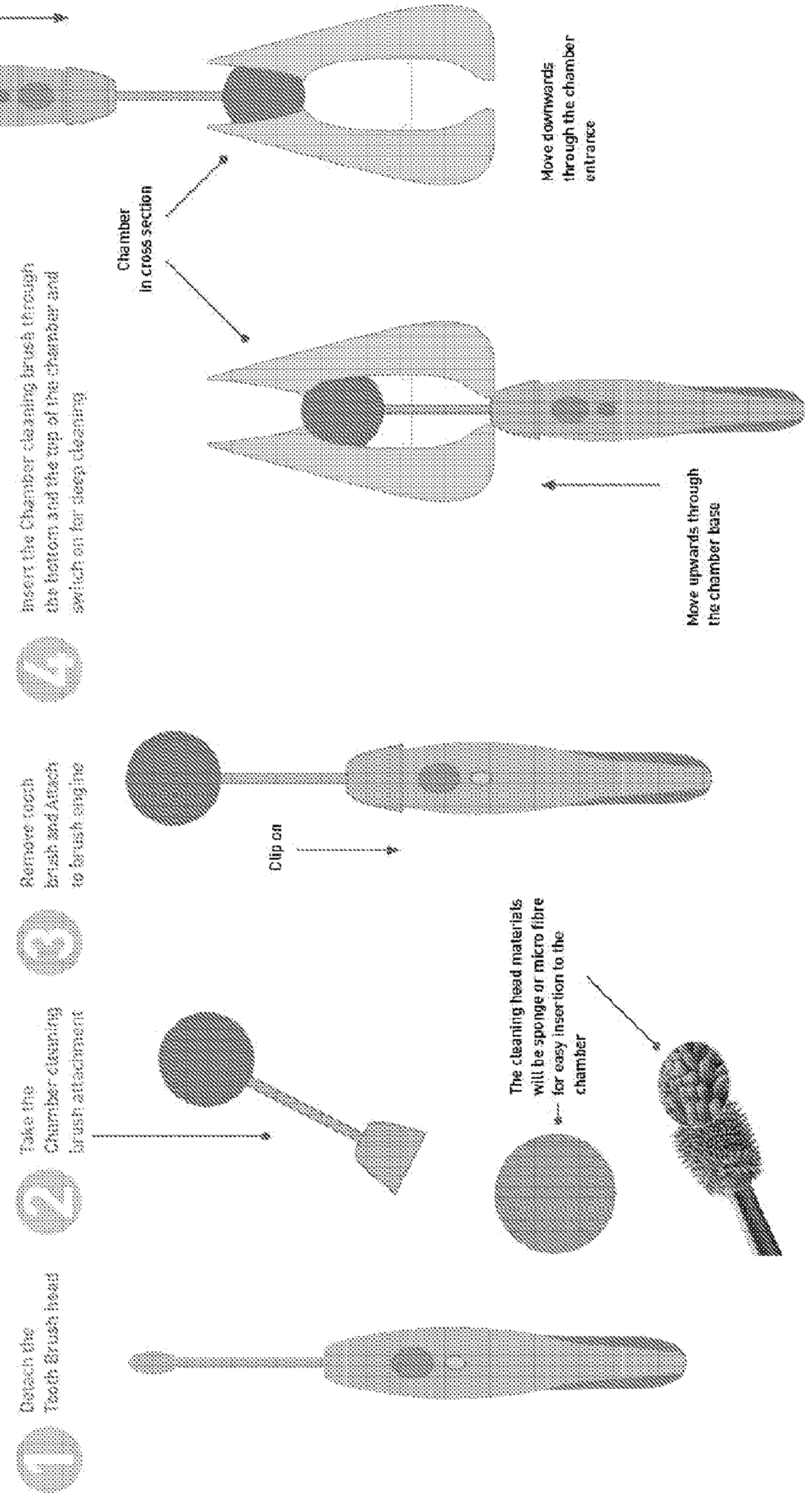
The Pad keeps surfaces clean

FORM ☐
FUNCTION ☐
EXPERIENCE ☐

Figure 17.

CHAMBER CLEANING BRUSH

The chamber clearing brush attachment keeps the chamber in pristine working order



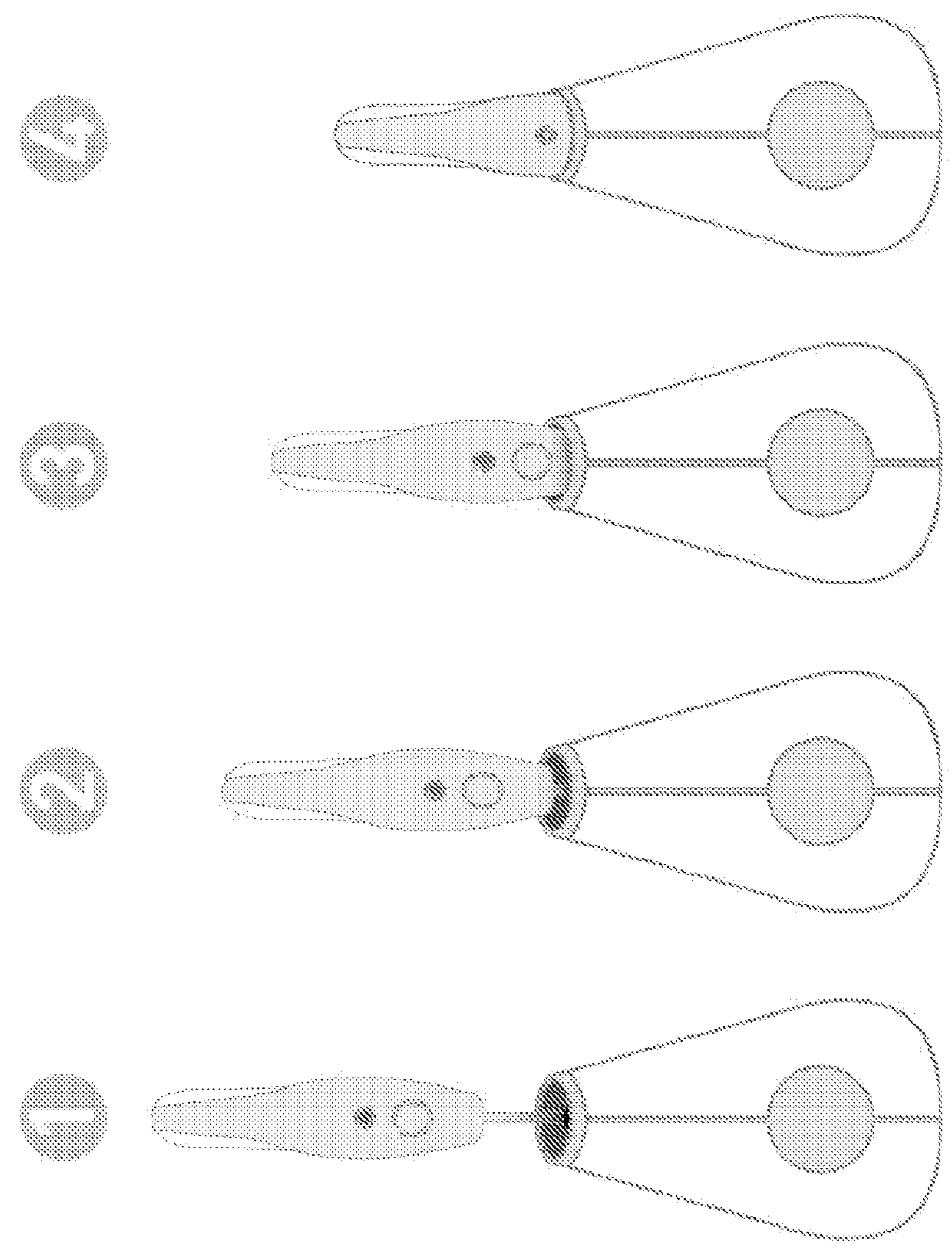
Cleaning the Chamber using Chamber cleaning brush the Chamber cleaning brush attach

- FORM ☐
- FUNCTION ☐
- EXPERIENCE ☐

Figure 20.

BRUSH TO CHAMBER ACTIVATION

This simple sequence of brush placement activates the chamber base features



CLOSE UP

Once the brush handle is placed securely, the chamber and the Touchbrush activate LEDs indicate the link and menu of functions inherent to cleaning, charging and purpose.

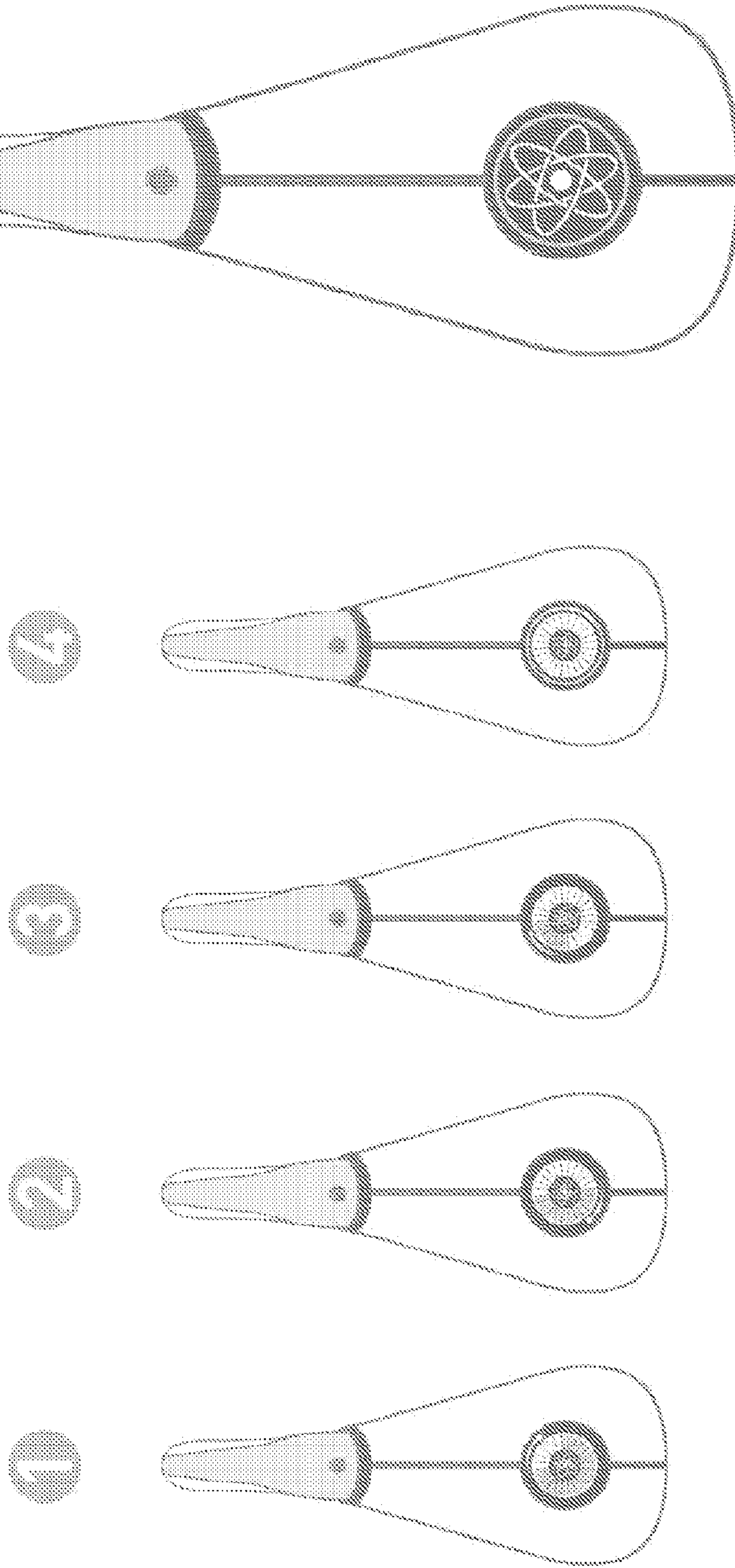
Brush placement activates Chamber base function

- FORM ☐
- FUNCTION ☐
- EXPERIENCE ☐

Figure 21.

CLEANING CYCLE SEQUENCE

This simple sequence of brush placement activates the chamber base cleaning cycle



CLAIM

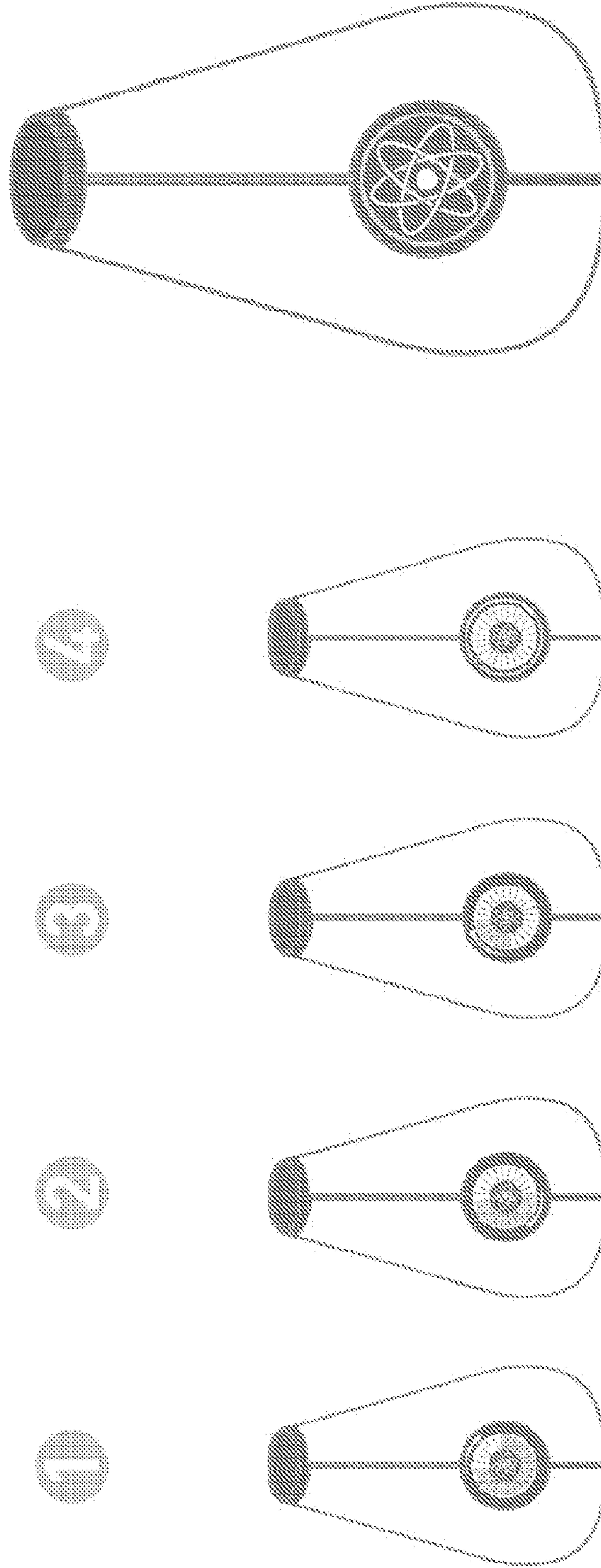
Selective cleaning intensity based on frequency of brush insertion

FORM ☐
FUNCTION ☐
EXPERIENCE ☐

Figure 22.

CLEANING CYCLE SEQUENCE

A timed process illustrating the cleaning cycle. Sequence lasts 7 minutes. In combination with the light accelerating chamber, intensity is increased by 70%.



CLAIM

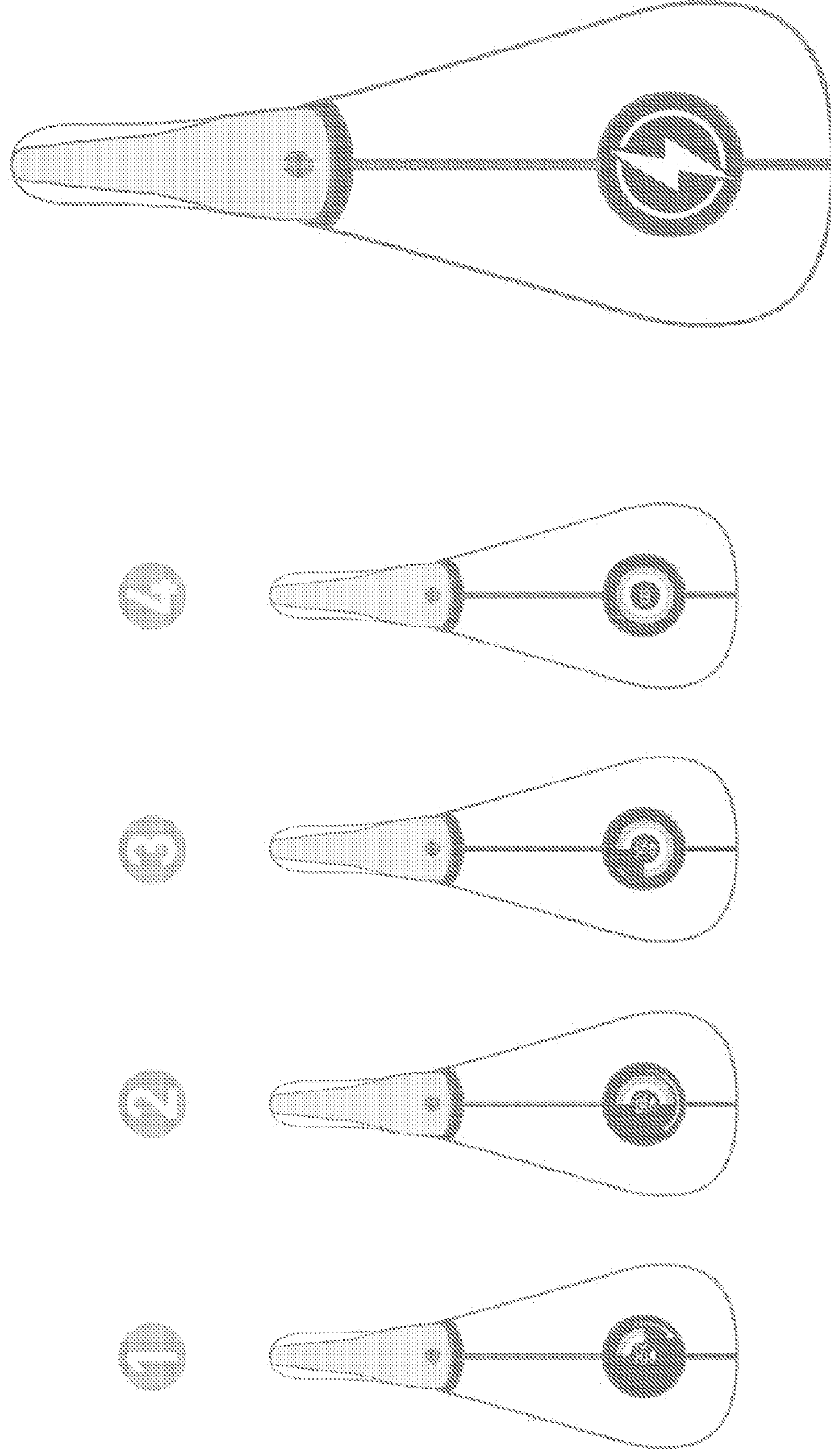
Self-cleaning on cycle without brush / Various cleaning intensity based on the frequency of insertion

FORM ☐
FUNCTION ☐
EXPERIENCE ☐

Figure 23.

CHARGING CYCLE SEQUENCE

A direct process illustrating the charging cycle.



VISUAL SEQUENCE: THE CHARGE SCREEN

LCD fully illustrates the charging process

FORM ☐
FUNCTION ☐
EXPERIENCE ☐

Figure 24.
THE CHAMBER

The attached invention includes and describes a brush-activated sanitizing chamber within a charging base (otherwise known as a chamber, UV Chamber, holder, compartment, enclosure, charge-base or shell) for a custom designed ergonomic electronic toothbrush device (otherwise known as a Electric Toothbrush, Sonic Toothbrush or powered toothbrush) intrinsic to the overall invention design.

We are concerned with keeping the toothbrush clean, sanitized and charged for the user. This is achieved through placement of the toothbrush onto the charging base and into the recessed internal sanitizing chamber, which encapsulates the brush head to activate the chamber sanitizing and charging functions. The sanitizing chamber is a controlled and clean environment.

The invention is also about user convenience as all functional actions of the sanitizing chamber are activated once the brush is placed within it.

The base and sanitizing chamber allows the user to protect, clean and charge their toothbrush.

This invention utilizes two distinct parts: a toothbrush and charging base with a recessed internal protective sanitizing chamber.

The charge base includes just one recessed entrance to the internal sanitizing chamber, which is located central on top of the device. The external material of the charging base would be glass, BPA free plastic or a resin based composite material. The recessed sanitizing chamber entrance (female) corresponds to the Toothbrush handle design (male). The toothbrush

placed vertically brush first into the sanitizing chamber by the user. The material for the internal chamber would be glass or a transparent thermoplastic. The sanitizing chamber can easily be accessed for cleaning or maintenance. Once placed, the toothbrush is held stable within the recess. The brush head and neck are submerged into the sanitizing chamber, leaving the majority of the brush handle vertically standing and in view.

There is a small but non-zero gap between the handle and the base. The brush occludes the vast majority of the opening. This makes for a very torturous path so that gasses or light from the sterilization means don't escape en masse. At the same time the slip fit between the parts creates two advantages.

1. It allows the user to remove the brush with one hand. The base does not have to be held down, fired or otherwise excessively weighted.
2. It allows a path for water vapor to escape the chamber. This is advantageous in that it aids in drying the brush.

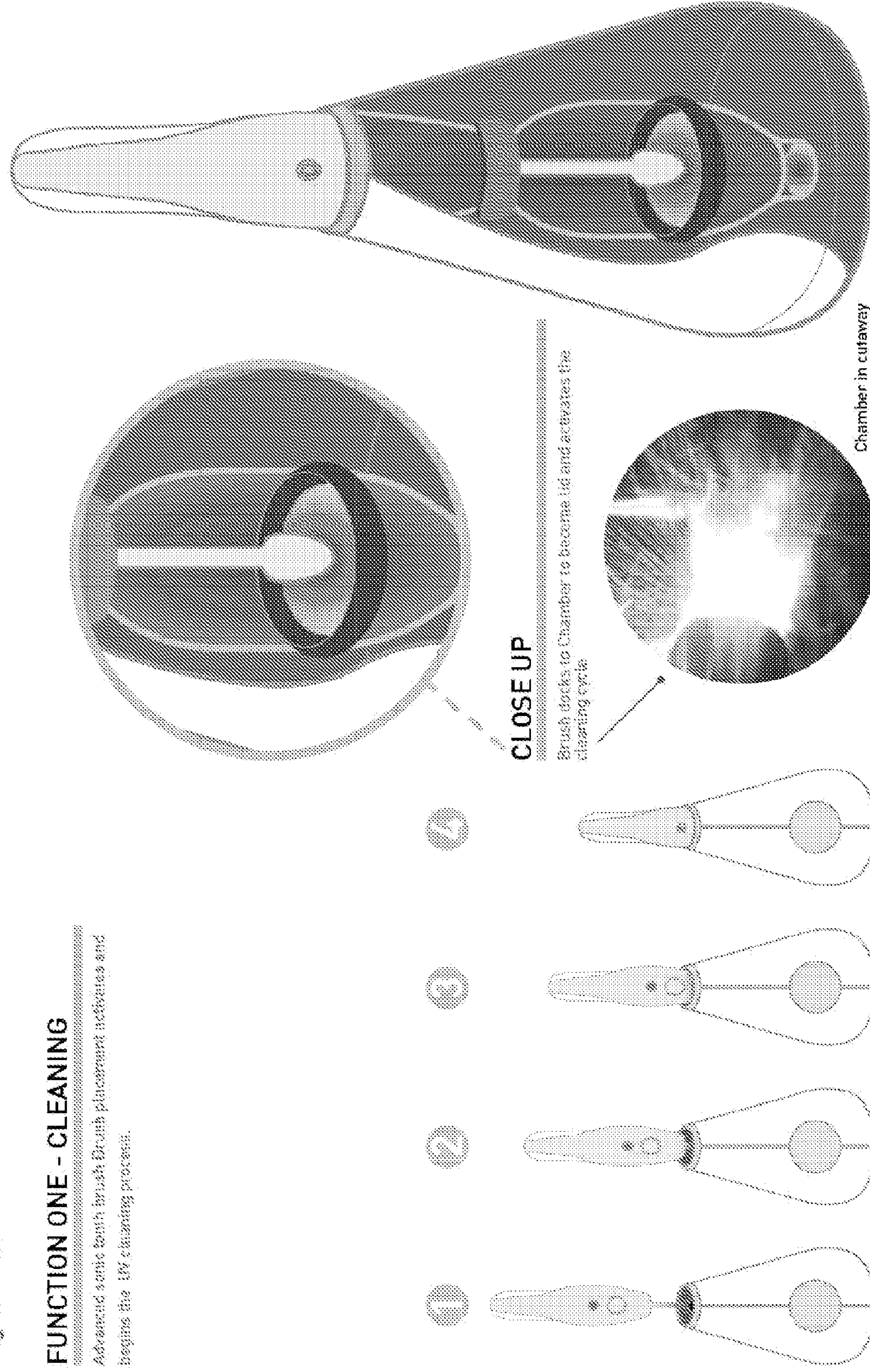
This action activates the charging mechanism. On the charging base, the entrance of the chamber conceals the coiled charge mechanism, which allows the brush to be charged whilst being safely held. The toothbrush handle (inhygienically seals the chamber entrance to allow activation of sanitizing chamber functions. The sanitizing chamber entrance can would be made of an elastomer material to cushion the brush handle.

The sanitizing chamber functions include activation of the sanitizing within the chamber and the battery charging for the toothbrush.

Figure 25.

FUNCTION ONE - CLEANING

Advanced sonic tooth brush. Brush placement activates and begins the UV cleaning process.



Brush docks into Chamber to become lid and activates cleaning sequence

FORM ☐

FUNCTION ☐

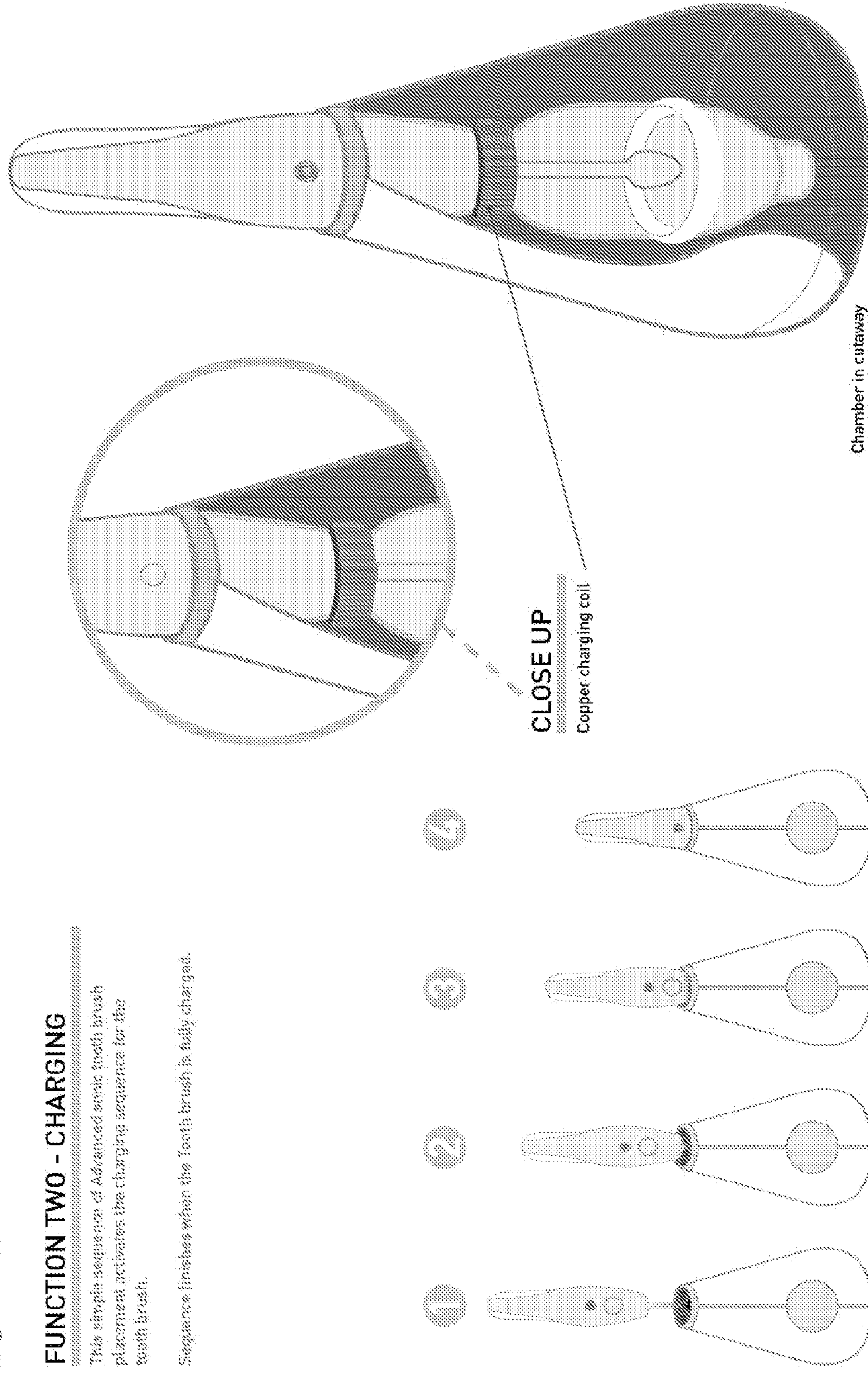
EXPERIENCE ☐

Figure 26.

FUNCTION TWO - CHARGING

This sample sequence of Advanced sonic tooth brush placement activates the charging sequence for the tooth brush.

Sequence finishes when the Tooth brush is fully charged.



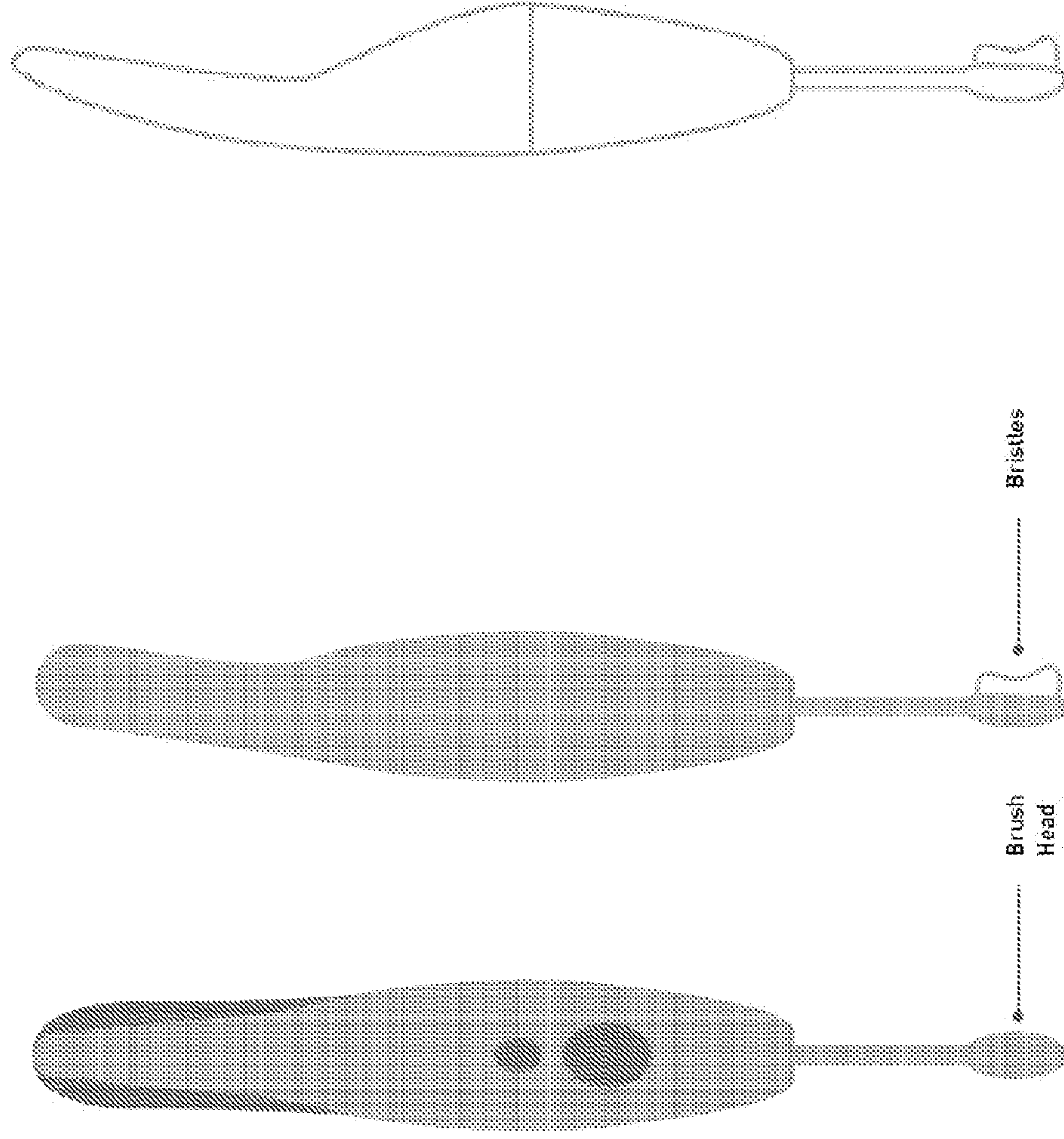
Brush placement activates charging sequence

FORM ☐
FUNCTION ☐
EXPERIENCE ☐

Figure 27.

ADVANCED SONIC BRUSH

Ergonomic, lightweight and made with hygienically safe materials. The brush head utilizes advanced sonic technology.



THE BRUSH

FORM ☐
FUNCTION ☐
EXPERIENCE ☐

Figure 28.

THE CHAMBER

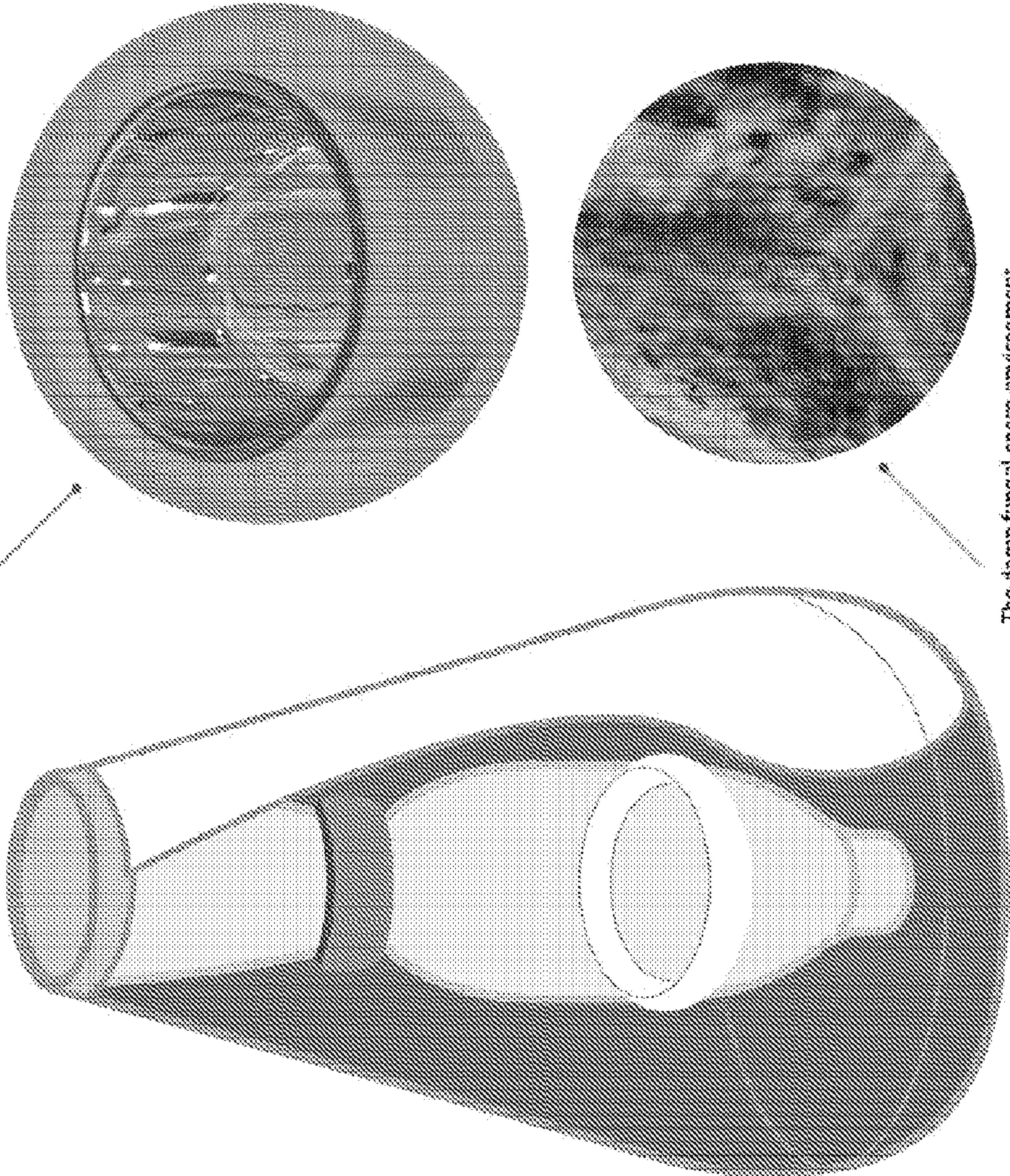
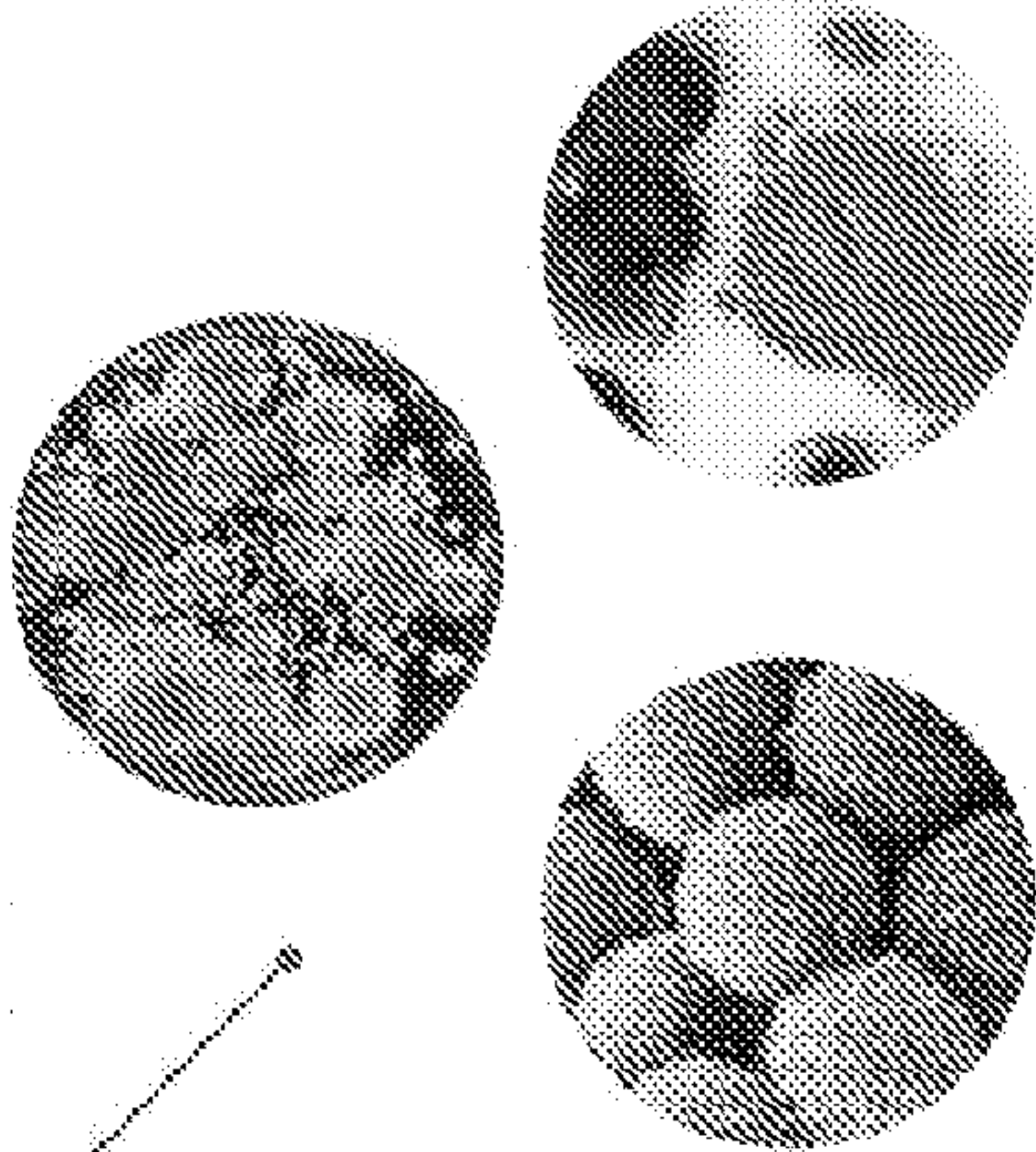
The chamber is a cleaning apparatus using ultraviolet rays enhanced within a parabolic light acceleration chamber that comprises a light source and a light guide member capable of transmitting ultraviolet rays from an even light source to bathe a brush head for autolysis and maximum sterilization effect.

The cleaning apparatus has a timed operation to activate the ultraviolet rays and operates as a charge station for the Sonic enhanced tooth brush.

CROSS SECTION OF THE CHAMBER

The diagram on the right gives us an insight to the chamber and the lack of hard edges.

Types of Fungal spores



ORTHOGRAPHIC PROJECTION

FORM	☐	ACTION	☐
FUNCTION	☐	ACTIVATION	☐
EXPERIENCE	☐		

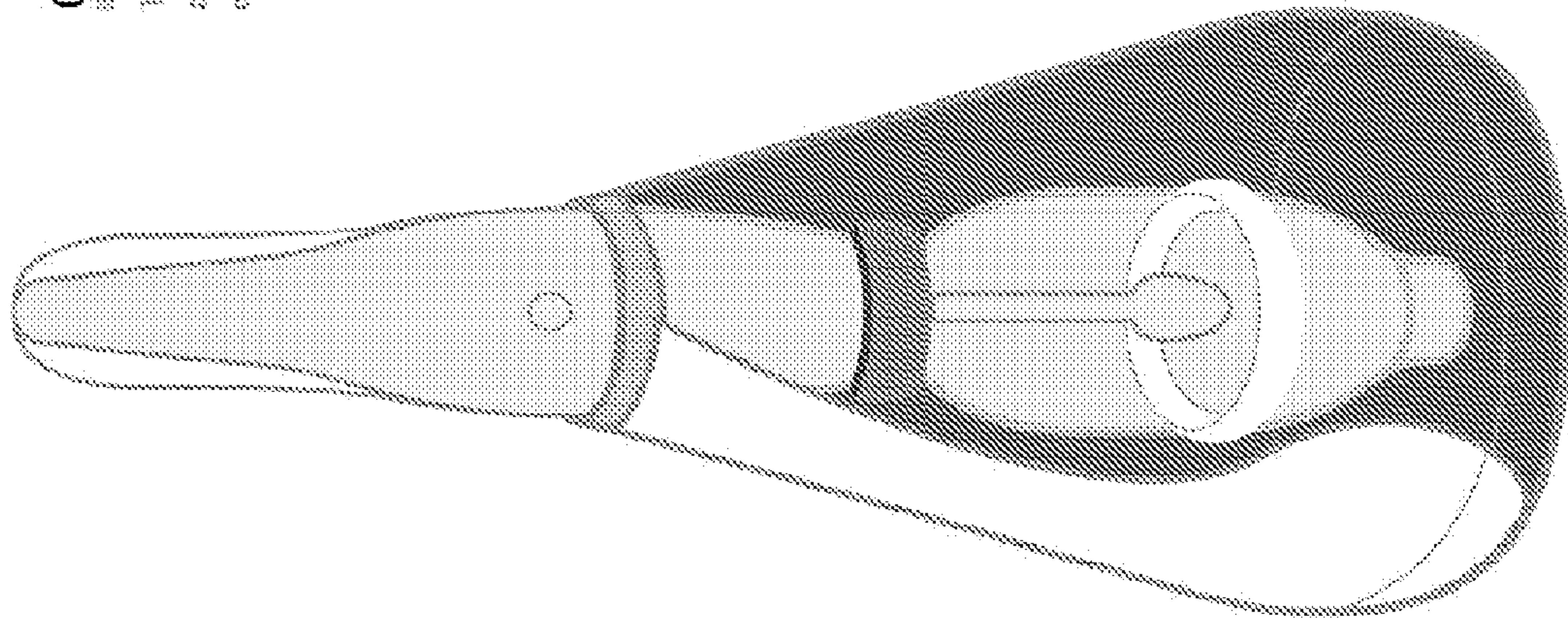
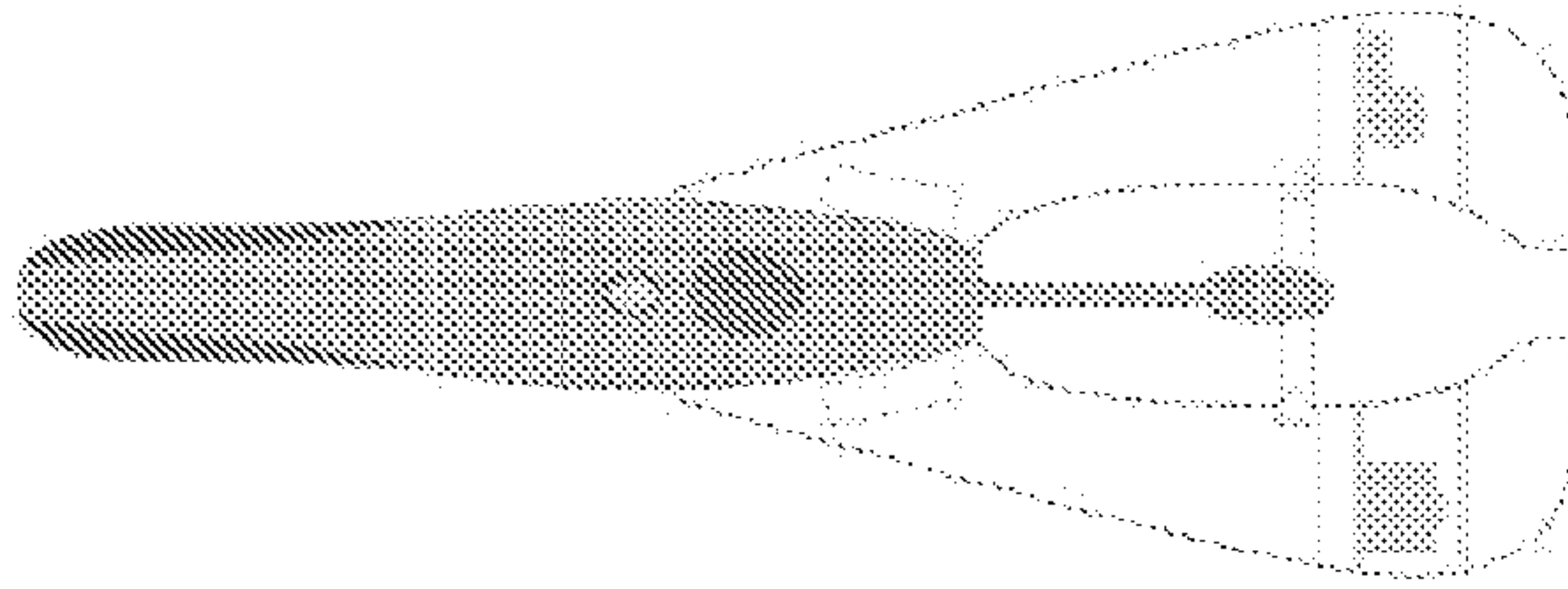
Chamber has no hard edges or acute angles that may accumulate water residue or cultivate mold growth

Figure 29.

THE CHAMBER

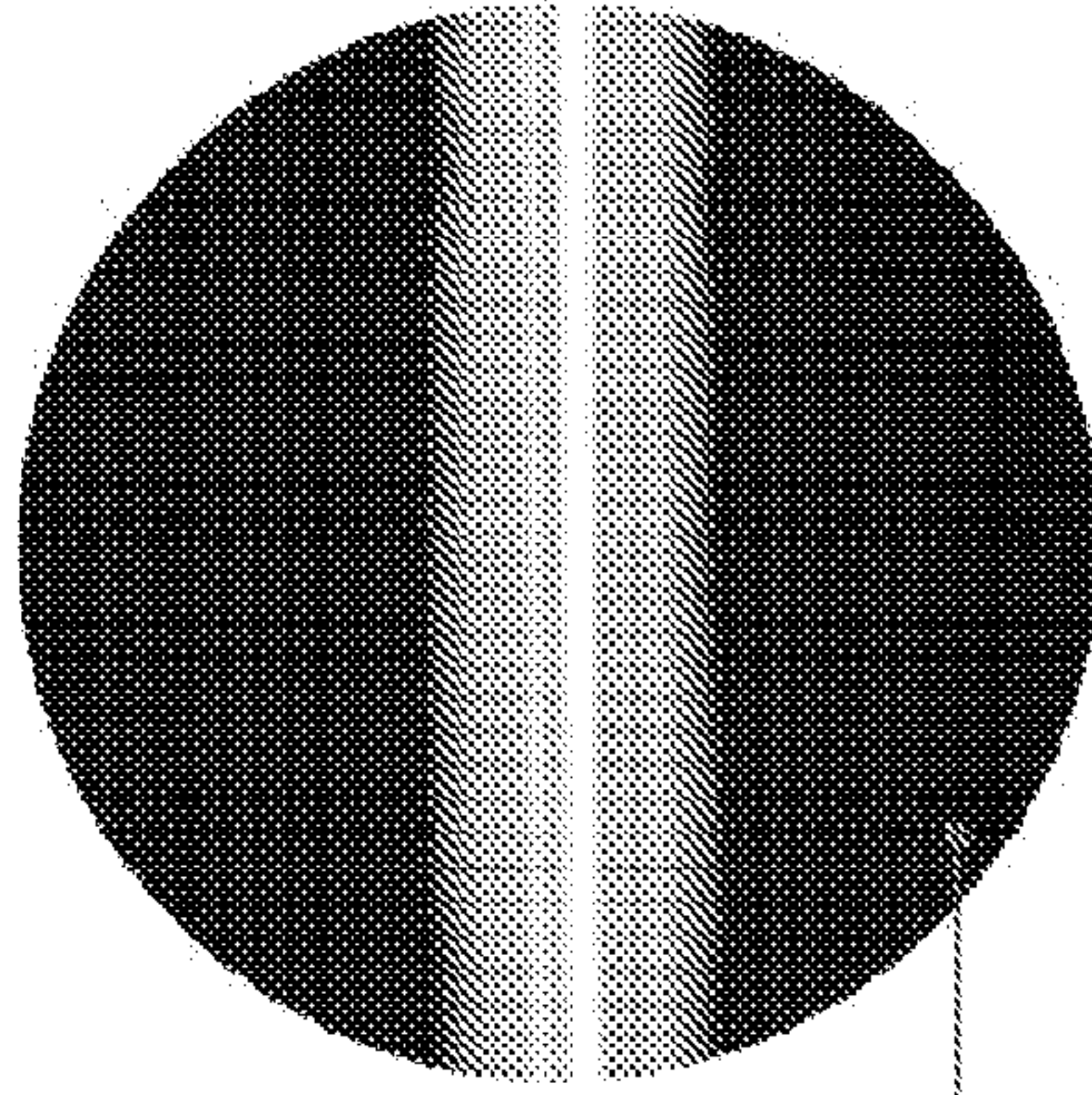
The chamber is a cleaning apparatus using ultraviolet rays enhanced within a parabolic light acceleration chamber that comprises a light source and a light guide number capable of transmitting ultraviolet rays from an even light source to bathe a brush head for total immersion and maximum sterilization effect.

The cleaning apparatus has a timed operation to activate the ultraviolet rays and operates as a charge station for the Sonic enhanced tooth brush.

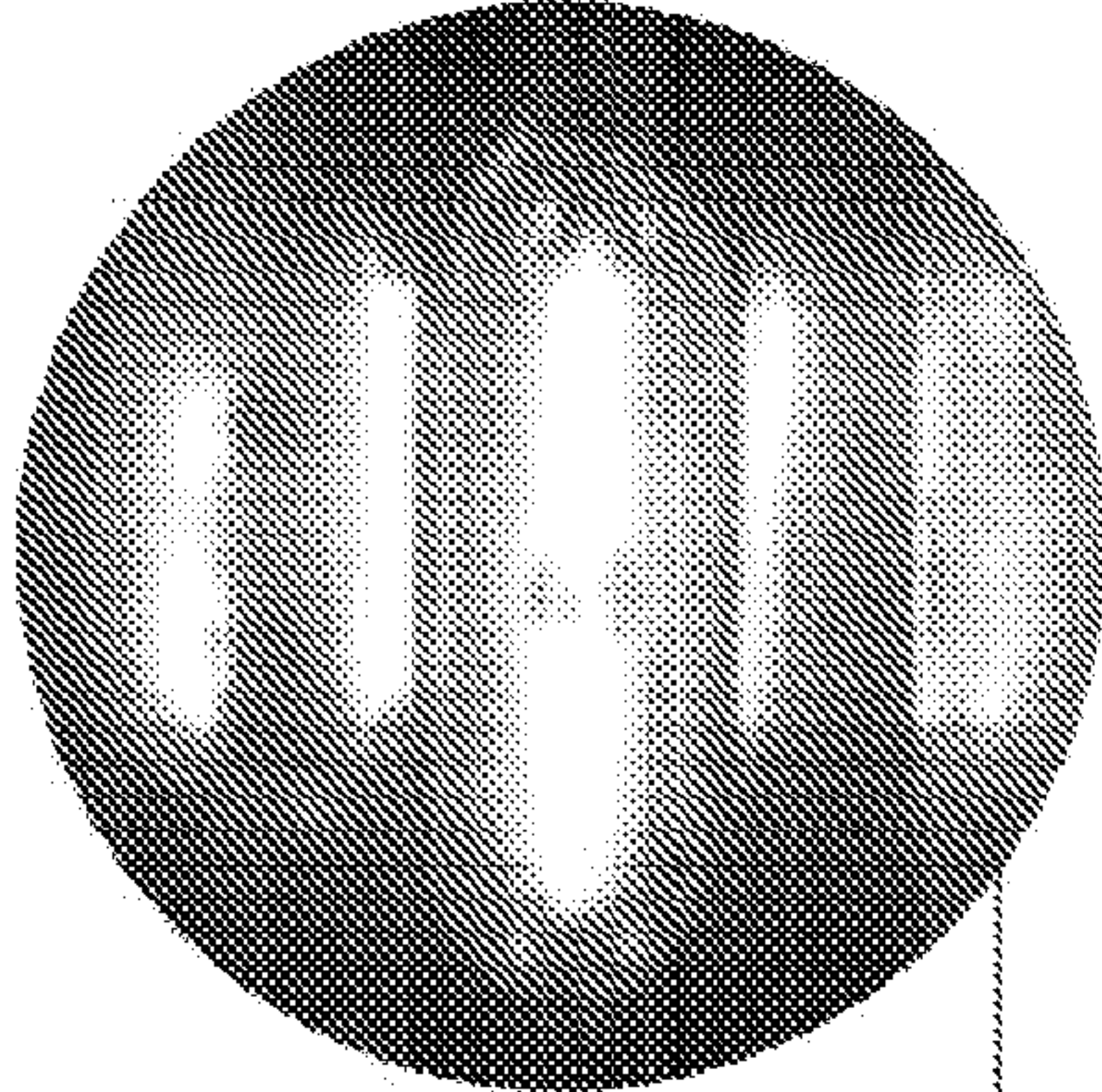


CROSS SECTION OF THE CHAMBER

The diagram on the left gives us an insight to the chamber and the images below simulate the workings of the amplifying circular perimeter UV light source



The concentrated UV Light Source ring



The reflected ring within the chamber

ORTHOGRAPHIC PROJECTION

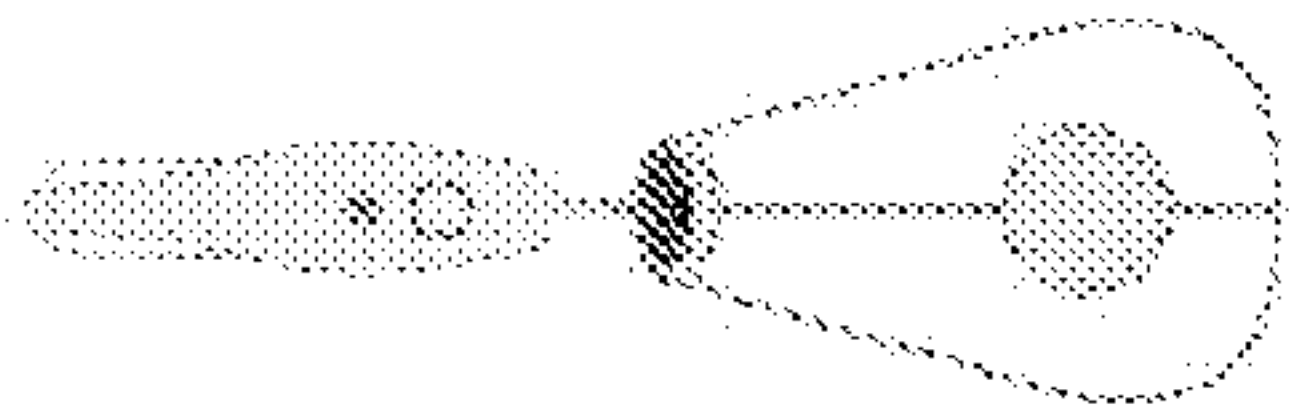
FORM	☐	ACTION	☐
FUNCTION	☐	ACTIVATION	☐
EXPERIENCE	☐		

Charging circuit is also the sterilizer on/off

Figure 30.

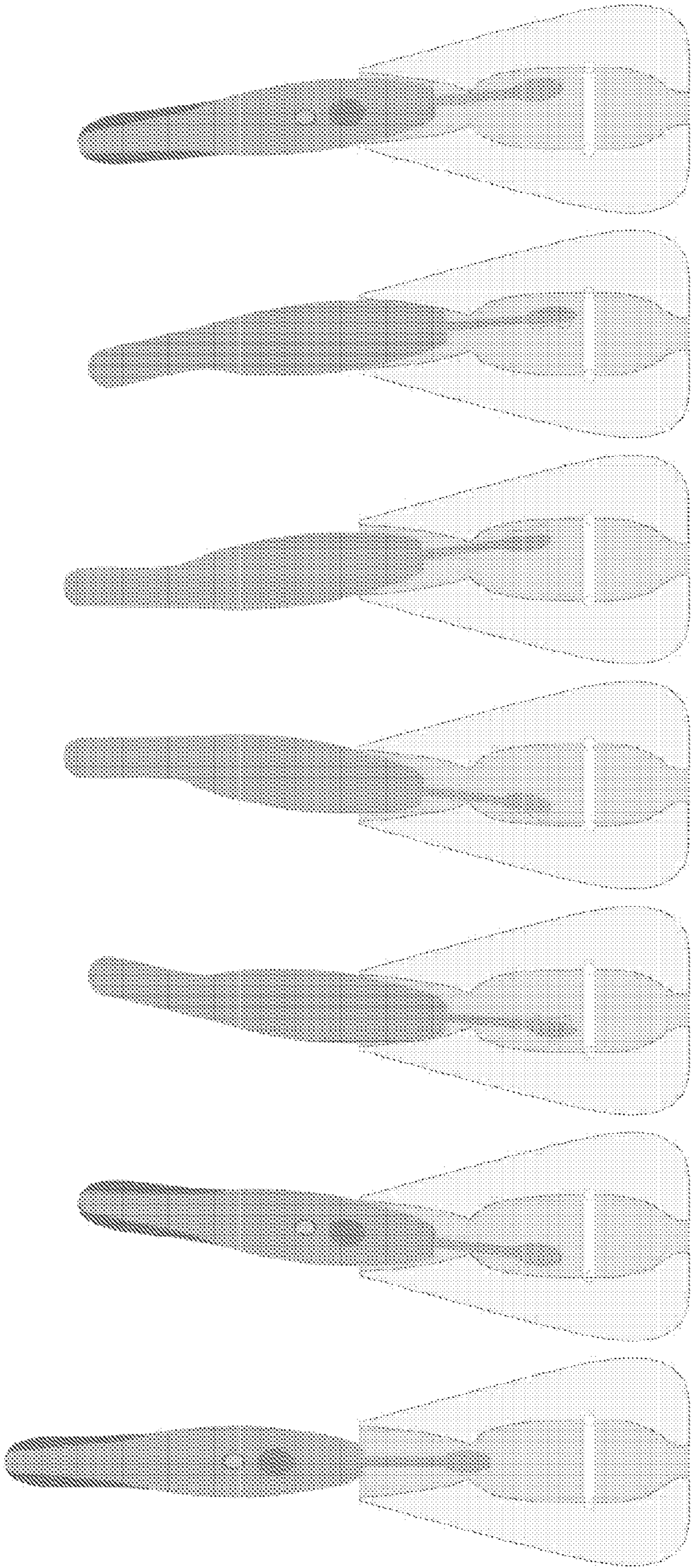
BRUSH PLACEMENT

The unique design of the entrance funnel and inner chamber in combination with the dedicated brush make it impossible for the brush to touch the sides of the inner chamber and UV source. This keeps the inner chamber at optimum operation.



BRUSH PLACEMENT IN MOTION

The images below illustrate in cross section the unique shape of the chamber in action.



FORM ☐
FUNCTION ☐
EXPERIENCE ☐

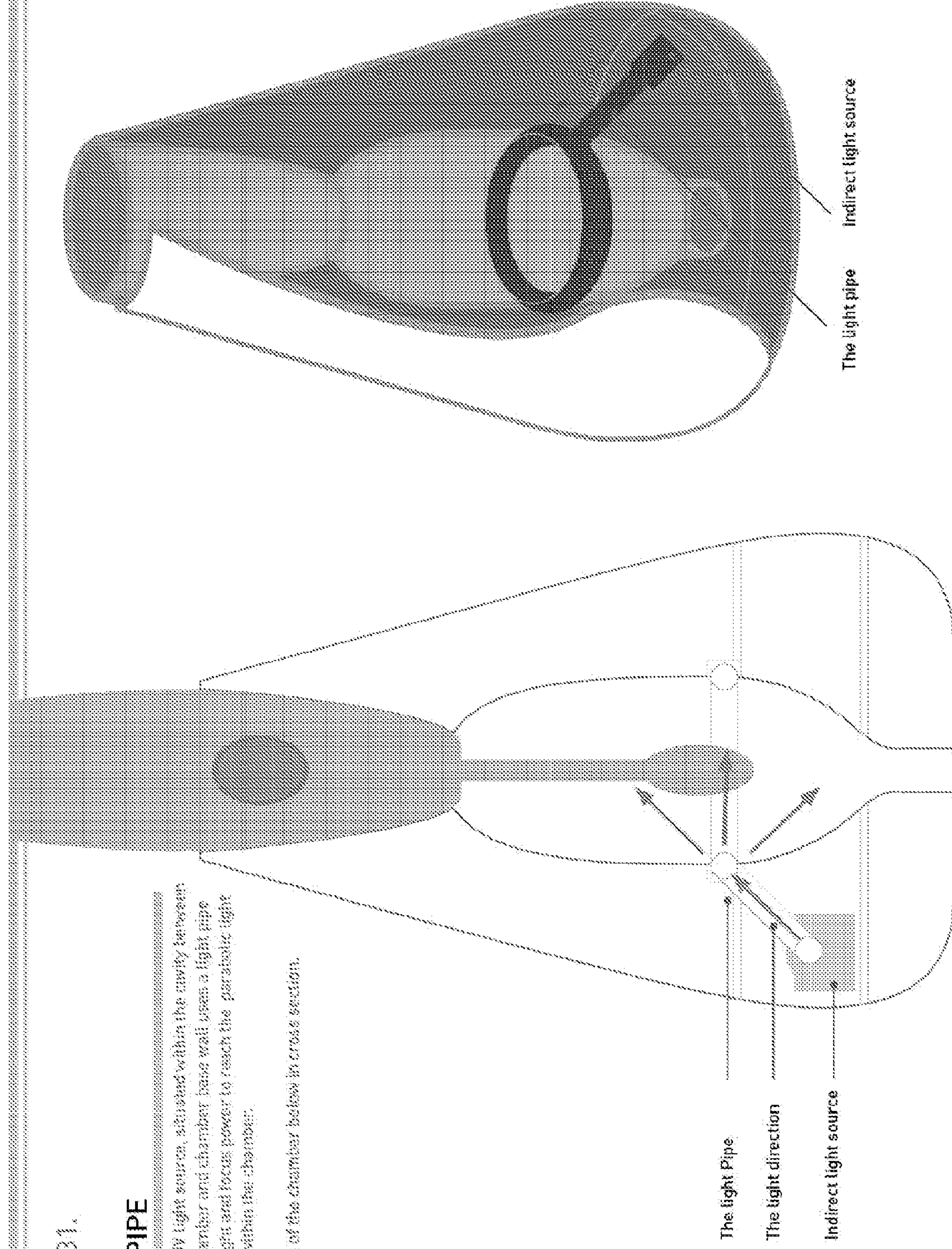
Funnel design does not allow brush to touch the UV element

Figure 31.

LIGHT PIPE

An indirect UV light source, situated within the cavity between the inner chamber and chamber base wall uses a light pipe to channel light and focus power to reach the parabolic light accelerator within the chamber.

See diagram of the Chamber below in cross section.



FORM ☐
FUNCTION ☐
EXPERIENCE ☐

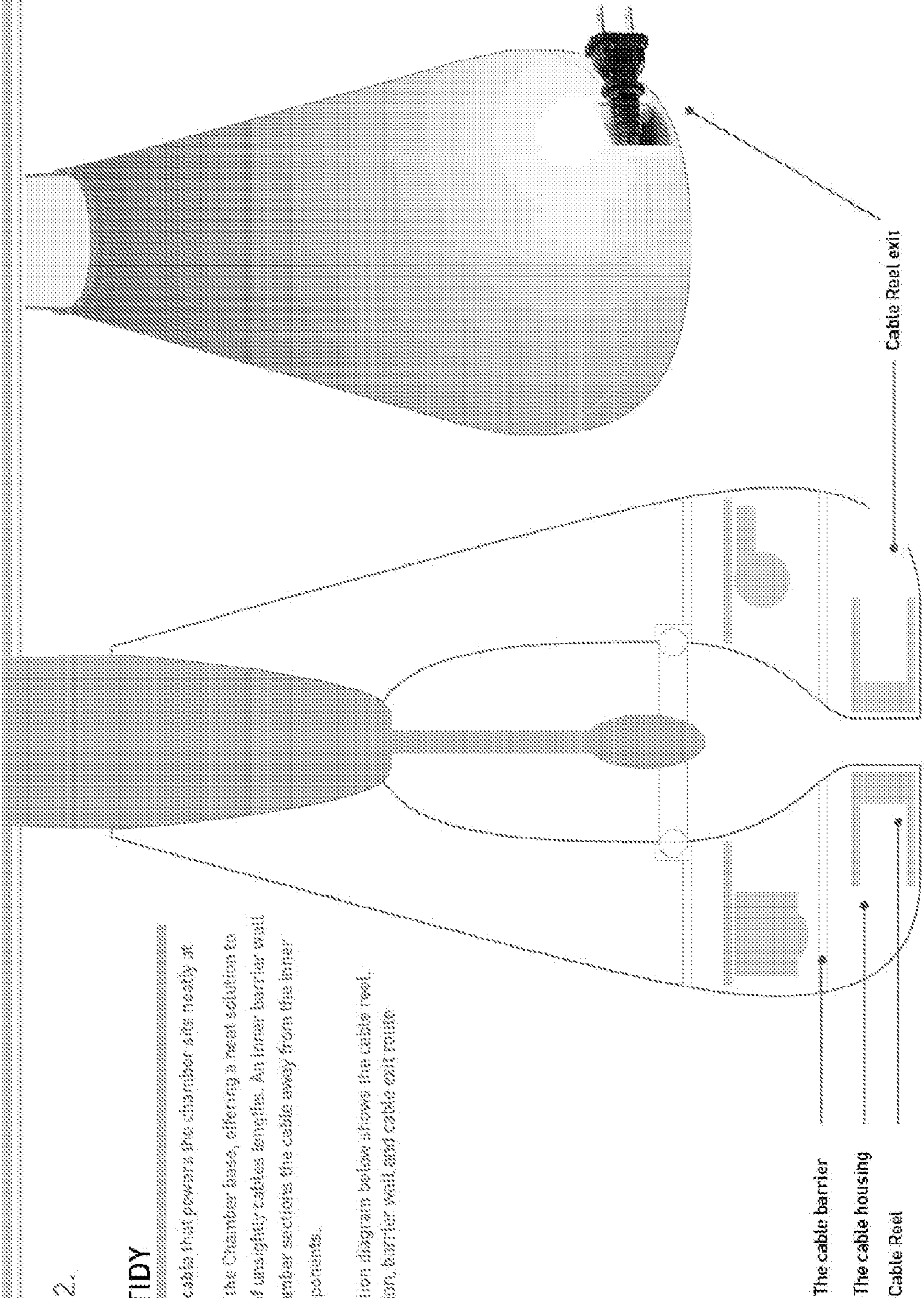
Sterilization power indirectly through a light tunnel

Figure 32.

CABLE TIDY

A retractable cable that powers the chamber sits neatly at the bottom of the Chamber base, offering a neat solution to the problem of unsightly cables lengths. An inner barrier wall within the chamber sections the cable away from the inner chamber components.

The cross-section diagram below shows the cable reel, housing location, barrier wall and cable exit route



FORM ☐
FUNCTION ☐
EXPERIENCE ☐

The retractable cable storage - cable tidy

Figure 33.

FUNCTION THREE - DRYING

This simple sequence of Advancing sonic tooth brush placement activates the drying sequence for the tooth brush.

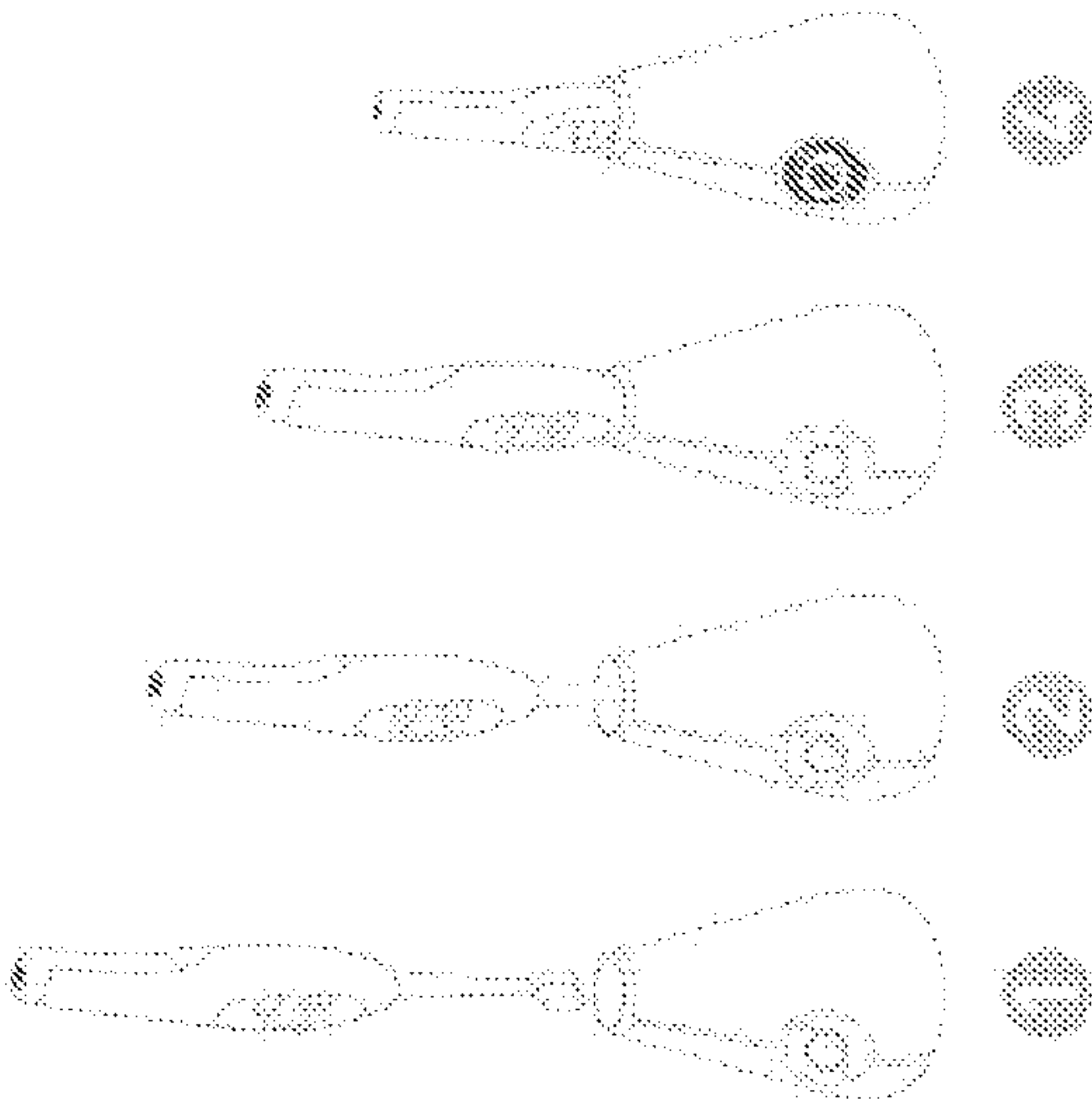


DIAGRAM No. 1 HANDLE PLACEMENT SEQUENCE

DRYING SEQUENCE

We found that existing 10 toothbrush sterilizers create an environment in which the toothbrush head may take 10-12 hours to dry. This means these toothbrushes are always wet - harboring an environment ripe for pathogens. To address this, the Chamber base actively draws the toothbrush head to prepare for its next use.

FORM ☐
FUNCTION ☐
EXPERIENCE ☐

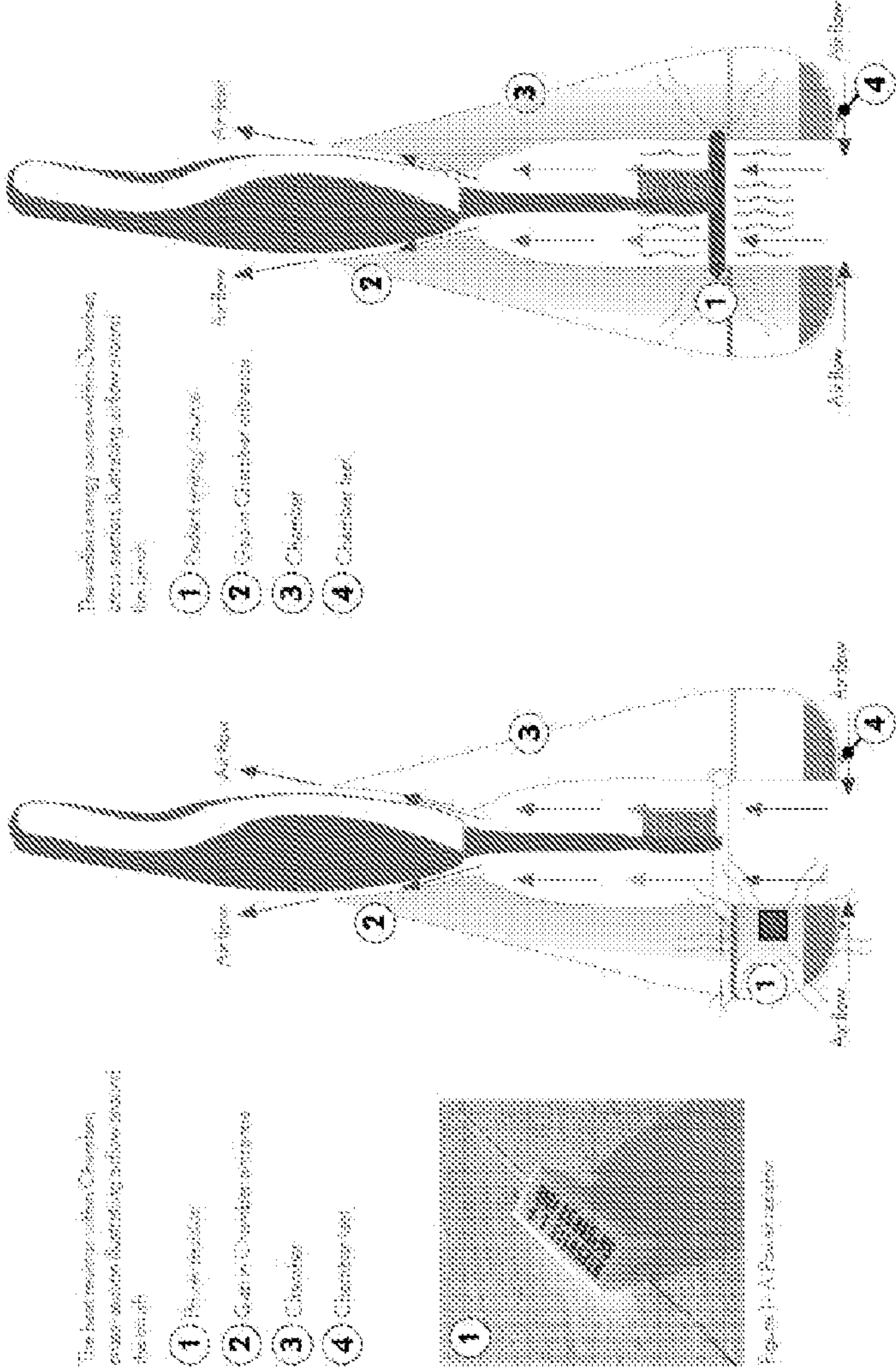


DIAGRAM No. 2 DRYING WITH THERMAL ENERGY

DIAGRAM No. 3 DRYING WITH RADIANT ENERGY

INCREASED AIRFLOW

As well as increasing ventilation within the chamber base, the design of the inner chamber acts like a chimney to transfer heat gases to the external environment via stack effect.

The circulated air aids the drying process. Cold air is circulated and exchanged using a small clearance underneath the Chamber base and a gap around the entrance of the Chamber base between brush handle and inner Chamber.

Brush placement activates drying sequence and the inner chamber design increases airflow

Diagram no. 2 illustrates our preferred embodiment, the power resistor

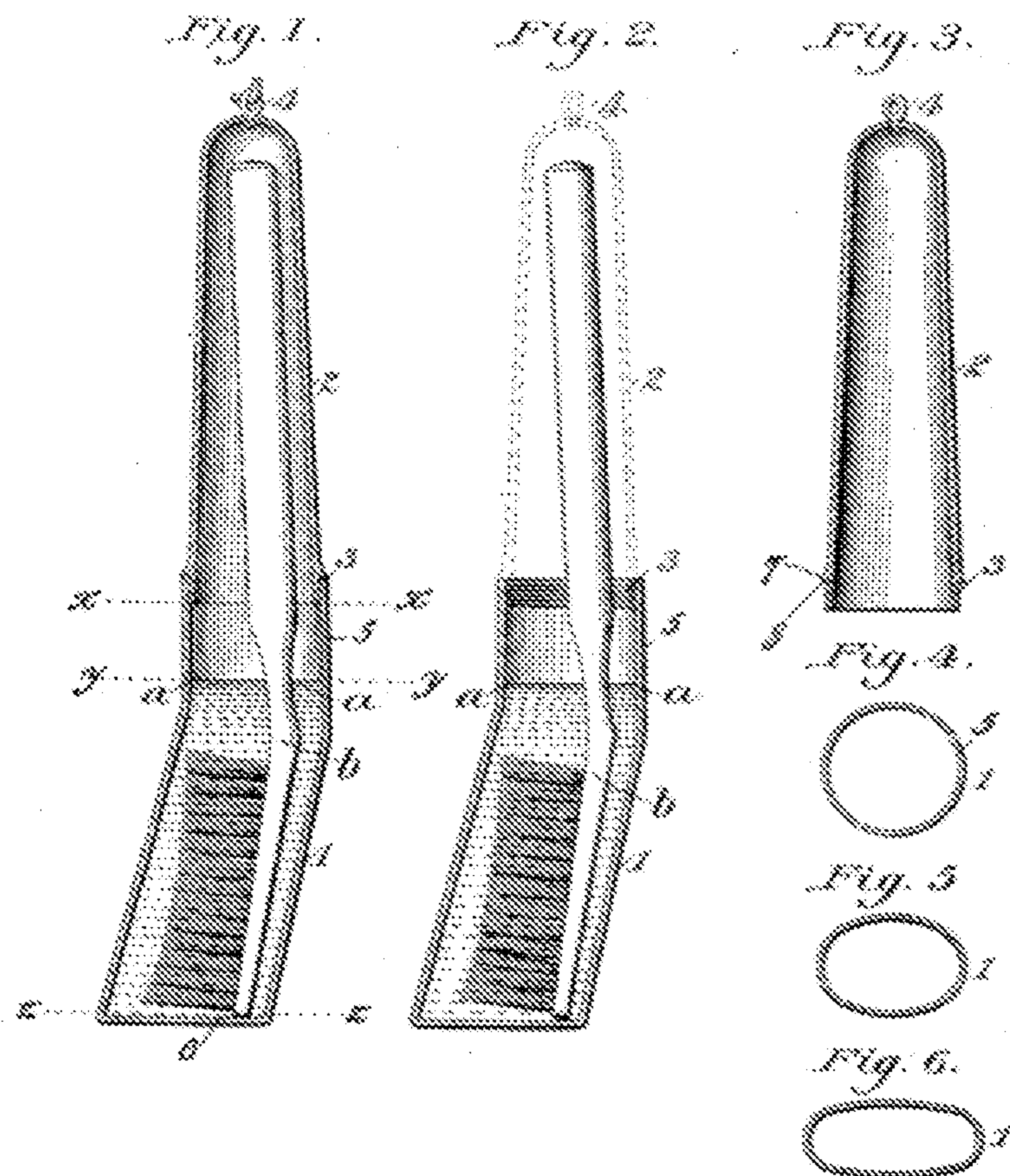
Diagram no. 3 uses a light source to dry with radiant energy

No. 757,885.

PATENTED APR. 19, 1904.

J. A. COCKEANE.
ANTISEPTIC TOOTH BRUSH HOLDER.
APPLICATION FILED APR. 2, 1903.

NO MODEL.



Witnesses:

David J. ...
J. M. ...

Inventor:

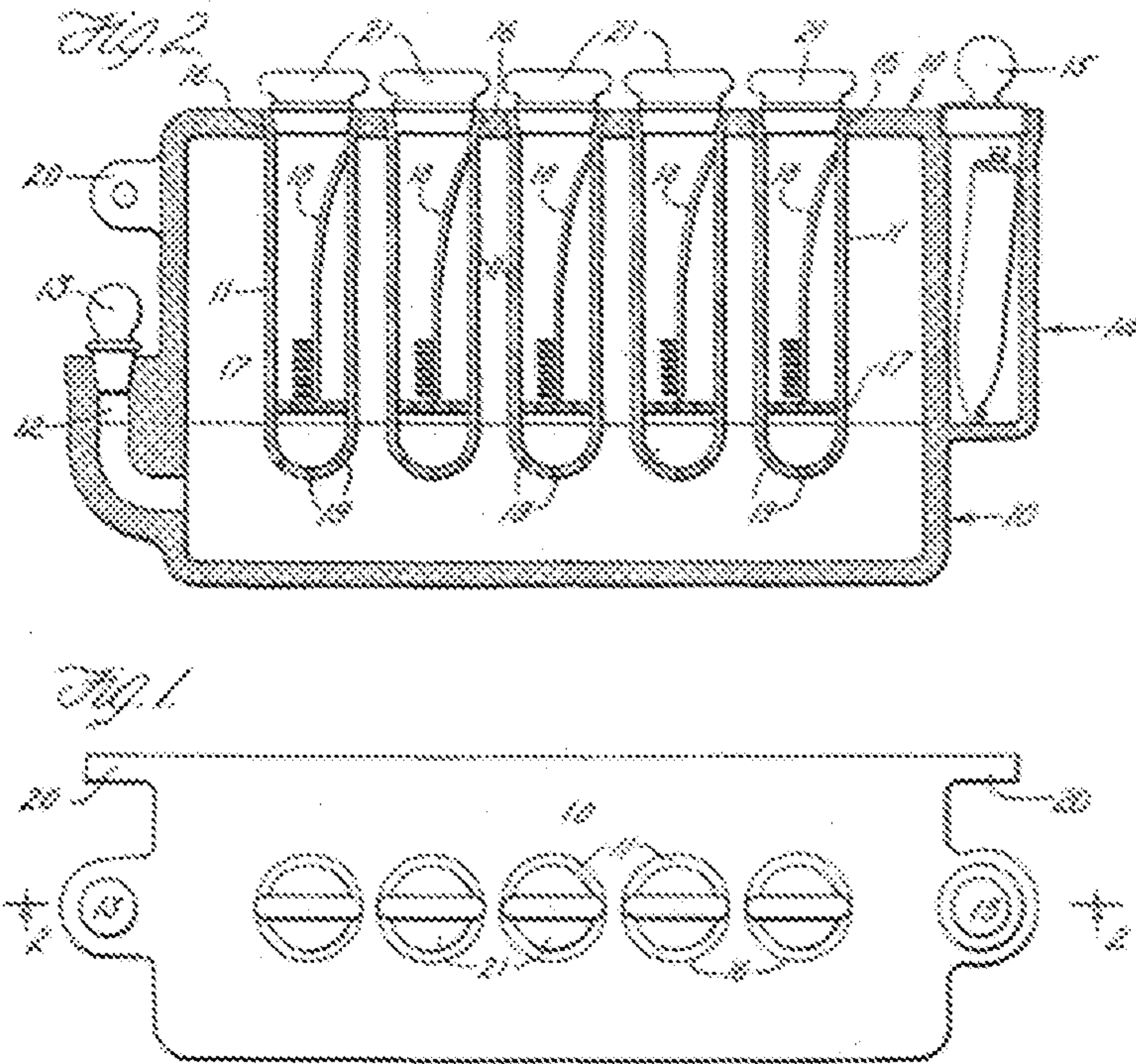
J. A. Cockeane

Figure 1. Fluid sterilizer 4/19/1904 Patent US 757885

S. N. THOMPSON.
 FORMALDEHYDE STERILIZER AND RETAINER.
 APPLICATION FILED SEP. 25, 1918.

1,278,789.

Patented Sept. 10, 1918.



Inventor
 Samuel N. Thompson
[Signature]
 his Attorney

Figure 2. Formaldehyde vapor sterilizer 9/10/1918 Patent US 1625202

April 8, 1952

R. O. FARRAR
THERMOPHORE STERILIZER

2,592,131

Filed April 5, 1949

2 SHEETS—SHEET 1

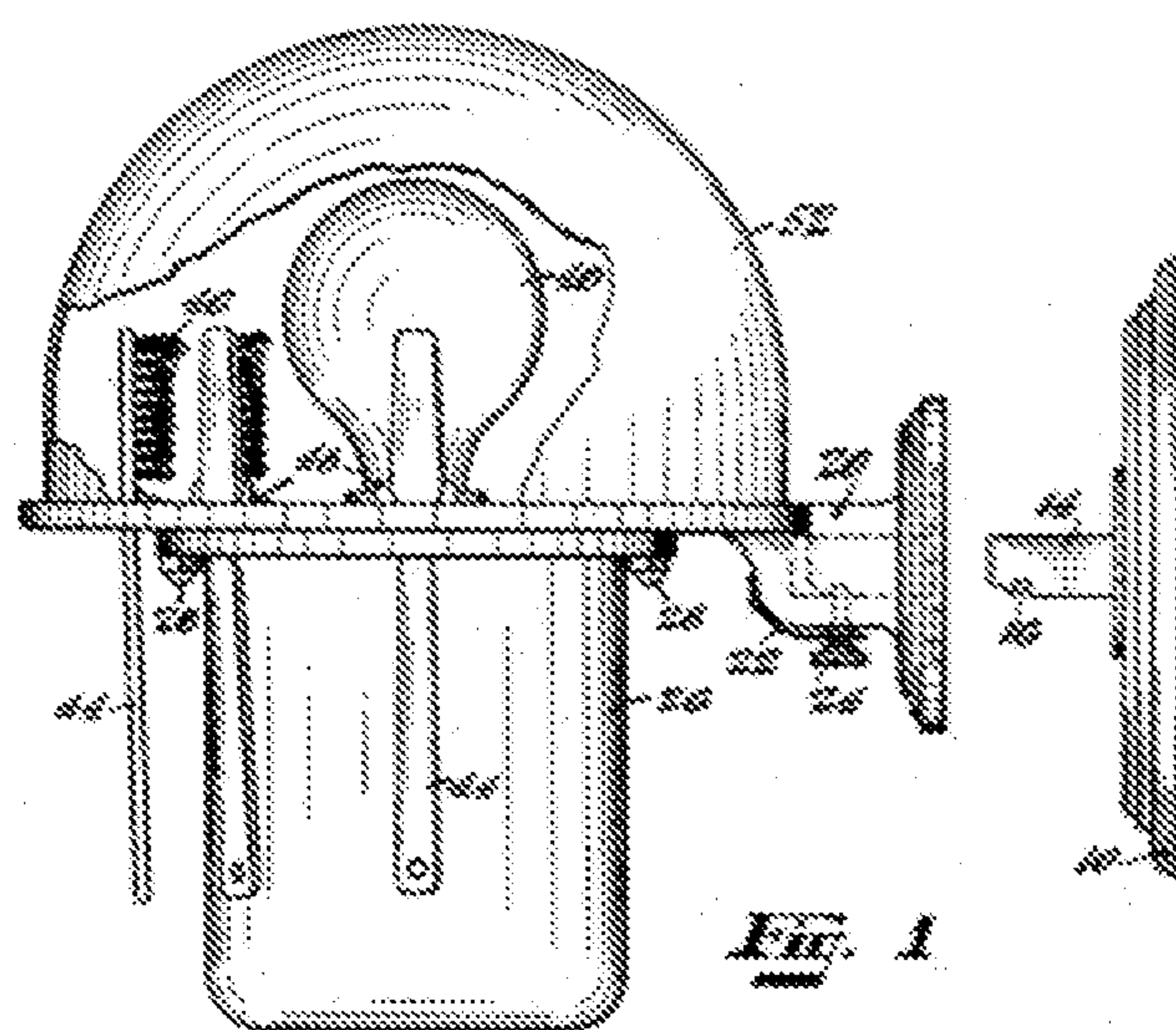


Fig. 1

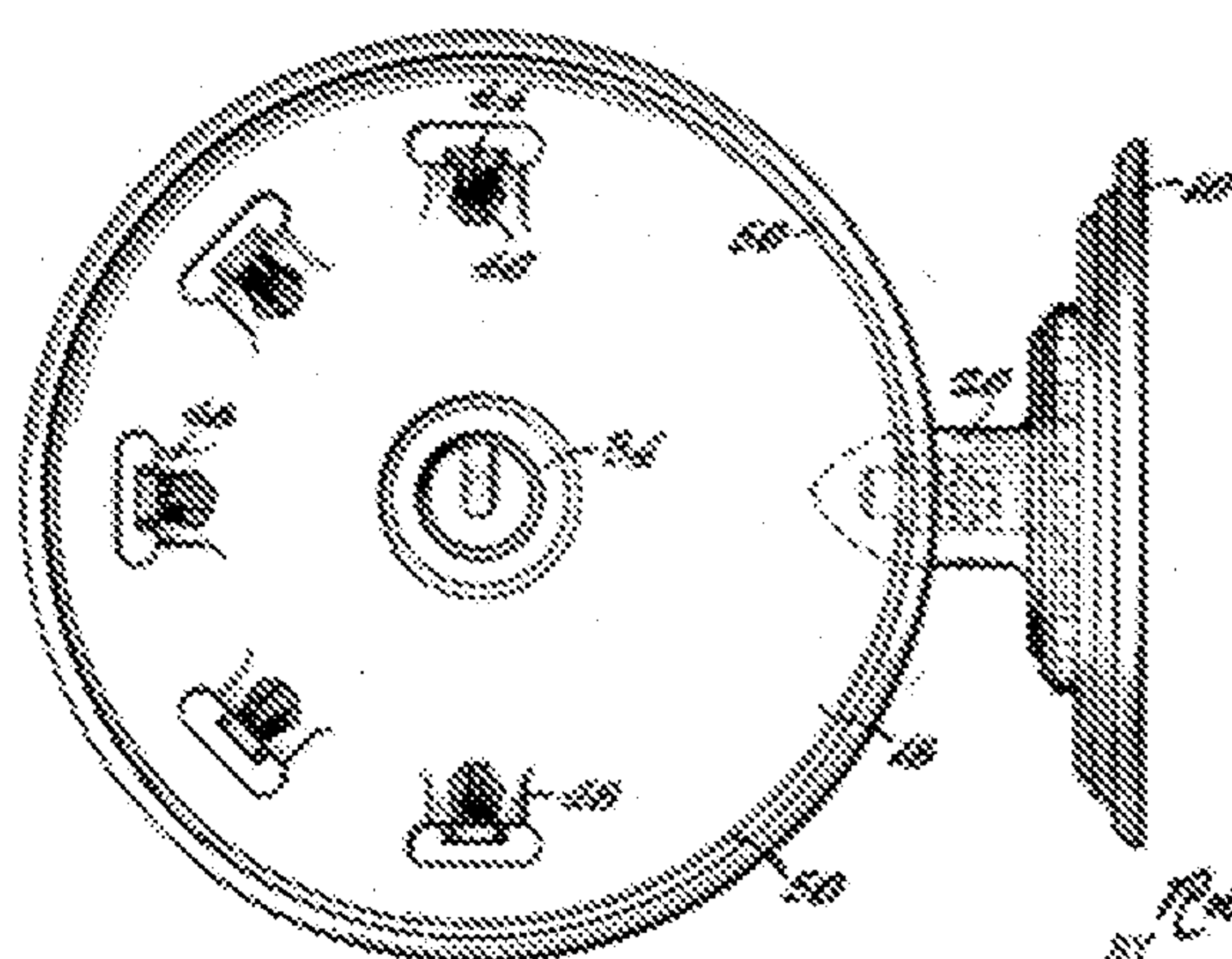


Fig. 2

INVENTOR
R. O. Farrar.
Clarence J. Jernigan, William H. Hilditch
Attorneys
Atlanta, Georgia

Figure 3. UV sterilizer 4/5/1949 Patent US 2592131A

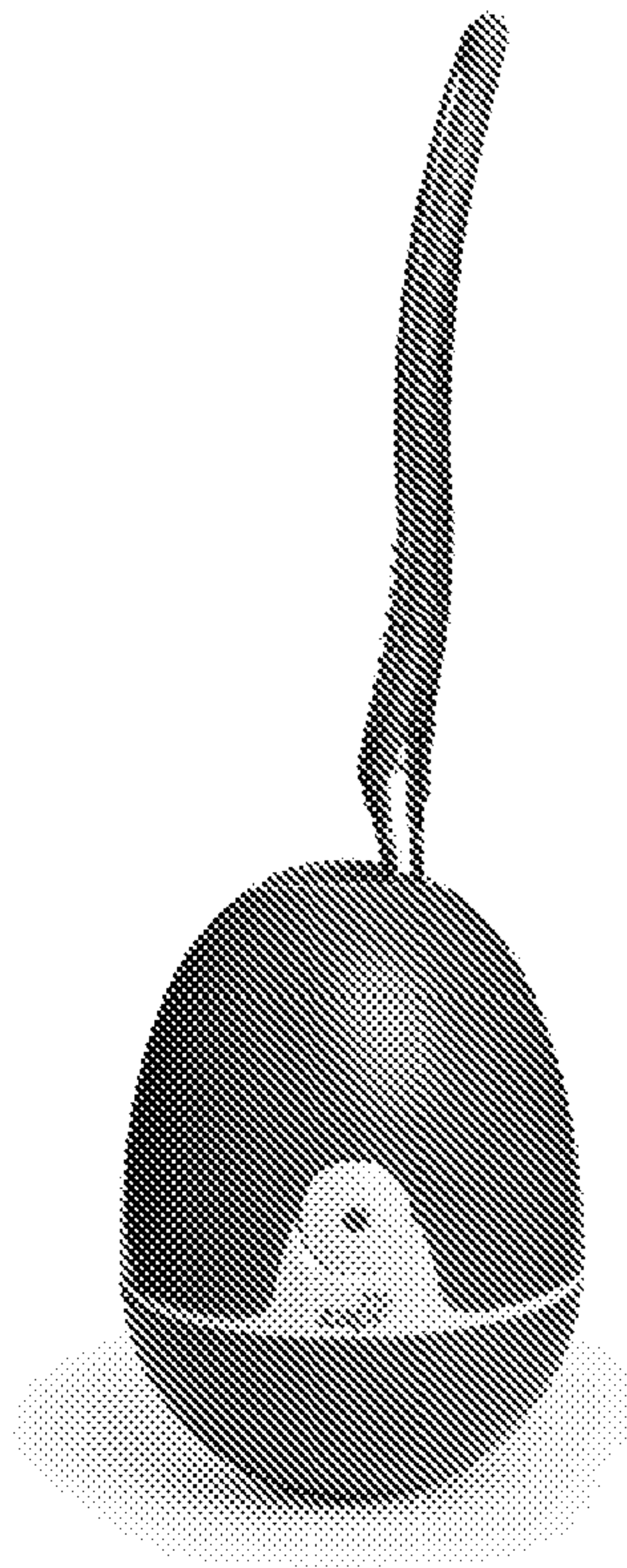


Figure 4. Zapi 11/23/2010 Patent US 7838846

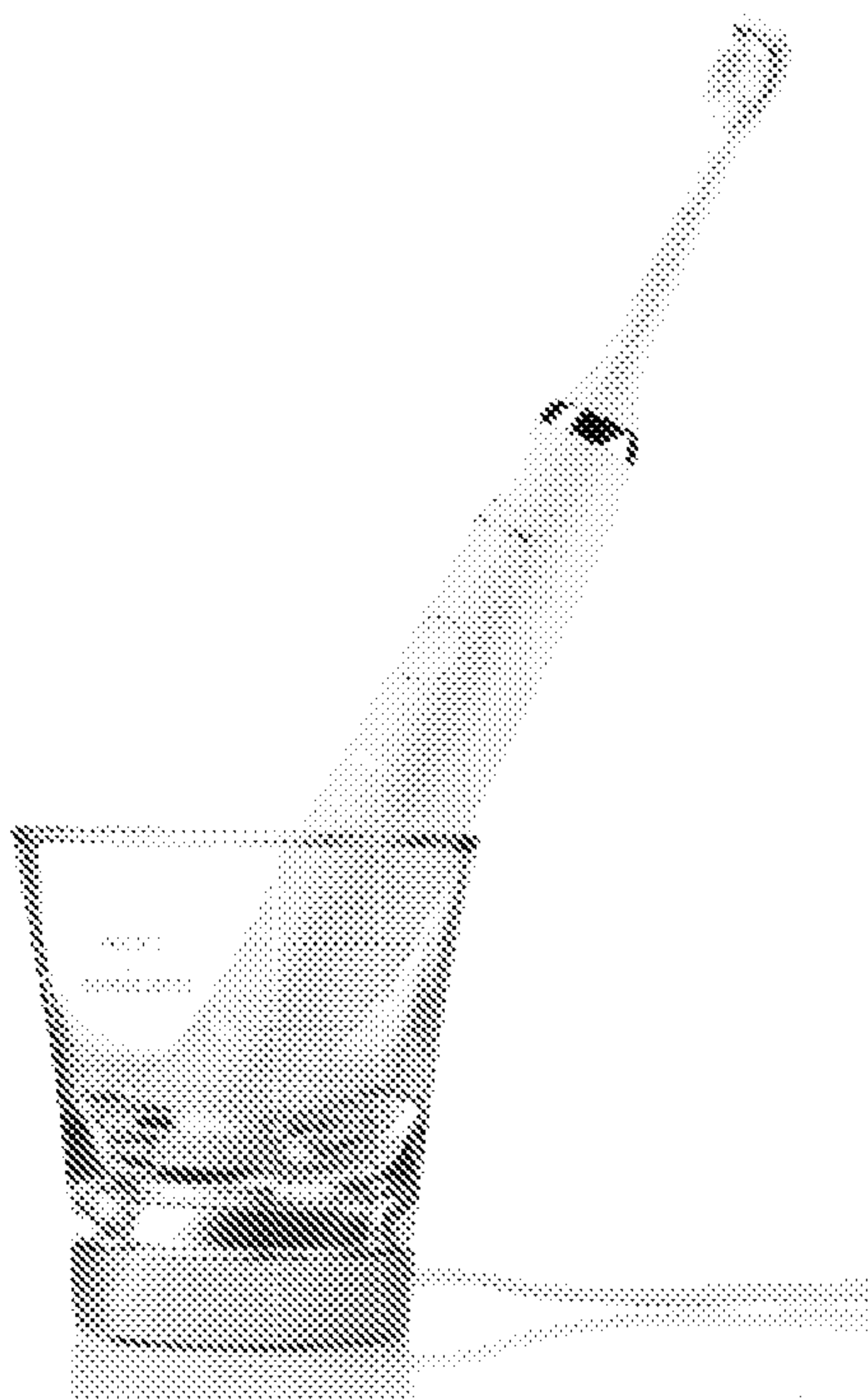


Figure 5. Phillips Sonicare Diamond Clean Rechargeable Ultrasonic toothbrush

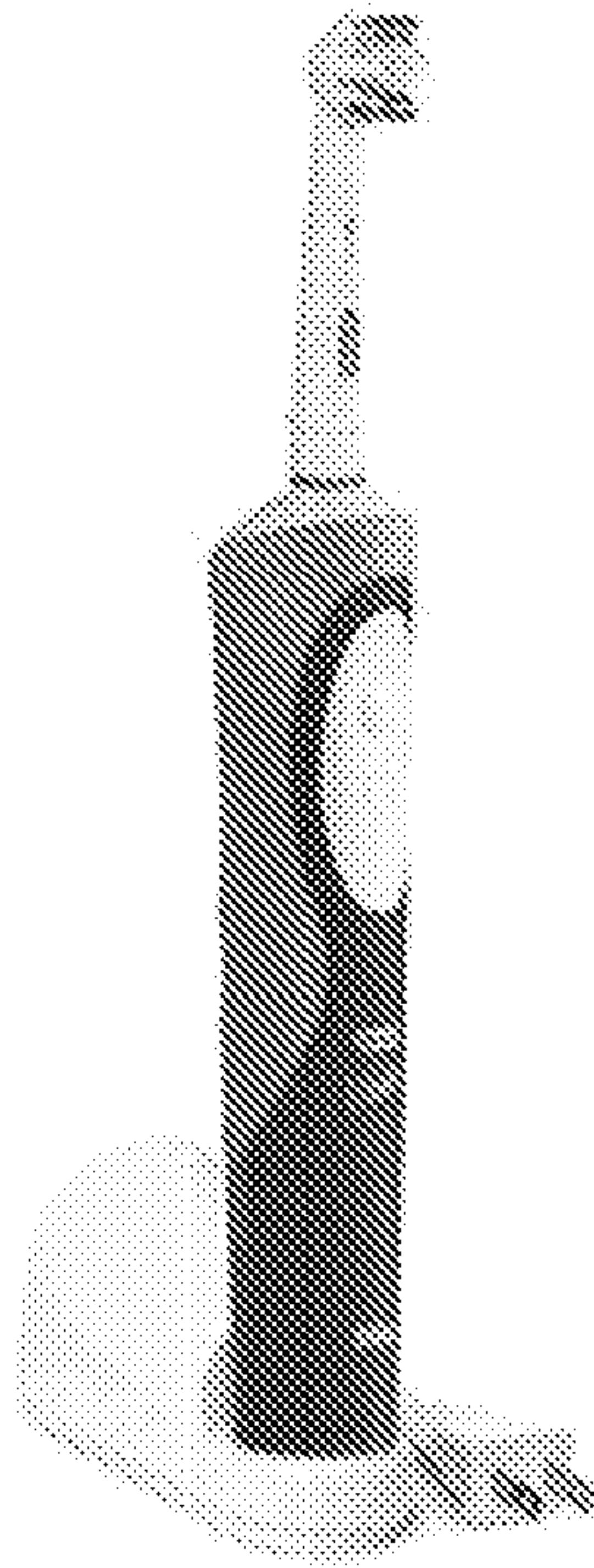


Figure 6. Braun Oral-B Vitality Floss Action oscillating electric Toothbrush

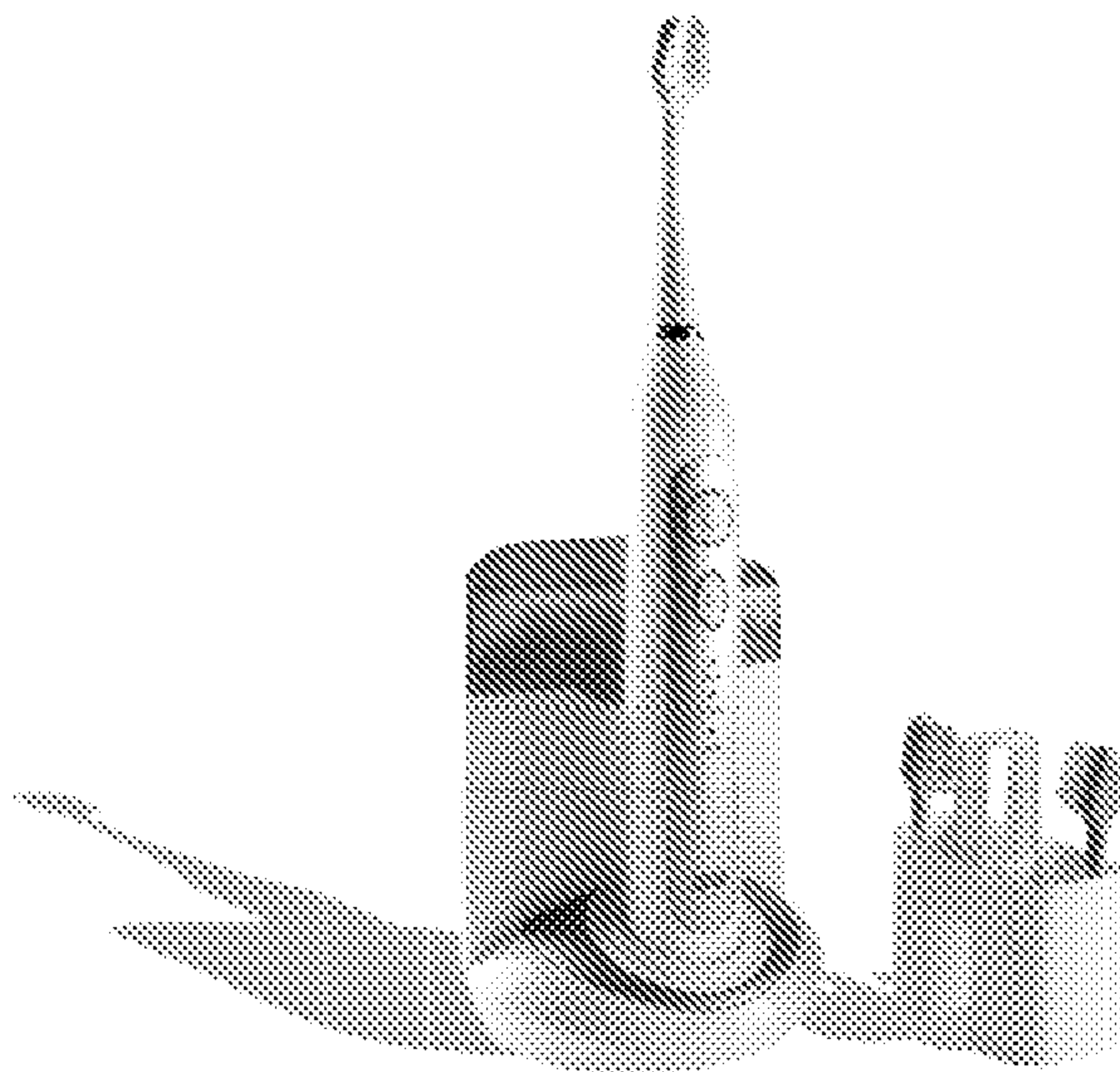


Figure 7. DAZ-7080 Dazzlepro Advanced GT Ultrasonic Toothbrush

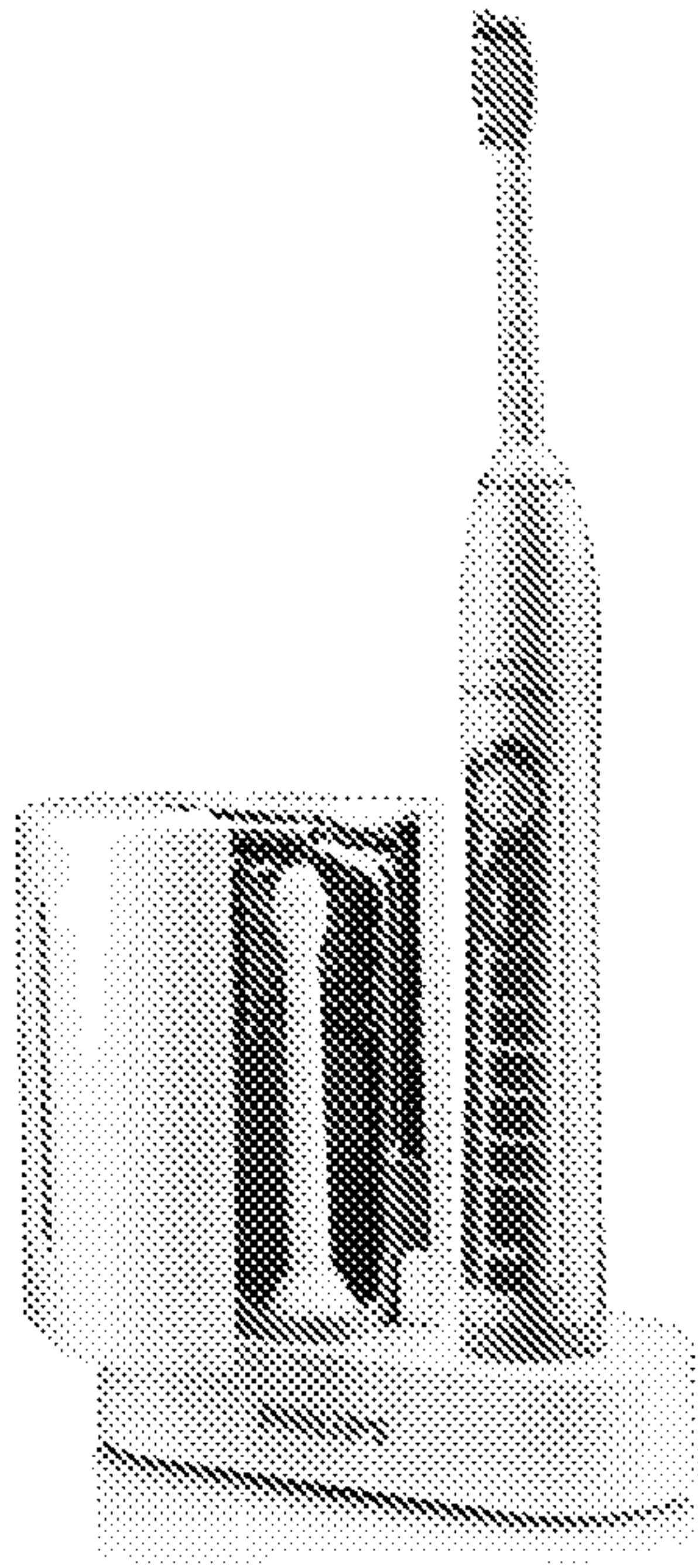


Figure 8. Phillips Sonicare FlexCare+ Rechargeable ultrasonic toothbrush

March 18, 1941.

H. M. MUNCHERYAN

2,235,296

ELECTRIC STERILIZER USING RADIANT ENERGY

Filed May 31, 1939

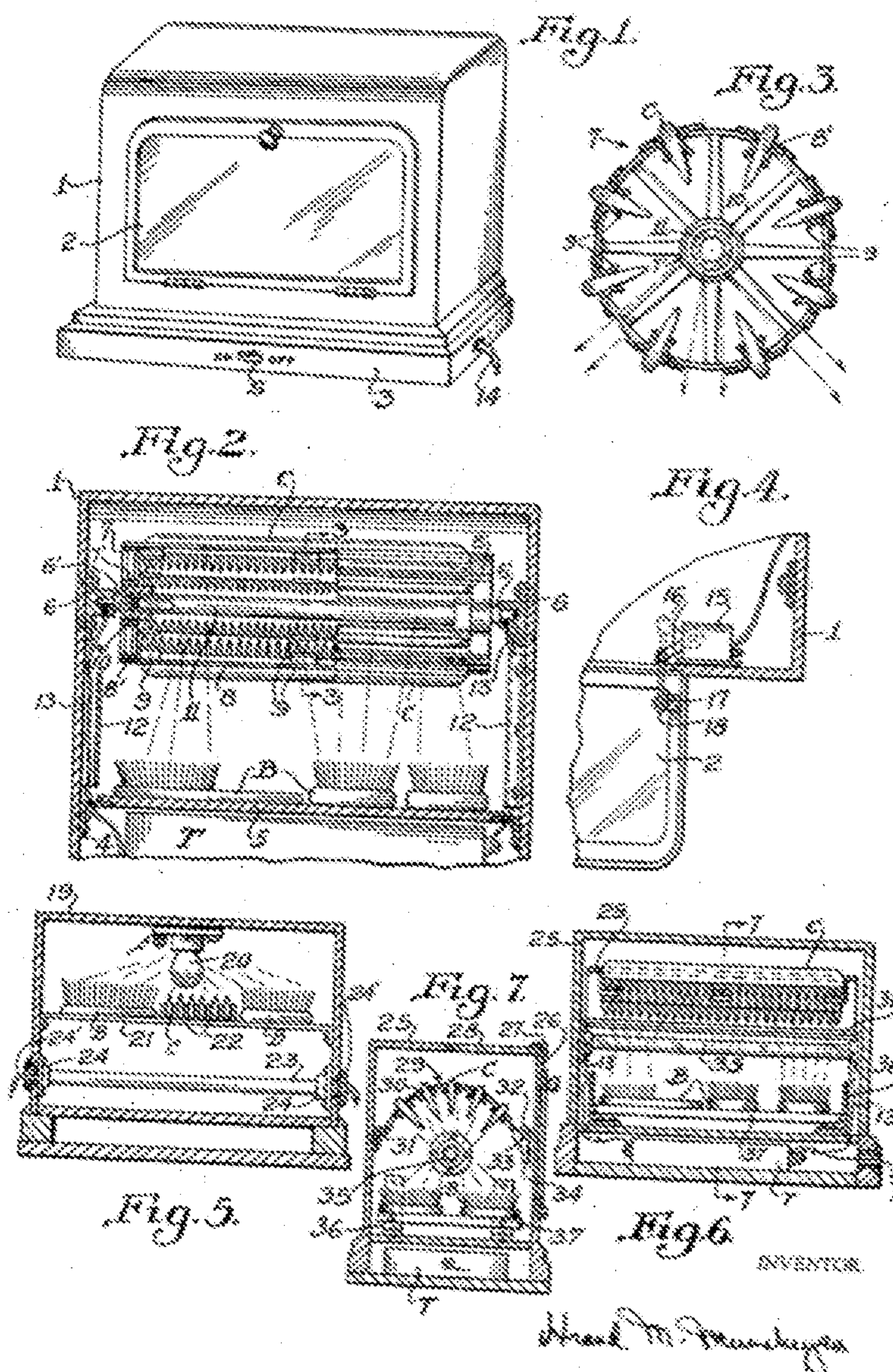


Figure 18. Heat sterilizer 5/31/1939 Patent US 2235296A



USX5922292A

United States Patent [19]

Hecker et al.

[11] Patent Number: 5,922,292

[45] Date of Patent: Jul. 13, 1999

[54] CARE STATION FOR TOOTHBRUSHES

1,564,261 5/2006 Yoda 422/360

4,967,426 5/1991 Montford et al. 422/360

[20] Inventors: Erithjof Hecker, Kuhlmannstr. 6c,
D-21614 Buntstade; Norman Doerck,
Höfener Mühlenweg 17, D-21244
Bardsholz, both of Germany

5,142,666 9/1992 Lueden 422/360

5,462,287 4/1995 Remondet et al. 422/292

FOREIGN PATENT DOCUMENTS

[21] Appl. No.: 08/843,434

28/26/95 5/1995 Germany .

[22] PCT Filed: Nov. 24, 1998

30/26/95 5/1995 Germany .

[86] PCT No.: PCT/DE98/01688

22/62/98 12/1998 United Kingdom .

§ 371 Date: May 23, 1997

§ 102(e) Date: May 23, 1997

[87] PCT Pub. No.: WO98/16750

Primary Examiner—Thomas R. Tibb
Assistant Examiner—Fadhil M. Almazan
Attorney, Agent, or Firm—Biemann, Muehlen and Lucas

PCT Pub. Date: Jan. 6, 1996

[57] ABSTRACT

[88] Foreign Application Priority Data

Dec. 25, 1994 [88] Germany 44 41 183

[51] Int. Cl. A61H 2/18

[52] U.S. Cl. 422/360; 422/292; 288/288.1;
288/362.2

[56] Field of Search 422/360, 361,
422/292, 288/288.1, 362.2

In a toothbrush cleaning station, the bristles of a toothbrush are brought into contact with a disinfectant. The toothbrush cleaning station has a spraying device for the disinfectant to be sprayed on the bristles and a support for the bristles of the toothbrush in the disinfectant spraying area. A holder holds the toothbrush and at the same time forms a holder for the can-shaped spraying device. The holder for the spraying device retains it in a position in which the bristles of the toothbrush remain in the disinfectant spraying area.

[58] References Cited

U.S. PATENT DOCUMENTS

1,278,789 6/1918 Thompson 422/360

14 Claims, 6 Drawing Sheets

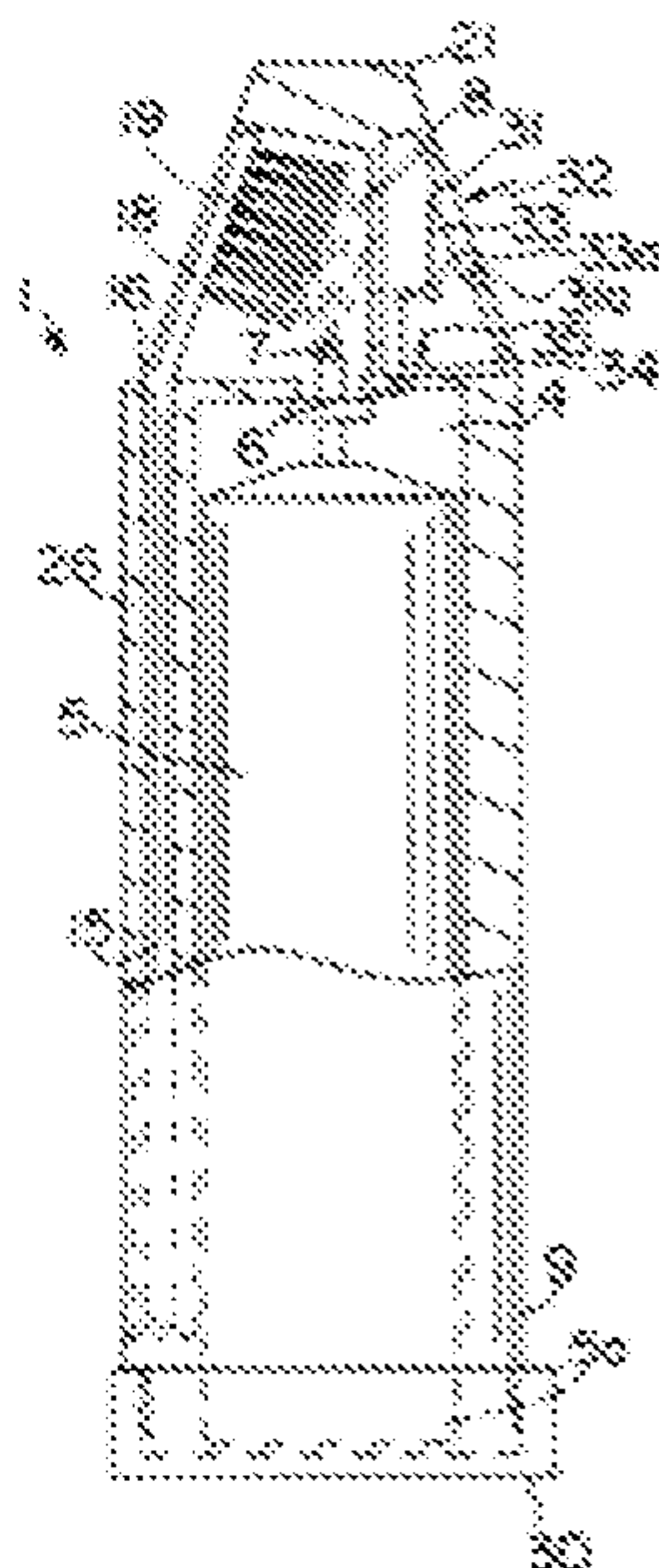
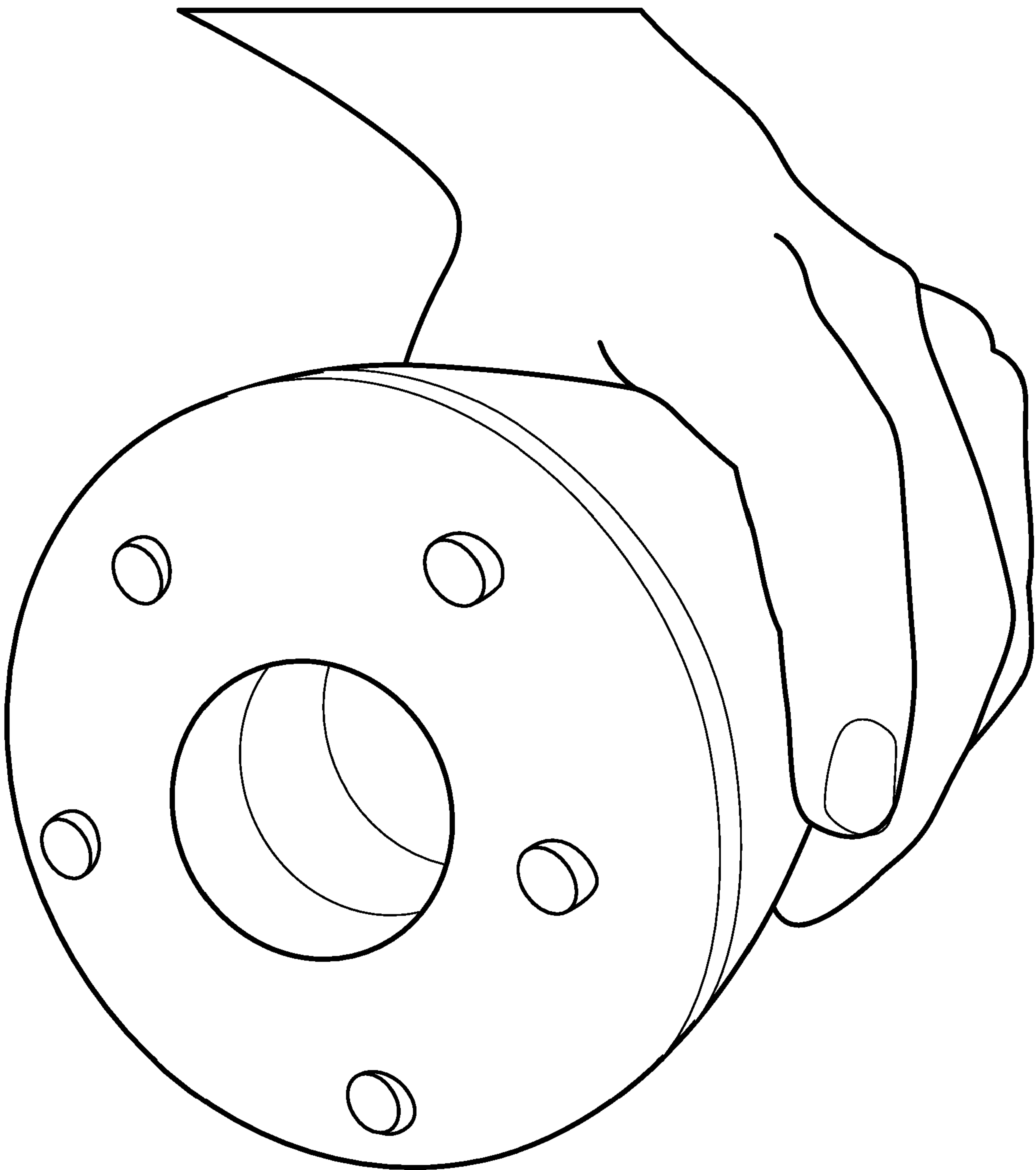
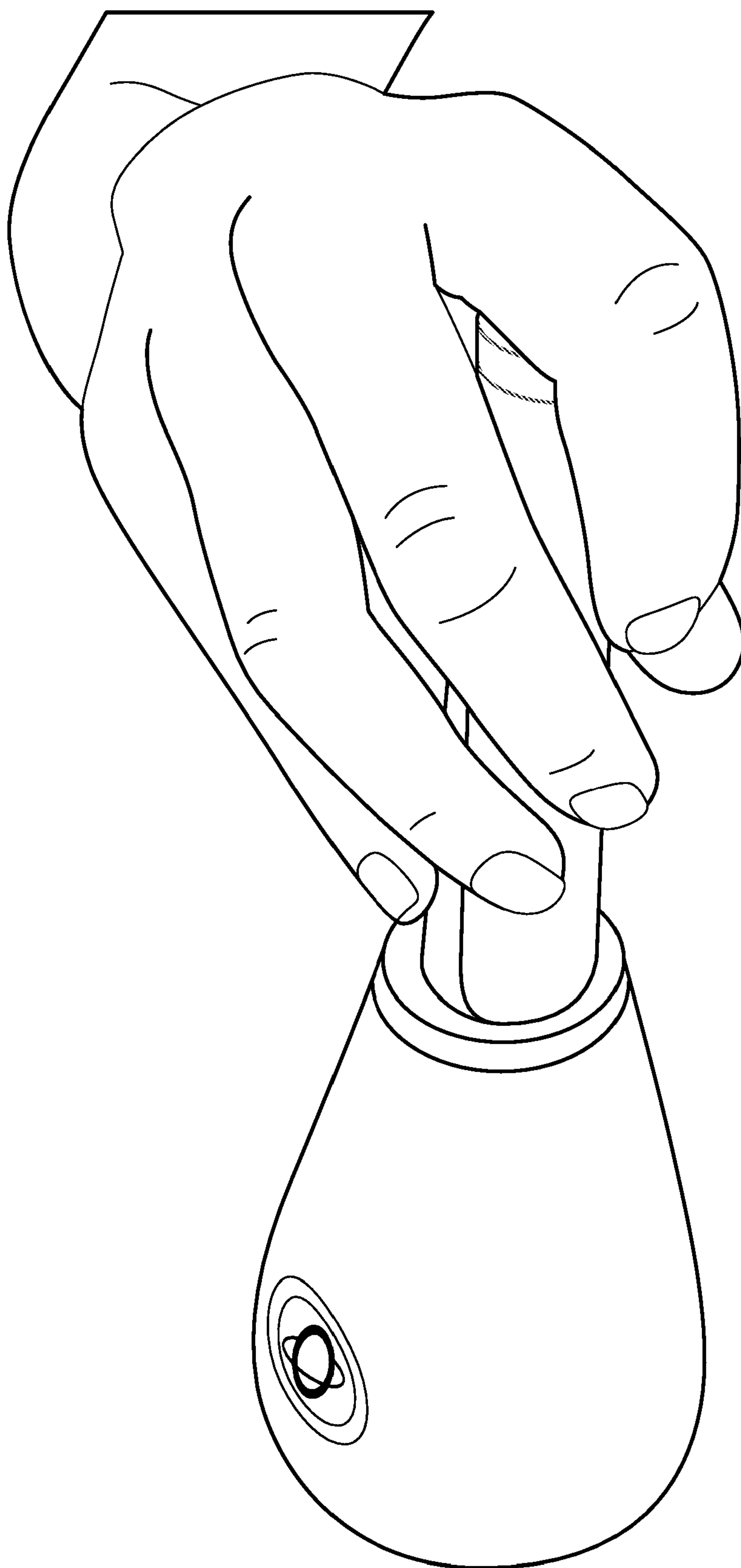
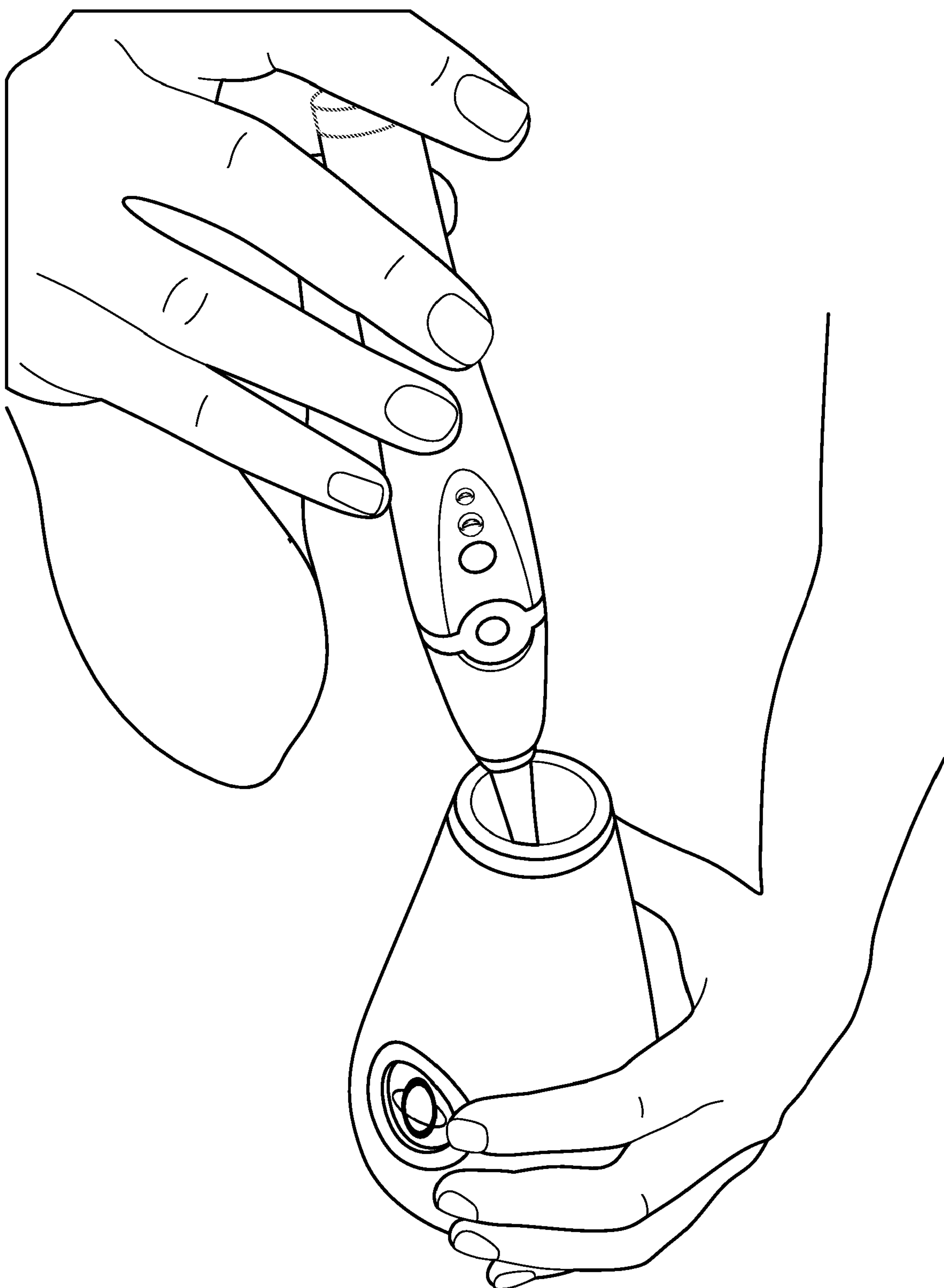
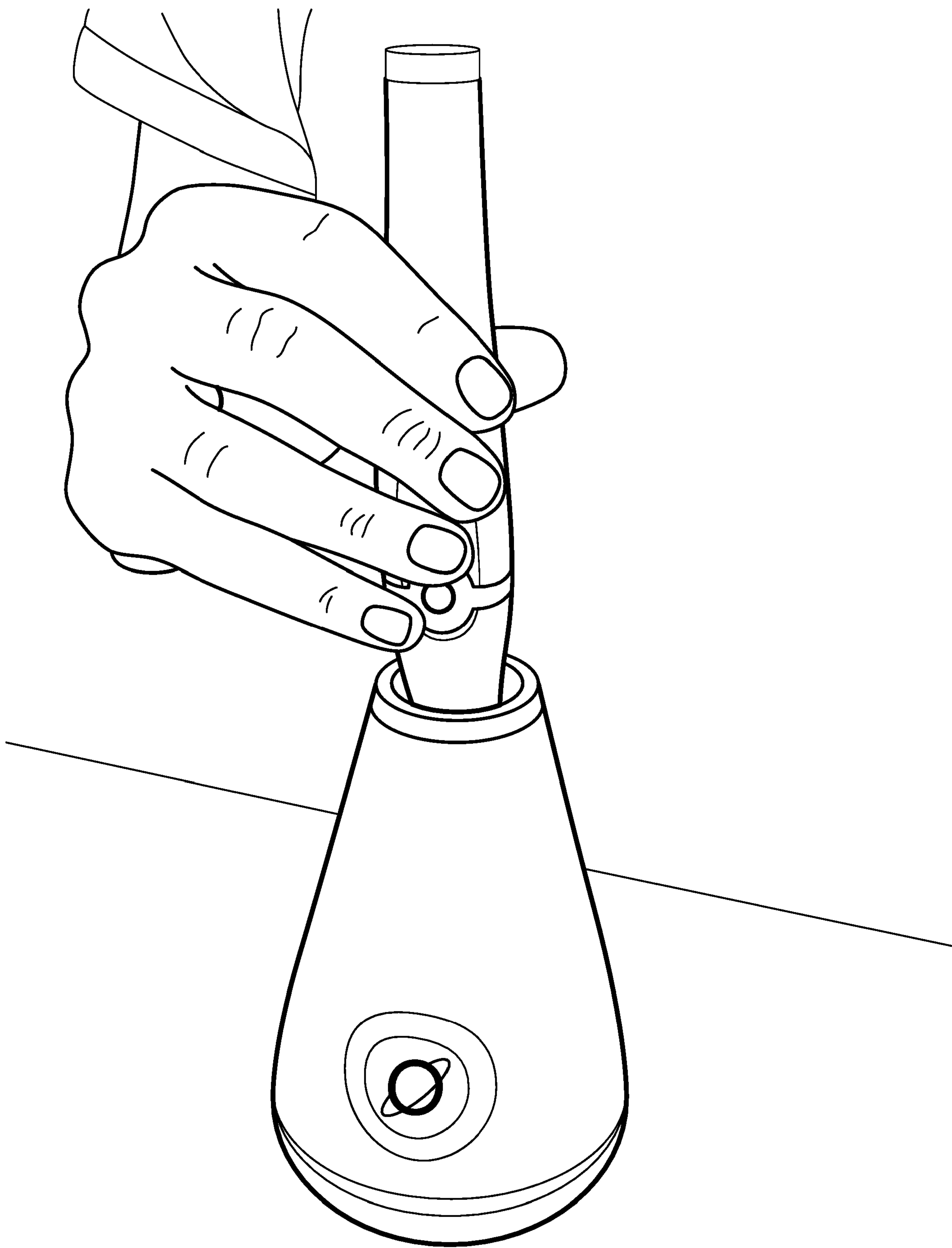


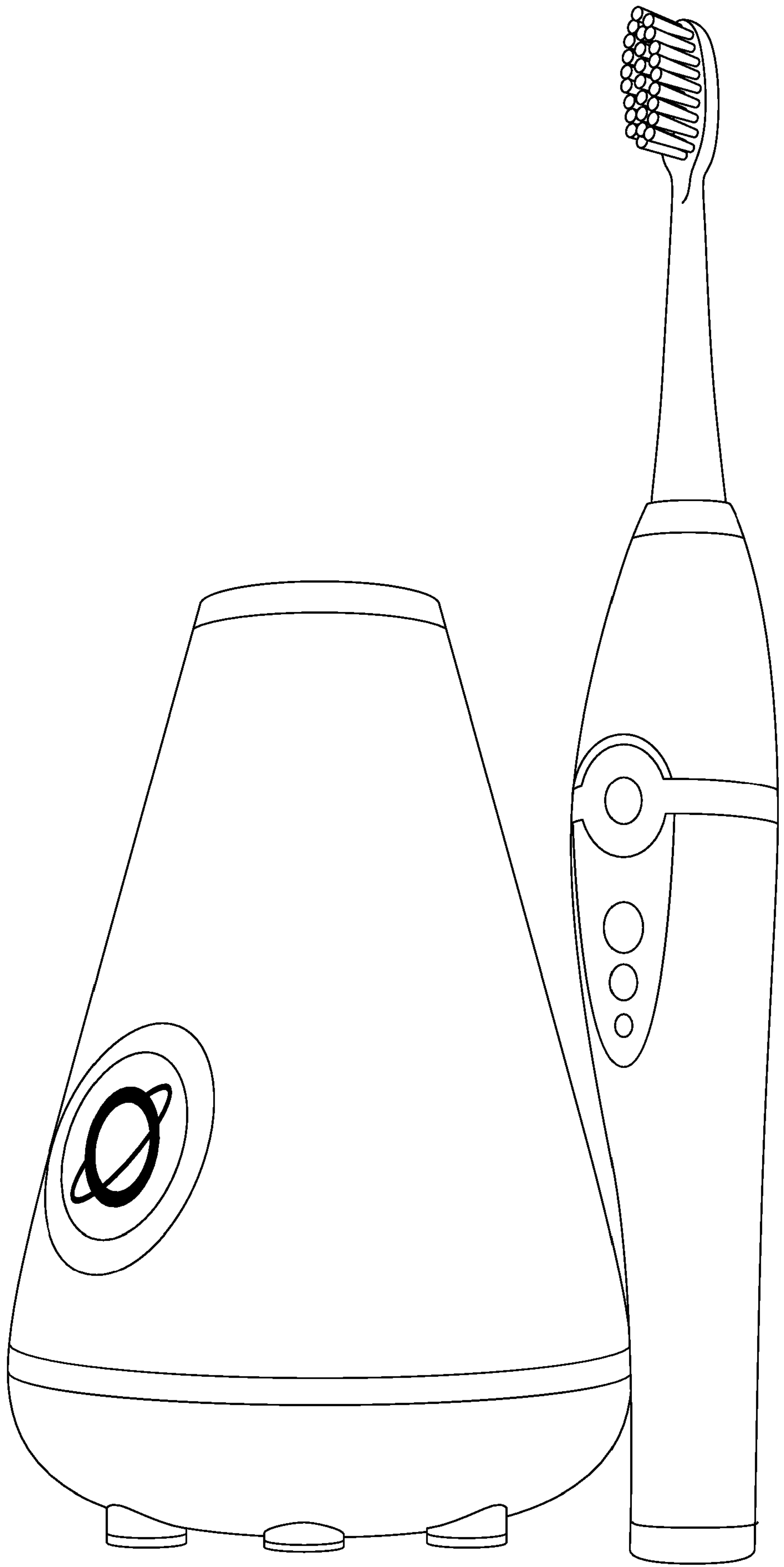
Figure 19. Aerosol sterilizer 7/13/1999 Patent US 5922292

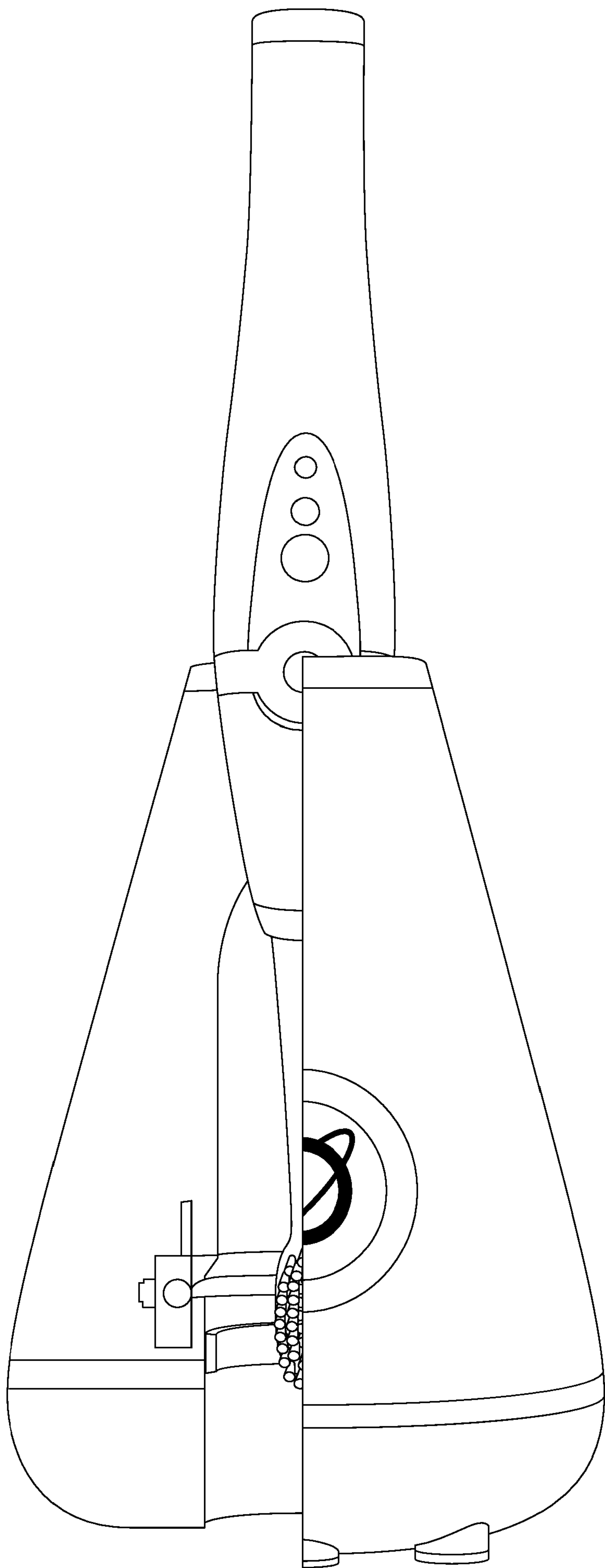


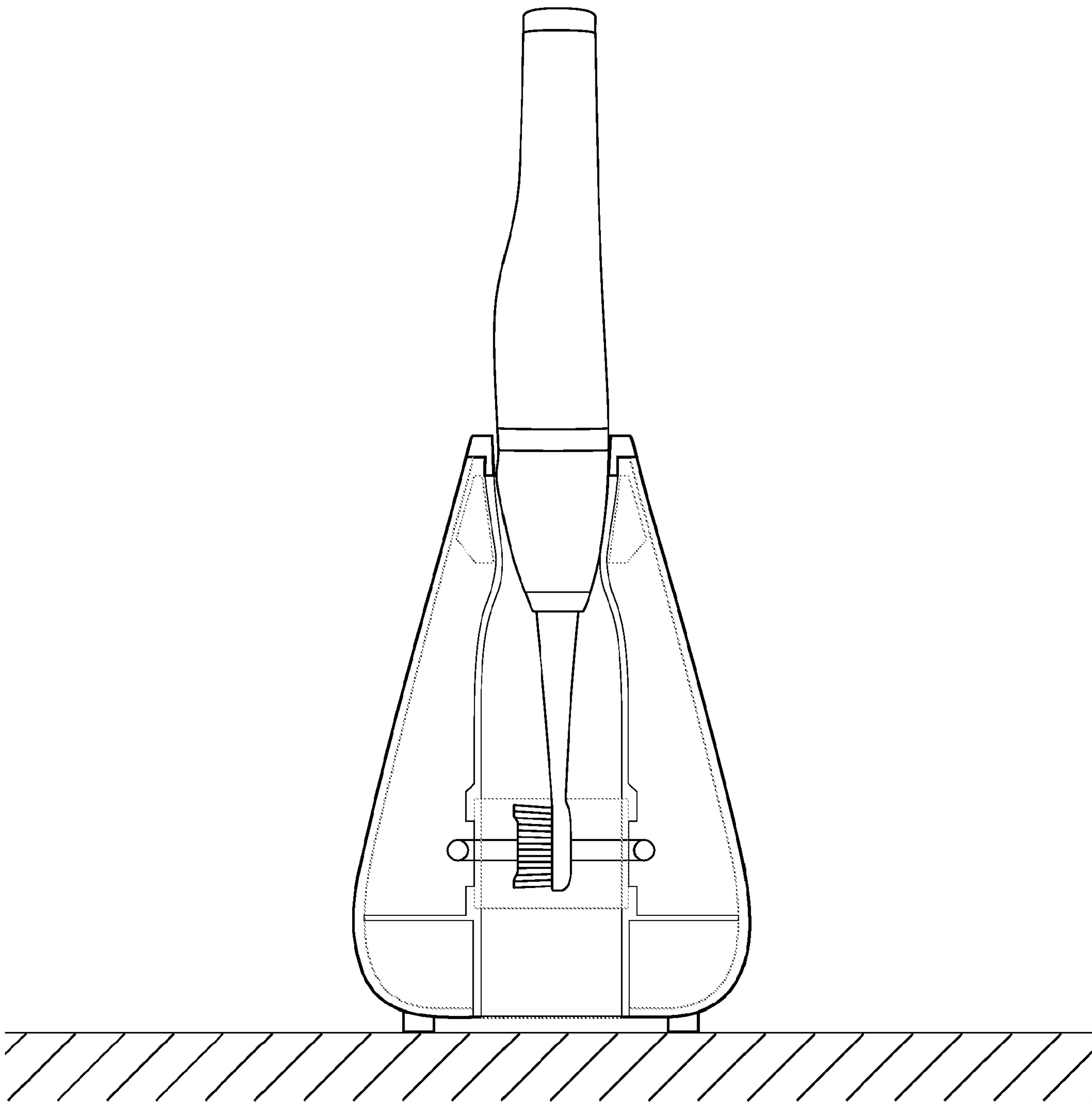


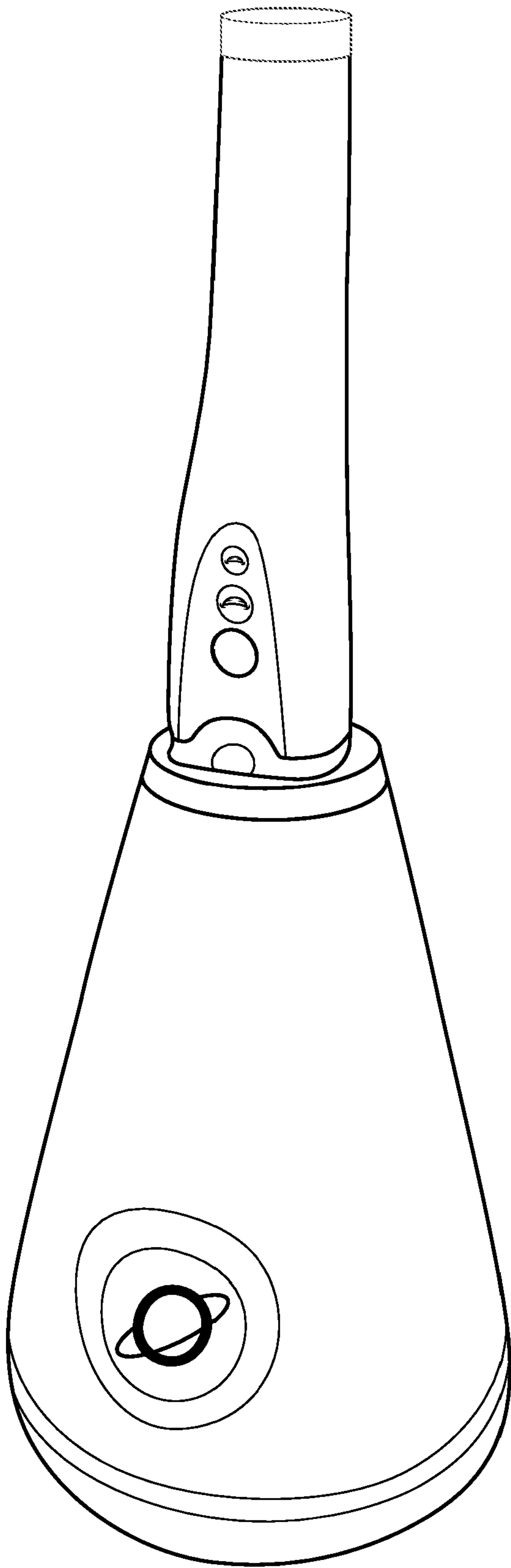


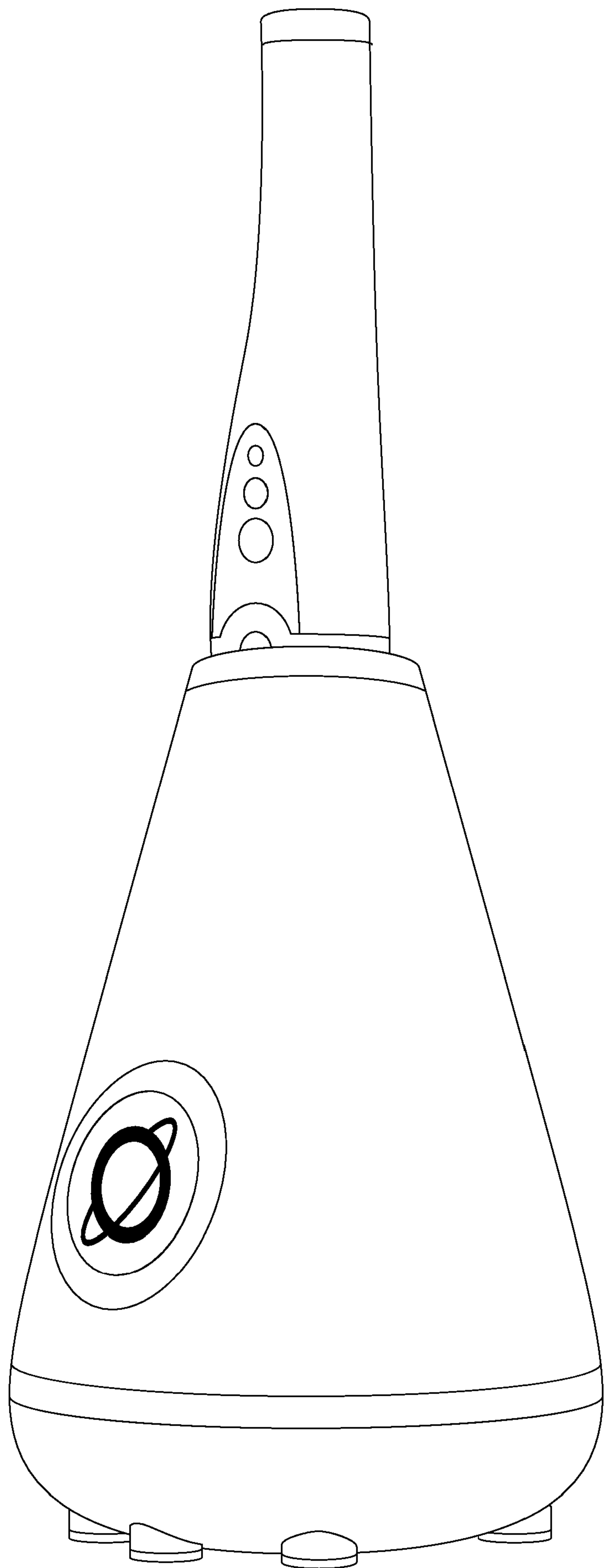


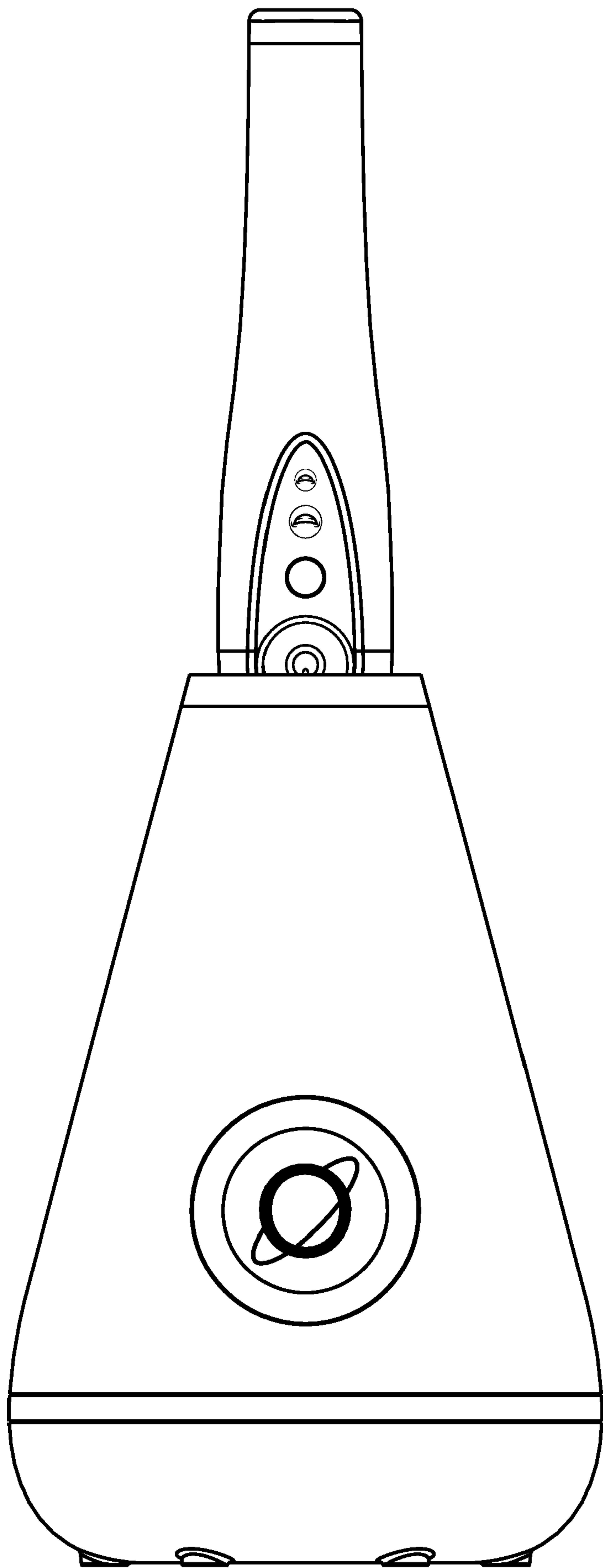


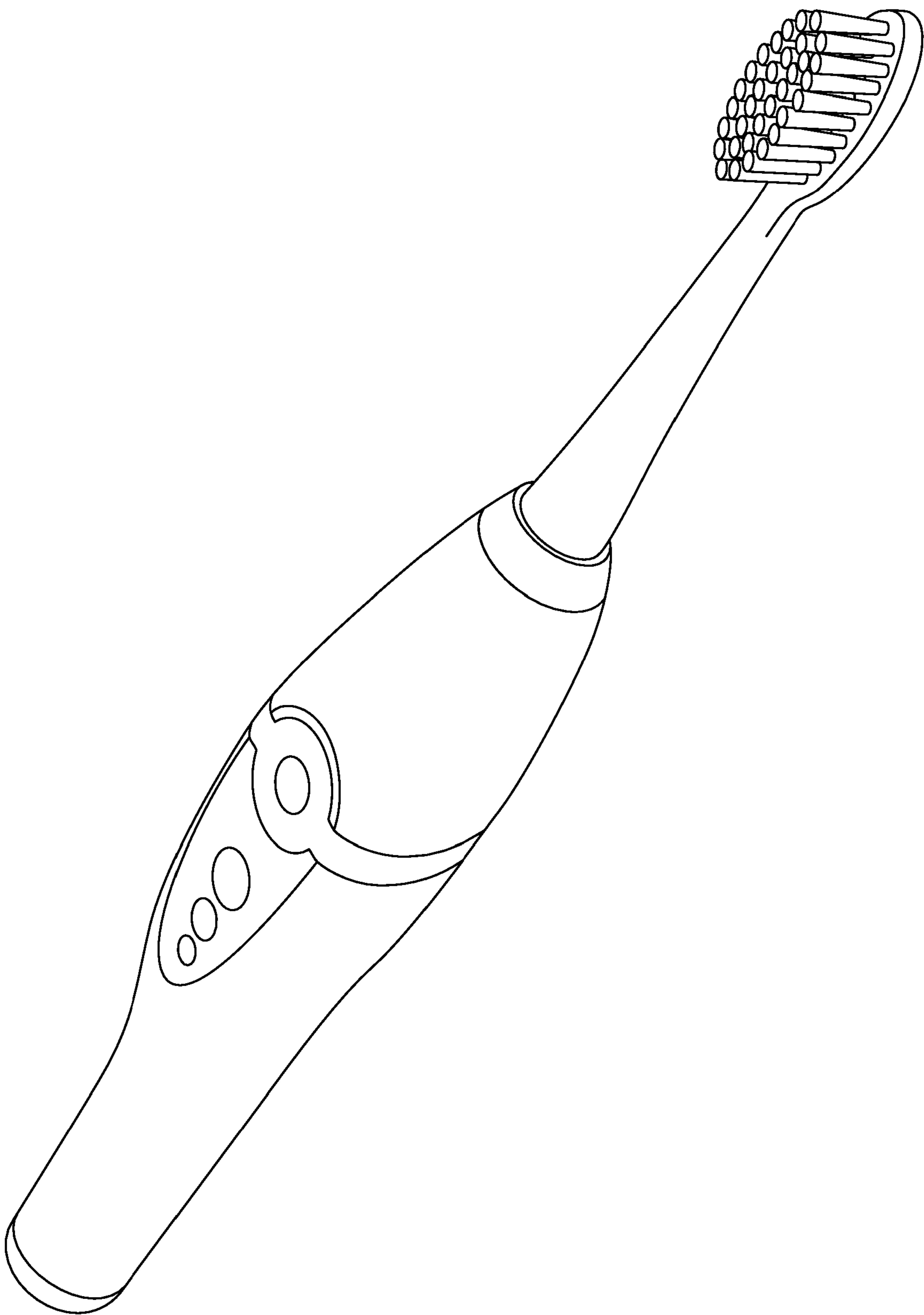












Claims

1. An oral care system, said system comprising:

a chamber;

wherein said chamber has a cavity in middle of said chamber, stretching from top to bottom of said chamber and inclusive of top and bottom of said chamber, creating an upper opening and a lower opening, said chamber having an open-ended top and an open-ended bottom;

wherein a brush head of a toothbrush is placed in said chamber through said open-ended top and wherein the cavity is in-line with the open-ended bottom such that if any drops of water were to fall off the brush head, they would fall all the way through the cavity of the chamber and reside on the counter on which the chamber rests when the chamber is upright;

a light source that emits ultraviolet light;

wherein said ultraviolet light is present in at least a portion of said cavity.

2. The oral care system as recited in claim 1, wherein a brush of said toothbrush is located below a handle of said toothbrush.

3. The oral care system as recited in claim 1, said system comprises:

a drying device.

4. The oral care system as recited in claim 1, said system comprises:

a radiant energy source inside said chamber.

5. The oral care system as recited in claim 1, said system comprises:

a heating source inside said chamber.

6. The oral care system as recited in claim 1, said system comprises:

a convection source inside said chamber.

7. The oral care system as recited in claim 1, said system comprises:

chamber feet located under said chamber.

8. The oral care system as recited in claim 1, wherein said toothbrush is an electric toothbrush.
9. The oral care system as recited in claim 1, wherein said toothbrush is battery-operated.
10. The oral care system as recited in claim 1, wherein there is a gap between a brush of said toothbrush and said chamber.
11. The oral care system as recited in claim 1, wherein there is a gap between said toothbrush and said chamber, for air flow.
12. The oral care system as recited in claim 1, said system comprises:
a charging circuit between said chamber and said toothbrush.
13. An oral care system, said system comprising:
a chamber;
wherein said chamber has a cavity in middle of said chamber, stretching from the top to the bottom of said chamber, inclusive of top and bottom of said chamber, creating an upper opening and a lower opening, said chamber having an open-ended top and an open-ended bottom;
wherein a brush head of a toothbrush is placed in said chamber through said open-ended top and wherein the cavity is in-line with the open-ended bottom such that if any drops of water were to fall off the brush head, they would fall all the way through the cavity of the chamber and reside on the counter on which the chamber rests when the chamber is upright;
a light source that emits ultraviolet light;
wherein said light source is located inside said chamber;
wherein said light source is substantially toroidal or circular in shape;
wherein said light source wraps around a brush of said toothbrush.

14. The oral care system as recited in claim 13, wherein said ultraviolet light source is a mercury-vapor lamp.

15. An oral care system, said system comprising:

a chamber with a chamber wall;

wherein said chamber has a cavity in middle of said chamber, stretching from the top to the bottom of said chamber, inclusive of top and bottom of said chamber, creating an upper opening and a lower opening, said chamber having an open-ended top and an open-ended bottom;

wherein said chamber has an open docking port leading from outside of said chamber to said cavity;

a toothbrush comprised of a brush end and a handle end;

wherein said handle end docks with said chamber;

wherein when docked, said brush end resides in said cavity and said handle end resides outside said chamber and wherein the cavity is in-line with the open-ended bottom such that if any drops of water were to fall off the brush end, they would fall all the way through the cavity of the chamber and reside on the counter on which the chamber rests when the chamber is upright;

wherein during docking, there is a gap between said brush end and said chamber wall;

an ultraviolet light source;

wherein said ultraviolet light source illuminates automatically, upon said docking.

16. The oral care system as recited in claim 15, wherein said cavity stretches from top of said chamber to bottom of said chamber.

17. The oral care system as recited in claim 15, wherein said brush end of said toothbrush is located below said handle end of said toothbrush.
18. The oral care system as recited in claim 15, said system comprises:
a drying device.
19. The oral care system as recited in claim 15, said system comprises:
a radiant energy source inside said chamber.
20. The oral care system as recited in claim 15, said system comprises:
a heating source inside said chamber.
21. The oral care system as recited in claim 15, said system comprises:
a convection source inside said chamber.
22. The oral care system as recited in claim 15, said system comprises:
chamber feet located under said chamber.
23. The oral care system as recited in claim 15, wherein said toothbrush is an electric toothbrush.
24. The oral care system as recited in claim 15, wherein said toothbrush is battery-operated.
25. The oral care system as recited in claim 15, said system comprises:
a charging circuit between said chamber and said toothbrush.
26. The oral care system as recited in claim 1, claim 13 or claim 15, wherein the chamber is devoid of crevices.
27. The oral care system as recited in any one of the preceding claims, wherein the chamber is an enclosure.