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

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
25 January 2018 (25.01.2018)

WIPO | PCT

(10) International Publication Number
WO 2018/017160 A1

(51) International Patent Classification:
A01M 1/02 (2006.01) *A01M 1/24* (2006.01)
A01M 1/20 (2006.01)

(21) International Application Number:
PCT/US2017/015264

(22) International Filing Date:
27 January 2017 (27.01.2017)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
15/215,165 20 July 2016 (20.07.2016) US
15/392,708 28 December 2016 (28.12.2016) US

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(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:
— *with international search report (Art. 21(3))*

WO 2018/017160 A1

(54) **Title:** PEST CONTROL SYSTEM AND METHOD

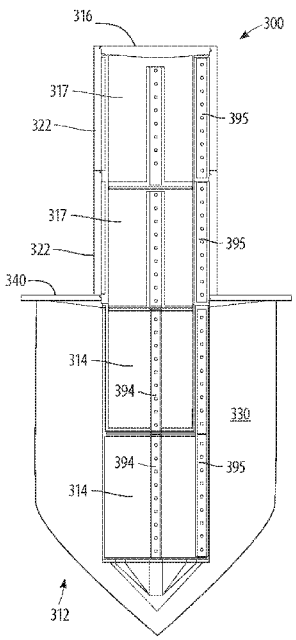


FIG. 21

(57) **Abstract:** A system and method of monitoring and controlling cellulose-consuming pests in a predetermined location that provides for the use of an assembly that has a main body containing a plurality of cellulose-containing bait units, which act as an attractant to cellulose-consuming pests. A plurality of cellulose-containing bait units are removably placed in the assembly. A moisture-retaining member is positioned in the upper portion above an uppermost of the bait units. A removable cap frictionally fittingly engages with the upper portion. The cap has an opening allowing liquid, such as water, to be poured into the main body to moisten the bait units and make them more attractive to foraging insects. If consumption of the cellulose material is detected, the bait units may be substituted with a bait material containing poisonous substance. The pests consume the bait and carry the poison to the colonies. The design incorporates below grade, at grade, and above grade cellulose source, thus giving the insect a choice of feeding locations. These alternate sources and added attractant features of the system increase the chance of the insect actually finding and consuming the bait food source.

Pest Control System and Method

Specification

Cross-Reference to Related Applications

[0001.] This application claims priority to my co-pending U.S. Appl. Serial No. 15/392,708, filed December 28, 2016, tilted "Pest Control Above-Ground System and Method," which is a continuation-in-part of my co-pending application Serial No. 15/215,165, filed July 20, 2016, titled "Pest Control System and Method," the full disclosures of which are hereby incorporated by reference and priority of which is hereby claimed.

Background of the Invention

[0002.] This invention generally relates to a pest control system, and more particularly to a system that allows attraction, interception, and elimination of colonies of cellulose-eating pests, such as termites, and other food foraging arthropods, with minimal disturbance to the natural foraging of the pests.

[0003.] Many pests, such as termites, are serious threats throughout much of the world to structures or other objects containing wood or other cellulose-containing components because these pests consume cellulose for nutrition. Subterranean termites, which typically dwell in the soil, often form large colonies. Members of the colony forage for food and thus burrow out passageways in the soil outwardly from the nest. Portions of the food located by the foraging termites are returned to the nest. Termites are also known to possess means for communicating the location of a food source to other termites within the colony. Termites invade residential and commercial structures, and even watercraft, moving along, and destroying, wooden or cellulosic poles, studs, beams, and sills.

[0004.] Coptotermes formosanus is an invasive species of termite; it is often nicknamed the super-termite because of its destructive habits. This is due in part to the large size of its colonies, and the termites' ability to consume wood at a rapid rate. A single colony may contain several million individuals (compared with several hundred thousand termites for other subterranean termite species) that forage up to 300 feet (100 m) in soil. A mature Formosan colony can consume as much as 13 ounces (400g) of wood a day and severely damage a structure in as little as three months. Because of its population size and foraging range, the presence of a colony poses serious threats to nearby structures. Formosan subterranean termites

infest a wide variety of structures (including boats and high-rise structures), and can also damage landscaping and trees. In the United States, along with another species, Coptotermes gestroi, which has also been introduced from Southeast Asia, the Formosan termites are responsible for tremendous damage to property, resulting in large treatment and repair costs.

[0005.] Another highly destructive type of termite is Reticulitermes flavipes, the eastern subterranean termite, which is the most common termite found in North America. These termites feed on cellulose material like the structural wood in buildings, wooden fixtures, paper, books, and cotton. A mature Formosan termite colony can range from 20,000 workers to as high as 5 million workers, and the queen of the colony lays 5,000 to 10,000 eggs per week. Both Coptotermes formosanus and Reticulitermes flavipes also feed on cellulose material above ground. In many instances, Coptotermes formosanus will build above-ground colonies in the wood they are consuming. These colonies may be associated with above-ground moisture such as rain, outdoor plant material, or moisture leaks in man-made structures. In such cases, the Formosan termites demonstrate a definite preference to feeding and colonizing at grade and above ground. Such termites do not need to return to the ground, and can invade to the top of a several-story structure if given a path of moist wood.

[0006.] Many pest control systems are known and formed in a wide variety of configurations to monitor and eradicate the pests. One type of popular termite control system, for example, utilizes a monitoring bait food source that is placed below grade; the food source is available to the termites, which begin feeding from the device. The bait incorporates a toxic material, which once consumed, helps in the elimination or suppression of the entire termite colony. However, such systems may be ineffective against the termites that cannot locate the bait.

[0007.] It has been observed that termites and other pests tend to find a vertical surface, along which they crawl from an underground location in search of food and water. Conventional colony-eradication devices are mostly of cylindrical configuration with smooth exterior walls that may prevent some of the pests from reaching the bait.

[0008.] The present invention contemplates elimination of drawbacks associated with conventional pest control systems and provision of a pest control system designed to eradicate below-ground and above-ground colonies of cellulose-eating insects, whether in an underground location or inside buildings and structures.

Summary of the Invention

[0009.] This invention provides a pest-control system and method that is designed to eradicate foraging pests by increasing the likelihood of the foraging termites being attracted to the system and guided into finding the bait. This is due to the unique design that provides for attractants within the system which channels foraging insects to the center of the device, thus directing the insects to consume the bait. The embodiments may be used below-ground in varied locations. Other embodiments may be used for applications above ground level or in the walls of buildings, such as interior or exterior walls of residential or commercial buildings, aboard boats and watercraft, directly on infested support members like beams, studs, and joists, attached to landscape features like timbers, fences, and sheds, and on infested trees.

[0010.] It is an object of the invention to provide a pest control system and method of monitoring presence of pests, such as termites, in pre-selected locations.

[0011.] It is a further object of the invention to provide a system and method that allows retention of moisture on the bait material for a considerable period of time, in the event of a period of less rain fall.

[0012.] These and other objects of the invention are achieved through a provision of a system and method of monitoring and controlling cellulose-consuming pests in a predetermined location that provides for the use of an assembly that has a main body containing a plurality of cellulose-containing bait units, which act as an attractant to cellulose-consuming pests. The bait units may initially be cellulose-containing to act as an attractant to the cellulose-consuming pests, but alternate units may contain an active ingredient that acts as a poisonous material to the pests, or may contain an ingredient that further serves to control the environment of the system. One such ingredient may be naphthalene, which does not act as a deterrent to cellulose-consuming pests like termites, but does act as a deterrent to different pests like ants. The user may wish to insert such a naphthalene unit if, for instance, the ants have overrun the system to such an extent that it no longer serves as an effective termite bait-and-poison station. A moisture-retaining member can be positioned in the upper portion above an uppermost of the bait units. A removable cap frictionally fittingly engages with the upper portion. The cap has an opening with gasket, allowing liquid, such as water, to be poured into the main body to moisten the bait units without disturbing the foraging pests, thus making the bait more attractive to foraging insects. If consumption of the cellulose material is detected, the bait units may be

substituted with a unit containing material comprising a poisonous substance, or additionally altered by adding an interlocking, additional main box body, containing additional cellulose material or poisonous substance. The pests consume the bait and carry the poison to the colonies. The design incorporates below grade, at grade, and above grade cellulose source, thus giving the insect a choice of feeding locations. These alternate sources and added attractant features of the system increase the chance of the insect actually finding and consuming the bait food source.

Brief Description of Drawings

[0013.] Reference will now be made to the drawings, wherein like parts are designated by like numerals, and wherein:

[0014.] FIG. 1 is a perspective view of the pest control assembly according to the first embodiment of the present invention;

[0015.] FIG. 2 is a sectional, partially exploded view of the pest control assembly of the first embodiment;

[0016.] FIG. 3 is an exploded view of the bait units and a moisture retaining unit;

[0017.] FIG. 4 is a top view of the bait units;

[0018.] FIG. 5 is a sectional view of the second embodiment of the pest control assembly according to the present invention;

[0019.] FIG. 6 is a detail perspective view of a perforated riser and a moisture collector secured on the bottom of the riser;

[0020.] FIG. 7 is a side view of the riser illustrating evaporation and condensation effect employed in the pest control system of the present invention;

[0021.] FIG. 8 is a plan view of the use main body of the pest control assembly according to the present invention;

[0022.] FIG. 9 is a top view of the use main body;

[0023.] FIG. 10 is a detail sectional view of the third embodiment of the pest control assembly according to this invention;

[0024.] FIG. 11 is detail sectional view of the third embodiment showing an extension riser;

[0025.] FIG. 12 is detail view of an extension member of the third embodiment of the present invention;

[0026.] FIG. 13 illustrates a user preparing a hole in the ground for receiving the pest control assembly of the present invention;

[0027.] FIG. 14 illustrates a user positioning the pest control assembly in the prepared hole;

[0028.] FIG. 15 illustrates the user positioning the pest control assembly in the soil and applying downward force for embedding the pest control assembly in the formed hole;

[0029.] FIG. 16 illustrates inspection of the bait station formed by the pest control system of the present invention and data collection;

[0030.] FIG. 17 illustrates location of the bait stations of the present invention relative to a building structure;

[0031.] FIG. 18 illustrates pathways formed by directional wings which direct pests attracted to the pest control system of the present invention;

[0032.] FIG. 19 illustrates condensation of water on the cap of the assembly of this invention;

[0033.] FIG. 20 illustrates an embodiment of the pest control system and method of the invention having interchangeable modules;

[0034.] FIG. 21 illustrates the embodiment of FIG. 20, further having two extension sections;

[0035.] FIG. 22 illustrates the embodiment of FIG. 20, further having one extension section;

[0036.] FIG. 23 illustrates the embodiment of FIG. 20, further having no extension sections;

[0037.] FIG. 24 illustrates the locking top of the embodiment of FIG. 20;

[0038.] FIG. 25 illustrates the operation of the cellulose wick of the embodiment of FIG. 20;

[0039.] FIG. 26 is a side exploded view of the embodiment of FIG. 20;

[0040.] FIG. 27 is a perspective exploded view of the embodiment of FIG. 20;

[0041.] FIG. 28 illustrates a cellulose-food module of the embodiment of FIG. 20;

[0042.] FIG. 29 illustrates a refillable cartridge module of the pest control system and method of the invention, which may be filled with active-ingredient, cellulose, or other material as desired;

[0043.] FIG. 30 illustrates a vent-shaft extension of the pest control system and method of the invention;

[0044.] FIG. 31 illustrates a bottom vent shaft of the pest control system and method of the invention;

[0045.] FIG. 32 illustrates a water-reservoir module of the pest control system and method of the invention;

[0046.] FIG. 33 illustrates the alternate-feature cap of an alternate-feature embodiment of the pest control system and method of the invention;

[0047.] FIG. 34 illustrates capabilities of the alternate-feature cap of an alternate-feature embodiment of the pest control system and method of the invention;

[0048.] FIG. 35 illustrates the alternate-feature embodiment of the pest control system and method of the invention, further having two extension sections;

[0049.] FIG. 36 illustrates the alternate-feature embodiment of the pest control system and method of the invention, further having one extension section;

[0050.] FIG. 37 illustrates the alternate-feature embodiment of the pest control system and method of the invention, further having no extension sections;

[0051.] FIG. 38 illustrates a sponge module of the pest control system and method of the invention;

[0052.] FIG. 39 illustrates a sealed cartridge module, which may contain active-ingredient, cellulose, or other appropriate material, of the pest control system and method of the invention;

[0053.] FIG. 40 illustrates a vent-shaft extraction tool of the pest control system and method of the invention;

[0054.] FIG. 41 illustrates a ground-water wick of the pest control system and method of the invention;

[0055.] FIG. 42 illustrates an external water source and hydration line of the pest control system and method of the invention;

[0056.] FIG. 43 illustrates an external power source, transformer, and buried electrical cable of the pest control system and method of the invention;

[0057.] FIG. 44 illustrates the retrofit installation of the pest control system of the invention in an existing opening in a concrete slab;

[0058.] FIG. 45 illustrates an in-port sensor and down-port lead of the pest control system and method of the invention;

[0059.] FIG. 46 illustrates a front perspective view of an above-ground embodiment of the pest control assembly of the invention;

[0060.] FIG. 47 illustrates a back perspective view of an above-ground embodiment of the pest control assembly of the invention;

[0061.] FIG. 48 illustrates a front sectional view of an above-ground embodiment of the pest control assembly of the invention;

[0062.] FIG. 49 illustrates a top sectional view of an above-ground embodiment of the pest control assembly of the invention;

[0063.] FIG. 50 illustrates a top view of an above-ground embodiment of the pest control assembly of the invention;

[0064.] FIG. 51 illustrates a side view of an above-ground embodiment of the pest control assembly of the invention;

[0065.] FIG. 52 illustrates a top perspective view of an above-ground embodiment of the pest control assembly of the invention;

[0066.] FIG. 53 illustrates a front view of an above-ground embodiment of the pest control assembly of the invention;

[0067.] FIG. 54 illustrates a perspective view of the stacking connection of main body units of an above-ground embodiment of the pest control assembly of the invention; and

[0068.] FIG. 55 illustrates a schematic view of an above-ground embodiment of the pest control assembly of the invention in use in commercial buildings, residential buildings, and watercraft.

Detailed Description of the Invention

[0069.] Turning now to the drawings in more detail, numeral 10 designates the pest control assembly according to the first embodiment of the present invention. The assembly 10 comprises a main body 12, a plurality of axially aligned bait units 14 detachably engageable with the main body 12, a removable cap 16 fitted over the top of the main body 12, and a moisture retaining member 18 detachably mounted in the main body 12 between the uppermost bait unit 20 and the cap 16.

[0070.] The main body 12 comprises an upper hollow cylindrical portion 22 and a lower

co-axially extending portion 24. The upper portion 22 has a top open end defined by an upper edge 28. A plurality of fin-shaped blades 30 defines the lower portion 24. Each of the blades 30 can be configured as an inverted triangle, with a sharp point 32 facing downwardly. Each blade 30 comprises a smooth planar narrow body of generally triangular configuration, although the bottom part 31 can be formed arcuate, as illustrated in the drawings.

[0071.] Each blade 30 has an inner edge 36 and an outer edge 38. The blades 30 can intersect and be joined at their inner edges 36, as shown in an exemplary embodiment of FIGS. 8 and 9. The blades can be three or more in number, equidistantly spaced about the circumference of the main body 12.

[0072.] The upper portion 22 and the lower portion 24 can be unitary, formed from a single sheet of rigid sturdy material, such as metal or plastics. The upper portion 24 can be rigidly affixed to an upper edge 40 of each blade 30. Alternatively, the upper portion 22 can be detachably engageable with the lower portion 24. An inwardly extending horizontal shoulder 42 is formed between an inner surface 23 of the upper portion 22 and an inner part of the blades 30. The shoulder 42 supports at least one of the bait units 14, as will be explained in more detail hereinafter.

[0073.] The main body 12 is configured to carry a plurality of bait units 14, which can be of the same size or of different sizes. In one of the preferred embodiments, the bait units 14 have a hollow substantially cylindrical central body portion 50, an upper plate 52 extending over the top of the central body portion 50, and a lower part 54 secured to the bottom of the central body portion 50. The upper plate 52 has an inverted cone configuration having a central opening 56 communicating with the hollow interior of the central body portion 50. The upper plate 52 has its widest part secured to the top edge 51 of the central body portion 50, while the apex of the plate 52 extends downwardly into the central body portion 50.

[0074.] The lower part 54 has an inverted cone configuration with its widest part secured to the bottom edge 53 of the central body portion 50. An apex 55 of the lower part 54 is provided with a central opening 58, which is co-axially aligned with the opening 56 in the upper plate 52.

[0075.] A plurality of radial slots 60 extend from the upper plate 52, along the cylindrical wall of the central body portion 50 and continue to the lower part 54. The slots 60 are configured to receive the blades 30 of the main body 12 when the bait units 20, 14a – 14d are

fitted within the main body 12. The bait units 20, 14a – 14d are formed from cellulose-containing substance, which is particularly attractive to subterranean and above-ground foraging pests. The bait units can be formed as unitary bodies from pressed cellulose-containing substance.

[0076.] The uppermost bait unit 20 has an enlarged central body portion 62, which forms a horizontal inwardly extending shoulder 64, which connects with the lower conical part 68. The shoulder 64 is configured to rest on the horizontal shoulder 42 of the blades 30. Similarly to the bait units 14a – 14d, the uppermost bait unit 20 is provided with aligned openings 70, 72 formed in an upper conical plate 74 and the lower conical part 68, respectively.

[0077.] As can be seen in FIG. 2, the bait units 14a and 14b are slightly larger in diameter than the bait units 14c and 14d. An inclined shoulder 80 is formed between the bottom sharp point 32 of the blades 30 and the horizontal shoulder 42. A first soil displacement member 82 is fitted on the main body 12 to fit between the blades 30 and rest on the inclined shoulder 80. A second soil displacement member 84 is fitted on the main body 12 below the bait unit 14d.

[0078.] Each of the first soil displacement member 82 and the second soil displacement member 84 is formed as a hollow member of inverted-cone configuration, with its apex facing downwardly. The first and the second soil displacement members 82, 84 are formed from a relatively rigid material, which protects the lower portions of the bait units from being crushed as the assembly 10 is driven into the ground.

[0079.] The moisture-retaining member 18 can be formed to match the configuration of the uppermost bait unit 20 and fit within the upper portion 22 of the main body 12. The moisture-retaining member 18 is positioned above the uppermost bait unit 20. The moisture-retaining member 18 can be formed from an open-cell foam material, such as sponge. The moisture-retaining member 18 is formed with an opening 86 in its upper cone 88 and an aligned opening 90 in the lower cone 92.

[0080.] The bait units 14 are stacked vertically on the blades 30, above the second cone 84. The lower bait units can be one or more in number, and may composed of cellulose-containing bait material, or may alternatively be composed of active-ingredient poisonous material or alternative material that further serves to control the environment of the system. Additional bait units, which may be comprised of bait, active-ingredient, or alternative material, are stacked vertically above the first soil displacement member 82, and can be also one or more

in number. The bait units are vertically aligned with the earth-displacing first and second soil displacement members 82, 84 such that the openings in the bait units define a central passageway for a riser tube 94. The lower part of each subsequent bait unit fits an upper plate of the bait unit below with the conical parts having a matching angle to allow stacking. The upper plate 52 of the lowermost bait unit is configured to receive a matching angle lower conical part 54 of the bait unit positioned above it. The stacking of the bait units is completed with the uppermost bait unit 20, which frictionally receives the moisture-retaining member 18 within its upper cone plate 88.

[0081.] The riser tube 94 is inserted through the aligned openings 86, 90, 70, 72, 56 and 58. The riser tube 84 extends from the second cone 84 to a distance above the moisture-retaining member 18. In one aspect of the invention, the riser tube 94 extends within the upper portion 22 of the main body 12.

[0082.] Turning now to FIGS. 6 and 7, the riser tube 94 is illustrated in more detail. The riser tube 94 extends along a longitudinal axis of the main body 12. The riser tube 94 comprises an elongated tubular body having a plurality of perforations 96 formed along the sidewall thereof. A bottom of the riser tube 94 is provided with longitudinal slots 98 extending from the bottom edge 100 of the riser tube 94 a distance upwardly. The bottom edge 100 of the riser tube 94 rests on a conical moisture collector 102, which frictionally fits in the second cone 84. In one aspect of the invention, the exterior surface of the conical reservoir matches the interior surface of the second cone 84, allowing a stable positioning of the moisture collector 102 within the second cone 84.

[0083.] The riser tube 94 allows circulation of moisture to the bait unit so that they are kept moist to attract the termites. The moisture penetrates through the openings 96 and rises through the riser tube interior, as schematically shown by arrows 104 and 106 in FIG. 7. Some of the moisture is collected in the inverted cone of the moisture collector 102. It is envisioned that the moisture collector 102 can also receive some of the cellulose material of the bait units should the material become loose.

[0084.] The cap 16 removably fits over the upper portion 22 of the main body 12. The cap 16 comprises a flat planar top 108, a cylindrical sidewall 110, and an outwardly convex bottom surface 112. The diameter of the planar top 108 is at least slightly greater than the diameter of the sidewall 110, and a circumferential flange 109 is formed between an edge 111 of

the planar top 108 and the exterior of the sidewall 110. The circumferential flange 109 allows the user to lift and remove the cap 16 for inspecting conditions of the bait units in the assembly 10. The cap 16 may also allow for a means of securing or sealing the cap 16 to the main body 12. One preferred embodiment allows for securing the cap 16 to the main body 12 by providing fastener ports 115, 117. The upper fastener port 115 is located on a circumferential flange 109 distally from the sidewall 110 and extends through the portion of top surface 108 that forms the circumferential flange 109 to the bottom of the circumferential flange 109 which contacts the upper edge 28 of the main body 12. The lower fastener port 117 aligns with the upper fastener port 115 and is a hole that extends a length slightly longer than the fastener 113. The fastener should have a length slightly shorter than the combined lengths of the upper and lower fastener ports 115, 117. Once the cap 16 is placed over the main body 12, the fastener 113 is placed through the upper fastener port 115 and continues into the lower fastener port 117 to secure the cap 16 to the main body 12. To ensure a sealing engagement of the cap 16 with the main body 12, an O-ring 119 is fitted to the underside of the circumferential flange 109. The O-ring 119 presses against the exterior of the sidewall 110.

[0085.] The outside diameter of the sidewall 110 is at least slightly smaller than an inner diameter of the upper portion 22 of the main body 12 such that the sidewall 110 of the cap 16 frictionally tightly fits inside the upper portion 22. A port 114 is formed in the cap 16 extending from the top surface 108 to the bottom surface 112 of the cap. A short tube 116 may be inserted in the port 114. The port 114 serves as an inlet for water to be added to the bait units and allows optional collection of data about the physical conditions inside the assembly 10, such as dew point, humidity, and temperature.

[0086.] As can be seen in FIG. 19, the outwardly convex bottom surface 112 of the cap 16 helps to direct water rising through the riser tube 94 toward the center of the main body 12, where the riser tube 94 extends. The moisture is re-circulated back into the bait units 14 to keep them from becoming dry.

[0087.] To place the assembly 10 in the soil, the user creates a hole using any available equipment, such as an auger, shown in FIG. 13. The auger 120 is a two-stage auger having smaller helical blades on the bottom and larger helical blades above. The soil auger 120 is capable of forming a two-stage hole 122 in the soil, with a smaller diameter hole 124 in the bottom and a larger diameter hole 126 above. The hole 122 is configured to receive the

assembly 10, allowing the sharp ends 32 of the blades 30 to lead the assembly into the hole.

[0088.] In operation, the main body 12 with the first and second soil displacement members 82, 84 is placed directly in the prepared hole 122 in a location where the presence of pests is detected or suspected. It is preferred that the soil has moisture content greater than 5% in the selected location. The user ensures that the blades 30 are embedded into the soil 128 such that the lower portion 24 of the body 12 is below ground, while the upper portion 22 may extend above ground. If necessary, the user applies a downward force with a hand tool 130, as shown in FIG. 14. Alternatively, the user can force the main body 12 into the hole 122 using his hands or foot, as shown in FIG. 15.

[0089.] The blades 30 secure the assembly 10 in the ground, minimizing the chance of assembly displacement. The user then places cellulose-containing bait units 14a in engagement with the main body 12. The moisture-retaining member 18 made of sponge material is placed above the uppermost bait unit 20, and the riser tube 94 is inserted through the aligned openings in the moisture-retaining member 18 and the bait units 14. The cap 16 is positioned on top of the upper portion 22, and water is added to the bait units to moisten the cellulose material.

[0090.] In one aspect of the invention, it is preferred that the cellulose-containing bait units 30 remain undisturbed for a period of about 30 days to give the foraging pests a chance to locate and feed on the cellulose. From time-to-time, the user may inspect the bait stations formed by the assembly 10. As is schematically illustrated in FIG. 16, the user may use a sensor 132 to check the conditions in the assembly 10. The collected data can be wirelessly sent via a wireless transmitter 134 to a remote location, for instance a monitoring company.

[0091.] FIG. 17 illustrates possible locations of the bait stations 140 adjacent a building 142. The property may have a tree 144 adjacent the building 142. The tree naturally attracts termites. A termite colony 146 may exist on the property. Phantom lines 148 illustrate movement of termites from the colony 146 to the tree. The location of the bait stations 140 is selected to be near the building 142 and the tree(s) 144.

[0092.] FIG. 18 illustrates the termites following the runways and using the blades 30 of the assembly 10 as a guiding path to the center of the cellulose bait units 14. The blades 30 form the vertical walls, which direct the termites and allow then to gain access to the bait units 14.

[0093.] On occasion, the user inspects the bait stations 140 to ascertain whether the bait units 14 have attracted above-ground and/or subterranean termites, or have otherwise affected

the natural environment of the station. After the feeding has begun, poisonous termite bait with active ingredients may be added to the assembly 10. If the system 10 is used only for the purpose of monitoring the subterranean activity and detecting the presence of termites, no toxic bait need to be added. If the user detects no activity in the system 10, the body 12 can be relocated to a new site. It is envisioned that the body 12 may also need to be relocated should the user detect presence of non-targeted insects, such as arthropods, annelids, or mollusks.

[0094.] Once the active-ingredient bait has been placed in the main body 12, the termites feeding on the bait bring the bait to the colonies. As the toxic substance is consumed by termites, the bait with the cellulose substance is added to the interior space 20 for period of time for the bait to have the intended toxic effect on the colony. The system 10 is periodically inspected to determine whether termites are active within the system 10.

[0095.] Depending on the activity and the speed of consumption of the cellulose-containing material and the bait, larger or smaller system 10 can be substituted in the selected location. If the cellulose-containing material is consumed within a matter of days, a larger body 12 may be needed to hold larger quantity of cellulose-containing substance. The size of the body 12 can range from just a few inches in height and diameter to several feet in diameter. The large unit would be used possibly under a structure where the termite foraging pressure is very high and the colony size and age is greater than average, and thus a larger quantity on cellulose would be needed to last 30 days. It is envisioned that the interval to be used as bait replacement period can be set by the pesticide regulatory bodies at 30 to 90 days.

[0096.] One of the advantages of the system of the present invention is that it most closely mimics the way cellulose is found and consumed by subterranean termites under natural environmental conditions. The cellulose-containing material can be chips of wood, carton, paper, and so forth, placed directly on the ground surface, below and above grade, thus attracting surface-foraging pests. The toxicant in the bait is preferably of the delayed-action type, or an insect growth regulator, pathogen, or metabolic inhibitor. Preferably, it comprises a nontoxic cellulose-containing bait composition to which the pesticide toxicant is added. The removal, inspection, and/or replacement of the cap 16 does not substantially disturb the network of access passageways established between the termite colony or nest and the system 10 because the body 12 is not displaced during removal and substitution of the cellulose-containing substance with the toxic bait. Similarly, the removal, inspection, and/or replacement of the bait units 14 does

not substantially disturb the network of access passageways, because the user of the system may easily remove and replace the appropriate bait units 14, which may be comprised of cellulose, active-ingredient, or other appropriate material, quickly and without altering the overall installation of the system. The easy removal, inspection, and/or replacement of these individual bait units 14, which minimizes disturbance of the overall system, allows for the user to potentially alter the cellulose or poison content of the system by, for example, replacing a cellulose bait unit with an active-ingredient bait unit when the termites are foraging, or by replacing an active-ingredient bait unit with a cellulose bait unit when the user wishes to attract more termites to the station.

[0097.] Turning now to the second embodiment of the present invention, illustrated in FIG. 5, the upper portion 212 of the main body is shown to be provided with an opening 214 formed at an angle to a longitudinal axis of the upper portion 212. The opening 214 can be used for collection of data and introduction of a sensor 216 (schematically shown in FIG. 16) into the main body 200.

[0098.] In this embodiment of the invention, the cap 216 forms a reservoir 217 for retaining a pre-determined amount of water 219, which is gradually and slowly dispensed through a bottom opening 218. The top plate 220 of the cap 216 is provided with an inlet opening, similar to the opening 114, through which water supply in the reservoir 217 can be admitted. A short conduit 222 is inserted in the inlet port 224 to guide liquid into the main body 200 of the pest control assembly.

[0099.] Similarly to the cap 16, the cap 216 has an outwardly extending circumferential flange 221, which allows the user to remove the cap 216 and inspect the conditions of the bait units of the pest control assembly. Other features of the cap 216 and the pest control assembly are similar to the first embodiment, where the lower portion is used to retain a plurality of bait units 14 and the moisture retaining sponge 18. It is envisioned that this embodiment can be particularly advantageous in arid climates.

[0100.] FIGS. 10-12 illustrate a third embodiment of the system of the present invention. In this embodiment, a detachable extension member 230 is added to the upper portion 22 of the main body 12. The extension member 230 comprises a hollow tubular element 232, which has a bottom part 234 and a top part 236. The tubular element 232 has an inner wall 238 provided with an inwardly horizontally extending shoulder 240. The shoulder 240 is configured to rest on

the upper edge 28 of the main body 12 when the extension member 230 is engaged with the main body 12. A lower end of the element 232 rests on the upper edge 40 of the blades 30 when the extension member 230 is positioned on the main body 12.

[0101.] The extension member 230 is provided with an extension riser tube 242 having exterior threads 244 formed on the lower part thereof. The threads 244 are configured to matingly engage inner threads (not shown) of the riser tube 94 of the assembly 10. The extension riser tube 242 is provided with perforations 243, similarly to the perforations 96 formed in the riser tube 94.

[0102.] A data collection port 250 is formed in the top part 232, because the data collection port 214 may be covered by the extension member 230. The extension member 230 allows introduction of additional bait units 248 in alignment with the bait units 14. The moisture retaining member 18 is placed over the uppermost bait unit, similar to the first embodiment described above.

[0103.] The cap 16 can be used with the extension member 230 because the diameter of the extension member corresponds to the diameter of the upper portion 22. As can be seen in FIG. 10, the inner wall 23 of the upper portion 22 extends continuously with the inner wall 246 of the top part 236.

[0104.] Although tap or rain water on the cellulose substance is believed to be sufficient for attracting foraging insects, it is envisioned that liquid attractant can be used instead of tap or rain water. Such sugar water can be poured through the opening in the cap 16 to make the bait station even more attractive to the insects.

[0105.] The cap 16 can be colored in light or dark colors to increase or decrease the internal temperature of the main body and facilitate condensation. Depending on the climate where the system of the present invention is to be utilized, the cap can be made black or white.

[0106.] Referring now to FIG. 20, FIG. 21, FIG. 22, & FIG. 23, another embodiment of the pest control system and method of the invention provides a modular design that allows different modules or combinations of modules to be incorporated into any given bait-station main body 312, to be taken out for inspection, for replenishment, and for replacement by other modules where desired.

[0107.] Provided modules include a cellulose-food module 314 as illustrated in FIG. 28, a moisture retaining and releasing sponge module 318 as illustrated in FIG. 38, a refillable

cartridge module 315 as illustrated in FIG. 29, a one-time use or sealed cartridge module 313 as illustrated in FIG. 39, and a water-reservoir module 317 as illustrated in FIG. 32. The refillable cartridge module 315 as illustrated in FIG. 29 and the one-time use or sealed cartridge module 313 as illustrated in FIG. 39 may be comprised of active-ingredient, cellulose, or other desired material, such as naphthalene. Each module is essentially cylindrical in shape, with two void spaces or holes or channels along the long dimension of the cylindrical module. A central, axial hole accommodates the vent shafts 394, allowing movement of gasses and liquids among the modules, as disclosed in detail above. This central hole is likely to be essentially circular or cylindrical to accommodate the vent shafts 394, but to remain close to the vent shafts for efficient transfer of liquids and gasses. An additional channel called a port-void 397 is provided along the side of the cylindrical module, essentially parallel with the central, axial hole. Although a range of positions and shapes of the port-void 397 will function, the port-void 397 must be the same on every module, so that all of the port-void 397 line up to form a single, continuous port-void when the invention is in use.

[0108.] A portway 395 is provided in the main body 312 as a continuous perforated riser tube from bottom to top of the main body 312. The port-voids 397 of the various modules accommodate the portway 395.

[0109.] The system can be extended above ground level using the provided extension sections 322, which allow the addition of more modules, such as the single additional water-reservoir module 317 illustrated in FIG. 22, and the two additional water-reservoir modules 317 illustrated in FIG. 21. Each extension section 322 provides a portway 395 which lines up with and continues the portway 395 of the main body 312.

[0110.] Referring briefly to FIG. 24, a locking top 316 is provided to enclose the system, either at the ground-level surface 340 of the main body 312 or at the open end of one or more extension sections 322. The lower connector portion of each extension section 322 matches the connector portion of the locking top 316, and the upper connector portion of each extension section 322 matched the connector portion of the ground-level surface 340 of the main body 312. Therefore, the connector portion of the main body can accommodate either a locking top 316 or an extension section 322, and the locking top 316 can be placed either at the ground-level surface of the main body or at the top end of one or more extension sections 322. Because of this universality of connectors, any particular installation of the system can be configured to hold the

needed number of modules, and can be re-configured as needed after installation. The locking top 316 provides keyholes 910 for mounting or removing the top, and provides a porthole 920 aligned with the portway 395 below, allowing the temporary insertion of probes to measure conditions such as temperature, moisture, and the sounds or vibrations produced by, and indicating the presence of, insects. A locking tab 930 provides for secure but removable mounting of the locking top 316.

[0111.] Referring briefly to FIG. 28 & FIG. 38, radial slots 360 are provided for the cellulose-food module 314 and the moisture retaining and releasing sponge module 318 for the purposes of creating more surface area and passageways for insects. Referring briefly to FIG. 29 & FIG. 39, slots are provided on the top, bottom, and side surfaces of the refillable active-ingredient cartridge module 315 and the sealed cartridge module 313 for the same purposes.

[0112.] The refillable cartridge module 315 and the sealed cartridge module 313 cartridges may be filled with any variety of active ingredients or attractants, so the orchestrator of the system may choose which cartridge to employ in any particular instance. The one-time use sealed cartridge module 313, FIG. 39, provides a tamper-resistant cartridge for a single use. Because it is meant to be used only once, the cartridge remains sealed throughout its insertion into and removal from the system. In contrast, the reusable refillable active-ingredient cartridge 315, FIG. 29, may be added to, cleaned out, and so forth, when it is emptied or at any point during its use. Because it is meant to be refillable, the lid is removable rather than tamper-resistant like the one-time use cartridge.

[0113.] Referring briefly to FIG. 30 & FIG. 31, in this modular embodiment of the invention the central riser 94 is split into riser sections 394 incorporated into a bottom vent shaft 384 and a vent-shaft extension 335. In use, the vent shafts 394 of multiple, stacked sections line up to form a continuous riser shaft. The bottom vent shaft 384 has a flange having a flat top and an inverted-conical bottom shape to conform to the bottom of the main unit. The vent-shaft extension 335 has a flange of essentially wafer shape, which is perforated to allow passage of gasses and liquids. Both types of flanges perform a function of supporting the bottom surface of any of the modules, and provide a means of raising and lowering modules out of and into the main unit. Both types of flanges have a port-void 397 to line up with the overall port-void of the system in use.

[0114.] Referring briefly to FIG. 40, optionally a vent-shaft extraction tool 610 can be

provided for insertion and removal of modules for installation, inspection, and maintenance purposes. The vent shaft 394 of the vent-shaft extension 335 is provided with internal threads that conform to the threaded lower end of the vent-shaft extraction tool 610. The vent-shaft extension 335 supports a module, in use, and the module-and-extension assembly can be put in or taken out with the appropriate engagement and disengagement of the vent-shaft extraction tool 610.

[0115.] Referring briefly to FIG. 25, a cellulose wick 337 is provided to cover both the flange and the vent shaft 394 of each vent-shaft extension 335, in order to facilitate the distribution of moisture within the system. The configuration illustrated shows an installation having a cellulose-food module 314 at the bottom with a water-reservoir module 317 above. The cellulose wick 337 in contact with the flange and the shaft extension of the vent-shaft extension 335 absorbs water from the water-reservoir module 317 at a controlled rate, and allows that water to migrate through the perforations in the flange and the shaft to the top portions and the inner portions of the cellulose-food module 314.

[0116.] Referring to FIG. 26 & FIG. 27, illustrating exploded views of this modular embodiment of the invention, it can be seen that the main body 312, which is installed below ground up to the ground-level surface 340, accommodates two cellulose-food modules 314, the lower one mounted on a bottom vent shaft 384 and the upper one mounted on a vent-shaft extension 335, both having vent shafts 394. Cellulose wicks 337 are placed around the flanges and vent shafts. Above the ground-level surface 340, two extension sections 322 are mounted, the lower one accommodating another cellulose-food module 314, and the upper one accommodating a water-reservoir module 317. The slowly released moisture from the water reservoir will keep the cellulose-food modules moist. This installation is closed by a locking top 316 mounted to the terminal extension section. The locking top can be easily removed, with the proper key, and the water-reservoir module can be easily refilled as needed.

[0117.] Referring now to FIG. 41, another, optional means of providing extra hydration to the pest control system 300 is to provide a ground-water wick 710 placed into a hole that has been drilled, preferably down to the water table. This wick 710 will draw moisture up to the pest control system 300 if the moisture level inside the system is dryer than the moisture level deeper underground, which is likely. The ground-water wick 710 can be brought into contact with the portway 395, which can accept and distribute moisture through its perforations. The ground-

water wick 710 can be a cellulose wick wherein the wick itself is made of or includes cellulose material that acts as its own attractant to the termites. The wick doubles as (1) an attractant to the pests and (2) a source of absorbing groundwater and transferring it to any cellulose material. The wick is removable and may be extracted from the system once it has been saturated with groundwater and/or has served its purpose as an attractant to the termites.

[0118.] Referring now to FIG. 44, this modular embodiment of the invention can be placed into a hole formerly containing another bait station or pest control system, or can be a new installation as disclosed above. A retrofit installation through a concrete slab is illustrated, with an optional ground-water wick 710. Such a retrofit modification to an existing pest control system creates a higher surface area ratio of cellulose to soil. It is desirable to have a large amount of direct contact between the soil, in which the termites live and burrow, and the cellulose of the pest control system. The direct contact allows for an easier avenue for the termites to engage in the pest control system. In modifying an old, preexisting pest control system, the cap may be removed and the preexisting system replaced with the new system. In placing the new system in the previous hole, a soil additive may be added as a filler surrounding the new system. The soil additive doubles as a sealant, plugging in any gaps between the preexisting hole and new system, and as a manner of increasing the soil-to-cellulose surface area, as mentioned above. Upon placement of the new system and any desired soil additive into the preexisting concrete system, the old cap may be used to seal the new system underground.

[0119.] Referring to FIG. 42, another, optional provision is a "daisy chain" external hydration line connecting the several instances of the system, as a supplemental source of moisture for the system. Wood saturated with water is more attractive to termites, and so it may be desirable in certain circumstances to provide a larger source of water in the system to saturate the wood. An external water source 720, such as a well, pond, rain barrel, or water tap provides water via a hydration line 730.

[0120.] Referring now to FIG. 35, FIG. 36, & FIG. 37, another embodiment of the pest control system and method 400 provides an alternate-feature cap 416 in lieu of a locking top 316. The alternate-feature cap 416 mounts to either the ground-level surface 340 of the main body 312 or to the extension section 322, in the same way as the locking top 316, and therefore can be used to close various and changeable configurations of the system. The top surface of the alternate-feature cap 416, when mounted, sits at essentially the same level as the locking top 316,

which is essentially flush with the ground-level surface 340 or extension section 322. The enhanced features of the alternate-feature cap 416 are housed in a portion of the cap that hangs down from the top surface, and occupies the upper portion of the space inside the main body or extension section, as shown.

[0121.] Referring now to FIG. 33 & FIG. 34, the alternate-feature cap 416 provides various enhancements that may increase the productivity of the system. It may include, without limitation, a vibrator 806, which acts as an attractant to termites; a heating element 807, which controls the temperature and, accordingly, overall environment of the system; a battery bank 802 or solar panel 803 for power; and a sensor array 801 for monitoring the various conditions of the system. The sensor array 801 may include, without limitation, a microphone or camera to monitor the termite activity of the system. The alternate-feature cap 416 can provide an activity-indicator light or lights 805, optionally with a reflector 804. The light or lights 805 of the alternate-feature cap 416 may also be optionally adjusted to act as a further attractant to the insects, which are traditionally attracted to a light source.

[0122.] The sensor array 801 can be provided with such capabilities or features as an upward-facing camera and/or light meter, a motion detector, a gas sensor, a thermometer, a thermo-imaging sensor, a microphone, a rain gauge, a hydrometer, a GPS system, and a USB port. The sensor array 801 can optionally have data-storage, data-computation, and data-communication capabilities. The data captured by the sensor array 801 provides important information, such as timing information, temperature, humidity levels, and so forth, in maintaining the effectiveness of a given installation of the system, and in making decisions about ongoing and future courses of treatment. Appropriate analysis of the data captured by the sensor array 801 may lead to altering of the overall environment of the system, such as the temperature, humidity, and so forth, in a manner that creates a more attractive environment for the termites.

[0123.] Referring to FIG. 45, another, optional provision is an in-port sensor 492 connected via a down-port lead 491 to the alternate-feature cap 416 in an installation of the system. The placement of such an in-port sensor 492 at the bottom of, or somewhere along the path of the portway 395, might be desirable in several circumstances, such as when, as illustrated, the alternate-feature cap 416 is located above ground level on an extension section and is therefore exposed to different heating and cooling and other effects than the underground main body 312. Also, some types of measurement might be affected by heat, sound, or motion

self-generated by the alternate-feature cap 416, masking and interfering with measurement of conditions elsewhere in the system. The down-port lead 491 can be a separate wire or cable placed inside the portway 395, as illustrated, or can be wires or conducting traces incorporated into the portways 395 of the main bodies 312 and the extension sections 322 during manufacture.

[0124.] Referring to FIG. 43, another, optional provision is an external power source chain for several instances of the system, which serves a dual purpose. First, it serves to provide electric power to the overall system, which may require power for various monitoring activities of the system. Second, the electromagnetic current itself acts as an attractant to the termites and may draw more pests into the system. Power from an external power source 740 is passed through a transformer 750 in order to bring it to a low voltage that is appropriate for any electronic components and is safely transmitted on the buried electrical cable 760 providing power to several instances of the system while creating a field of electromagnetic current detectable by insects.

[0125.] Referring now to FIGS. 46-55, an alternative embodiment of an above-ground pest control system 500 provides a system and method of monitoring and controlling cellulose-consuming pests in a predetermined location above ground level or in the walls of buildings, such as interior or exterior walls of residential or commercial buildings, aboard boats and watercraft, directly on infested support members like beams, studs, and joists, attached to landscape features like timbers, fences, and sheds, and on infested trees. A moisture-retaining member is positioned in the upper portion above an uppermost of the bait units. A removable cap has an opening allowing liquid, such as water, to be poured into the main body to moisten the bait units and make them more attractive to foraging insects. If consumption of the cellulose material is detected, the bait units may be substituted with a bait material containing poisonous substance, or altered by adding an interlocking, additional main box body, containing additional cellulose material or poisonous substance, as discussed in more detail below. The pests consume the bait and carry the poison to the colonies, as in the embodiments discussed above.

[0126.] The pest control above ground system assembly comprises a main box body 541, a plurality of axially aligned bait units 314 detachably engageable with the main box body 541, a removable cap 316 or alternate cap 416 fitted over the top of the main box body 541, and, optionally, a liquid-reservoir module 317 detachably mounted in the main box body 541 between the uppermost bait unit and the cap.

[0127.] Referring briefly to FIG. 55, the pest control above ground system 500 is intended to be mounted either to the wall which covers an infested area, or directly to an infested member such as a beam, stud, joist, or rafter, in residential and commercial buildings, in wooden vessels such as boats, and on landscaping features such as infested trees, fences, or sheds.

[0128.] The main box body 541 forms a box intended to be mounted on an internal or external wall covering an infested area such as a stud, or directly on a structure such as a beam, rafter, or column which is infested. In use, when mounted on a wall, the main box body 541 has an open front surface and a partially open back surface, which is closest to the wall. A mounting tab 542 or tabs are provided for attachment to the wall. The side surfaces of the main box body 541 are impermeable to light and air flow. The top surface of the main box body 541 accommodates a locking cap 316 or, optionally an alternate-feature cap 416 as disclosed below, and is otherwise impermeable to light and air flow. The bottom surface of the main box body 541 also accommodates a locking cap 316, and is otherwise impermeable to light and air flow. The locking cap 316 can be made with a universal, interchangeable design, so that the same cap can be used either at the top or at the bottom. The back surface of the main box body 541 is partially open to allow travel of termites between the wall over an infested area and the interior of the main box body. The back surface around its perimeter should provide enough solid face upon which to mount an adhesive foam gasket 543. The rest of the back surface can provide a few braces or bars for structural support, which may also serve as an attractive area for termite foraging activity. The open front surface of the main box body 541 is sealed in two ways. A transparent window 550 is provided to cover and seal the open front surface, to allow occasional visual inspection of the interior of the main box body, while preventing any significant air flow. A hinged door 544, which is impermeable to light and air flow, is provided to cover and close the front surface of the main box body 541. A door handle 545 is provided on the hinged door 544, and a magnetic latch 546 is provided to keep the hinged door 544 tightly closed except when opened for inspection. The presence of light or air flow will tend to repel, rather than attract, the termites. The main box body 541, with locking caps 316 in place and with the hinged door 544 closed, is therefore impermeable to light and air flow except at its partially open back surface. The adhesive foam gasket 543 forms a light- and air-tight seal between the perimeter of the back surface and the wall, and also compensates for irregularities on the wall surface.

[0129.] The main box body 541 is configured to carry a plurality of bait units 314, which

can be of the same size or of different sizes. A module stop 549 is provided at the bottom of the assembly to support the stack of bait units. The bait units 314 are formed from cellulose-containing substance, which is particularly attractive to subterranean and above-ground foraging pests, and may be formed as unitary bodies from a cellulose-containing substance. The moisture-retaining member can be formed to match the configuration of the uppermost bait unit and fit within the upper portion of the main box body 541. The moisture-retaining member is positioned above the uppermost bait unit. The moisture-retaining member can be formed from an open-cell foam material, such as sponge. The bait units 314 are stacked vertically inside the main box body. The lower bait units can be one or more in number, and may composed of cellulose-containing bait material, or may alternatively be composed of active-ingredient poisonous material or an alternative material that further serves to control the environment of the system. Additional bait units, which may be comprised of bait, active-ingredient, or alternative material, are stacked vertically, and can be also one or more in number. The bait units are vertically aligned such that the openings in the bait units define a central passageway for a vent shaft 394. The vent shaft 394 allows circulation of moisture to the bait unit so that they are kept moist to attract the termites. The moisture penetrates through openings and rises through the vent shaft 394.

[0130.] In use, the user places cellulose-containing bait units 314 inside the main box body 541. The moisture-retaining member made of sponge material is placed above the uppermost bait unit. Liquid is added to the bait units to moisten the cellulose material.

[0131.] In one aspect of the invention, it is preferred that the cellulose-containing bait units remain undisturbed for a period of time to give the foraging pests a chance to locate and feed on the cellulose. The user may occasionally inspect the baited assemblies. The user may use a sensor to check the conditions in the assembly. The collected data can be wirelessly sent via a wireless transmitter to a remote location, for instance a monitoring company. The user inspects the baited assemblies to ascertain whether the bait units 314 have attracted termites, or have otherwise affected the natural environment of the station. After the feeding has begun, poisonous termite bait with active ingredients may then be added to the assembly. If the system is used only for the purpose of monitoring the subterranean activity and detecting the presence of termites, no toxic bait need be added. If the user detects no activity in the system, the assembly can be relocated to a new site. Once the active-ingredient bait has been placed in the main box

body 541, the termites feeding on the bait bring the bait to the colonies. As the toxic substance is consumed by termites, the bait with the cellulose substance is added to the assembly for a period of time for the bait to have the intended toxic effect on the colony. The system is periodically inspected to determine whether termites are active. Depending on the activity and the speed of consumption of the cellulose-containing material and the bait, a larger or smaller system can be substituted in the selected location. If the cellulose-containing material is consumed within a matter of days, a larger assembly may be needed to hold a larger quantity of cellulose-containing substance.

[0132.] Referring briefly to FIG. 54, two or more main box bodies 541 can be attached together to form a larger assembly. Two tail rails 547 are formed into the top surface of the main box body 541, and two corresponding pin rails are formed upon the bottom surface of the main box body 541, allowing a dovetail connection. The distribution of the pin and tail rails on the top or bottom surfaces could be switched. When joining two assemblies together, the locking caps 316 at the bottom surface of the upper unit and the top surface of the lower unit are removed, and a continuous inner area is formed.

[0133.] The easy removal, inspection, and/or replacement of the individual bait units 314, which minimizes disturbance of the overall system, allows for the user to potentially alter the cellulose or poison content of the system by, for example, replacing a cellulose bait unit with an active-ingredient bait unit when the termites are foraging, or by replacing an active-ingredient bait unit with a cellulose bait unit when the user wishes to attract more termites to the station. The units can be visually inspected through the transparent window 550 behind the hinged door 544. Although doing so will allow a certain amount of light into the assembly for a short period, there is no additional air infiltration allowed. Any air turbulence caused by the opening of the hinged door 544, and any air turbulence in the environment, is blocked by the transparent window 550.

[0134.] The toxicant in the bait is preferably of the delayed-action type, or an insect growth regulator, pathogen, or metabolic inhibitor. Preferably, it comprises a nontoxic cellulose-containing bait composition to which the pesticide toxicant is added. Provided modules include a cellulose-food module 314, a moisture retaining and releasing sponge module, a refillable cartridge module, a one-time use or sealed cartridge module, and a liquid-reservoir module 317. The refillable cartridge module and the one-time use or sealed cartridge module may be

comprised of active-ingredient, cellulose, or other desired material, such as naphthalene. Each module is essentially cylindrical in shape, with two void spaces or holes or channels along the long dimension of the cylindrical module. A central, axial vent hole accommodates the vent shaft 394, allowing movement of gasses and liquids among the modules, as disclosed in detail above. This central vent hole is likely to be essentially circular or cylindrical to accommodate the vent shafts, but to remain close to the vent shafts for efficient transfer of liquids and gasses. An additional channel called a port-void is provided along the side of the cylindrical module, essentially parallel with the central, axial hole. Although a range of positions and shapes of the port-void will function, the port-void must be the same on every module, so that all of the port-voids line up to form a single, continuous port-void when the invention is in use.

[0135.] A portway 395 is provided in the main box body 541 as a continuous perforated riser tube from bottom to top of the main body. The port-voids of the various modules accommodate the portway 395.

[0136.] The refillable cartridge module and the sealed cartridge module cartridges may be filled with any variety of active ingredients or attractants, so the orchestrator of the system may choose which cartridge to employ in any particular instance. The one-time use sealed cartridge module provides a tamper resistant cartridge for a single use. Because it is meant to be used only once, the cartridge remains sealed throughout its insertion into and removal from the system. In contrast, the reusable refillable active-ingredient cartridge may be added to, cleaned out, and so forth, when it is emptied or at any point during its use. Because it is meant to be refillable, the lid is removable rather than tamper-resistant like the one-time use cartridge.

[0137.] In use, the vent shafts 394 of multiple, stacked sections line up to form a continuous riser shaft.

[0138.] A locking cap 316 is provided to enclose the system. The locking cap 316 provides keyholes 910 for mounting or removing the top, and provides a porthole 920 aligned with the portway 395 below, allowing the temporary insertion of probes to measure conditions such as, without limitation, temperature, moisture, gas emissions, and the sounds or vibrations produced by, and indicating the presence of, insects. A locking tab provides for secure but removable mounting of the locking cap 316.

[0139.] Another embodiment of the pest control above ground system and method 500 provides an alternate-feature cap 416 in lieu of a locking cap 316. The alternate-feature cap 416

mounts to the main box body 541 in the same way as the locking cap 316, and therefore can be used for various and changeable configurations of the system. The top surface of the alternate-feature cap 416, when mounted, sits at essentially the same level as the locking cap 316, which is essentially flush with the top surface of the main box body 541. The enhanced features of the alternate-feature cap 416 are housed in a portion of the cap that hangs down from the top surface, and occupies the upper portion of the space inside the main body, as shown.

[0140.] The alternate-feature cap 416 provides various enhancements that may increase the productivity of the system, as it provides in the embodiments discussed above. It may include, without limitation, a vibrator, which acts as an attractant to termites; a heating element, which controls the temperature and, accordingly, overall environment of the system; a battery bank or solar panel for power, or for emission of power current; and a sensor array for monitoring the various conditions of the system. The sensor array may include, without limitation, a microphone or camera to monitor the termite activity of the system. The alternate-feature cap 416 can provide an activity-indicator light or lights, optionally with a reflector. The light or lights of the alternate-feature cap 416 may also be optionally adjusted to act as a further attractant to the insects, which are traditionally attracted to a light source.

[0141.] The sensor array can be provided with such capabilities or features as an upward-facing camera and/or light meter, a motion detector, a gas sensor, a thermometer, a thermo-imaging sensor, a microphone, a rain gauge, a hydrometer, a GPS system, and a USB port. The sensor array can optionally have data-storage, data-computation, and data-communication capabilities. The data captured by the sensor array provides important information, such as timing information, temperature, humidity levels, and so forth, in maintaining the effectiveness of a given installation of the system, and in making decisions about ongoing and future courses of treatment. The alternate-feature cap 416 may either be hard-wired for transmission or data, or may be configured wirelessly to allow for wireless transmission of data. Appropriate analysis of the data captured by the sensor array may lead to altering of the overall environment of the system, such as the temperature, humidity, and so forth, in a manner that creates a more attractive environment for the termites.

[0142.] Many other changes and modifications can be made in the system and method of the present invention without departing from the spirit thereof. I pray that my rights to the present invention be limited only by the scope of the appended claims.

Claims

I Claim:

1. A pest control system for controlling cellulose-consuming pests in a pre-determined location, the pest control system comprising:

(i) a main body having a plurality of spaced blades meeting at a lowermost point and defining a sharp bottom point, defining an essentially cylindrical area, adapted to be placed into the ground, and having a ground-level surface, in use;

(ii) a portway extending vertically along the side of the cylindrical inner area of said main body, adapted to allow continuing access to the lower portion of said main body, in use;

(iii) at least one cellulose-food module fitted in the inner area of said main body, and having a central essentially cylindrical void and a peripheral essentially cylindrical void;

(iv) a bottom vent shaft section having a vent shaft adapted to allow vertical distribution of gases and liquids and having a flange adapted to facilitate removal and reinstallation of said cellulose-food module;

(v) at least one vent-shaft extension having a vent shaft adapted to coaxially join the vent shaft originating from said bottom vent shaft section, forming a longer vent shaft, and having a perforated flange to allow vertical distribution of gases and liquids; and

(vi) a locking top adapted to be removably attached to said main body at said ground-level surface;

where, in use, said cellulose-food modules are supported by the flanges of said bottom vent shaft section and said vent-shaft extension, gases and liquids are distributed vertically within said main body by said vent shafts, said cellulose modules can be installed, removed, and re-installed, and monitoring of said system can be performed through said portway.

2. The pest control system of claim 1, further comprising: (vii) at least one extension section having an incorporated portway adapted to continue the portway originating from said bottom vent shaft section, adapted to removable locking placement between said ground-level surface and said locking top, and adapted to continue and extend above ground level the essentially cylindrical inner area of said main body.

3. The pest control system of claim 1, further comprising: (vii) at least one cellulose wick adapted for placement around said vent shafts and placement over the flange of said vent-shaft

extensions, and adapted to promote distribution of gases and liquids within said pest control system.

4. The pest control system of claim 1, further comprising: (vii) at least one water-reservoir module adapted to store water and release water at a controlled rate, and having a port-void to accommodate said portway.

5. The pest control system of claim 1, further comprising: (vii) at least one sponge module adapted to absorb and store water and release water at a controlled rate, and having a port-void to accommodate said portway.

6. The pest control system of claim 1, further comprising: (vii) at least one refillable cartridge module having a port-void to accommodate said portway.

7. The pest control system of claim 1, further comprising: (vii) at least one sealed cartridge module having a port-void to accommodate said portway.

8. The pest control system of claim 1, further comprising: (vii) a vent-shaft extraction tool adapted to engage and disengage said bottom vent shaft, allowing installation, removal, and re-installation of said modules.

9. The pest control system of claim 1, further comprising: (vii) a plurality of radial slots in said cellulose-food module and said sponge module, adapted to allow enhanced ventilation and migration of insects.

10. The pest control system of claim 1, further comprising: (vii) a ground-water wick adapted to be placed in a drilled hole below said main body, and adapted to draw moisture from deeper soil levels into said main body.

11. The pest control system of claim 1, further comprising: (vii) an external water source and hydration line adapted to supply water to a plurality of main bodies through said hydration line.

12. The pest control system of claim 1, further comprising:

(vii) an external power source;

(viii) a transformer; and

(ix) buried electrical cable, adapted to supply electric current to a plurality of said main bodies.

13. The pest control system of claim 1, further comprising: (vii) an alternate-feature cap adapted to capture, store, and transmit data from a sensor array.

14. The pest control system of claim 1, further comprising: (vii) an alternate-feature cap

adapted to provide heat, as needed, inside the inner cylindrical area of said main body and said extension sections.

15 . The pest control system of claim 1, further comprising: (vii) an alternate-feature cap adapted to provide vibration, as needed, inside the inner cylindrical area of said main body and said extension sections.

16 . The pest control system of claim 1, further comprising: (vii) an in-port sensor adapted to be placed inside said portway, and to convey sensor data up said portway via a down-port lead.

17 . A pest control method for controlling cellulose-consuming pests in a pre-determined location, the pest control method comprising:

(i) providing a pest control system, in turn comprising:

(a) a main body having a plurality of spaced blades meeting at a lowermost point and defining a sharp bottom point, defining an essentially cylindrical inner area, adapted to be placed into the ground, and having a ground-level surface, in use;

(b) a portway extending vertically along the side of the cylindrical inner area of said main body, adapted to allow continuing access to the lower portion of said main body, in use;

(c) at least one cellulose-food module fitted in the inner area of said main body, and having a central essentially cylindrical void and a peripheral essentially cylindrical void;

(d) a bottom vent shaft section having a vent shaft adapted to allow vertical distribution of gases and liquids and having a flange adapted to facilitate removal and reinstallation of said cellulose-food module;

(e) at least one vent-shaft extension having a vent shaft adapted to coaxially join the vent shaft originating from said bottom vent shaft section, forming a longer vent shaft, and having a perforated flange to allow vertical distribution of gases and liquids; and

(f) a locking top adapted to be removably attached to said main body at said ground-level surface;

where, in use, said cellulose-food modules are supported by the flanges of said bottom vent shaft section and said vent-shaft extension, gases and liquids are

distributed vertically within said main body by said vent shafts, said cellulose-food modules can be installed, removed, and re-installed, and monitoring of said system can be performed through said portway;

(ii) installing said main bodies of said pest control system in the ground of the pre-determined location;

(iii) installing at least one said cellulose-food module into each said main body;

(iv) monitoring said pest control system for presence of cellulose-consuming pests;

(v) adding a poison to the inner cylindrical area of each said main body; and

(vi) monitoring said pest control system for elimination of cellulose-consuming pests.

18. The pest control method of claim 17, further comprising providing said pest control system further comprising: (g) at least one extension section.

19. The pest control method of claim 17, further comprising providing said pest control system further comprising: (g) an alternate-feature cap.

20. The pest control method of claim 17, further comprising providing said pest control system further comprising: (g) a down-port lead connected to an in-port sensor.

21. A pest control above ground system assembly for controlling cellulose-consuming pests in a pre-determined location, the pest control above ground system assembly comprising:

(i) a main box body adapted to be mounted to a wall, defining an inner area, having an open front, a partially open back, and sides, top, and bottom surfaces impermeable to light and air flow;

(ii) a hinged door impermeable to light and air flow covering said front of said main box body;

(iii) a magnetic latch adapted to keep said hinged door closed against said main box body;

(iv) a door handle affixed to said hinged door, adapted to allow opening of said hinged door;

(v) at least one mounting tab adapted for mounting said main box body to a wall;

(vi) an adhesive foam gasket affixed to said partially open back of said main box body, adapted to create a seal with the wall which is tamper-proof and impermeable to light and air flow;

(vii) a transparent window impermeable to air flow forming a front surface of said

main box body;

(viii) a portway extending vertically along the side of the inner area of said main box body, adapted to allow continuing access to the inner portion of said main box body, in use;

(ix) at least one cellulose-food module fitted in the inner area of said main box body, and having a central essentially cylindrical void and a peripheral essentially cylindrical void;

(x) a vent shaft adapted to allow for insect travel and for vertical distribution of gases and liquids within and between said cellulose-food modules;

(xi) a locking top adapted to be removably attached to said main box body at said top surface; and

(xii) a module stop placed inside and near said bottom surface of said main box body, adapted to support said cellulose-food modules;

where, in use, said cellulose-food modules are supported by said module stop; gases and liquids are distributed vertically within said main box body by said vent shaft; said cellulose-food modules can be installed, removed, and re-installed; and monitoring of said system can be performed through said portway.

22 . The pest control above ground system assembly of claim 21, further comprising: (xiii) a locking bottom adapted to be removably attached to said main box body at said bottom surface.

23 . The pest control above ground system assembly of claim 21, further comprising: (xiii) two pin rails on said bottom surface on said bottom surface of said main box body, and two corresponding tail rails on said top surface of said main box body, adapted to facilitate joining of said main box bodies.

24 . The pest control above ground system assembly of claim 21, further comprising: (xiii) an alternate-feature cap adapted to capture, store, and transmit data from a sensor array.

25 . The pest control above ground system assembly of claim 21, further comprising: (xiii) an alternate-feature cap adapted to provide at least one of heat or vibration, as needed, inside the inner cylindrical area of said main body and said extension sections.

26 . The pest control above ground system assembly of claim 21, further comprising: (xiii) at least one liquid-reservoir module adapted to store liquid, such as water, and release said liquid at a controlled rate, and having a port-void to accommodate said portway.

27 . The pest control above ground system assembly of claim 21, further comprising: (xiii) at least one sponge module adapted to absorb and store liquid, such as water, and release said liquid at a controlled rate, and having a port-void to accommodate said portway.

28 . The pest control above ground system assembly of claim 21, further comprising: (xiii) at least one refillable cartridge module having a port-void to accommodate said portway.

29 . The pest control above ground system assembly of claim 21, further comprising: (xiii) at least one sealed cartridge module having a port-void to accommodate said portway.

30 . The pest control above ground system assembly of claim 21, further comprising: (xiii) a plurality of radial slots in said cellulose-food module and said sponge module, adapted to allow enhanced ventilation and migration of insects.

31 . A pest control method for controlling cellulose-consuming pests in a pre-determined location, the pest control method comprising:

(i) providing a pest control above ground system assembly, said pest control above ground system assembly in turn comprising:

(a) a main box body adapted to be mounted to a wall, defining an inner area, having an open front, a partially open back, and sides, top, and bottom surface impermeable to light and air flow;

(b) a hinged door impermeable to light and air flow covering said front of said main box body;

(c) a magnetic latch adapted to keep said hinged door closed against said main box body;

(d) a door handle affixed to said hinged door, adapted to allow opening of said hinged door;

(e) at least one mounting tab adapted for mounting said main box body to a wall;

(f) an adhesive foam gasket affixed to said partially open back of said main box body, adapted to create a seal with the wall which is tamper-proof and impermeable to light and air flow;

(g) a transparent window impermeable to air flow forming a front surface of said main box body;

(h) a portway extending vertically along the side of the inner area of said main

box body, adapted to allow continuing access to the inner portion of said main box body, in use;

(i) at least one cellulose-food module fitted in the inner area of said main box body, and having a central essentially cylindrical void and a peripheral essentially cylindrical void;

(j) a vent shaft adapted to allow for insect travel and for vertical distribution of gases and liquids within and between said cellulose-food modules;

(k) a locking top adapted to be removably attached to said main box body at said top surface; and

(l) a module stop placed inside and near said bottom surface of said main box body, adapted to support said cellulose-food modules;

where, in use, said cellulose-food modules are supported by said module stop, gases and liquids are distributed vertically within said main box body by said vent shaft, said cellulose-food modules can be installed, removed, and re-installed, and monitoring of said system can be performed through said portway;

(ii) installing said main box bodies of said pest control above ground system on the walls of the pre-determined location;

(iii) installing at least one said cellulose-food module into each said main box body;

(iv) monitoring said pest control above ground system for presence of cellulose-consuming pests;

(v) adding a poison to the inner cylindrical area of each said main box body; and

(vi) monitoring said pest control above ground system for elimination of cellulose-consuming pests.

32 . The pest control above ground system method of claim 31, said pest control above ground assembly further comprising further comprising: (m) a locking bottom adapted to be removably attached to said main box body at said bottom surface.

33 . The pest control above ground system method of claim 31, said pest control above ground assembly further comprising further comprising: (m) two pin rails on said bottom surface of said main box body, and two corresponding tail rails on said top surface of said main box body, adapted to facilitate joining of said main box bodies.

34 . The pest control above ground system method of claim 31, said pest control above

ground assembly further comprising further comprising: (m) an alternate-feature cap adapted to capture, store, and transmit data from a sensor array.

35 . The pest control above ground system method of claim 31, said pest control above ground assembly further comprising further comprising: (m) an alternate-feature cap adapted to provide at least one of heat or vibration, as needed, inside the inner cylindrical area of said main body and said extension sections.

36 . The pest control above ground system method of claim 31, said pest control above ground assembly further comprising further comprising: (m) at least one liquid-reservoir module adapted to store liquid, such as water, and release said liquid at a controlled rate, and having a port-void to accommodate said portway.

37 . The pest control above ground system method of claim 31, said pest control above ground assembly further comprising further comprising: (m) at least one sponge module adapted to absorb and store liquid, such as water, and release said liquid at a controlled rate, and having a port-void to accommodate said portway.

38 . The pest control above ground system method of claim 31, said pest control above ground assembly further comprising further comprising: (m) at least one refillable cartridge module having a port-void to accommodate said portway.

39 . The pest control above ground system method of claim 31, said pest control above ground assembly further comprising further comprising: (m) at least one sealed cartridge module having a port-void to accommodate said portway.

40 . The pest control above ground system method of claim 31, said pest control above ground assembly further comprising further comprising: (m) a plurality of radial slots in said cellulose-food module and said sponge module, adapted to allow enhanced ventilation and migration of insects.

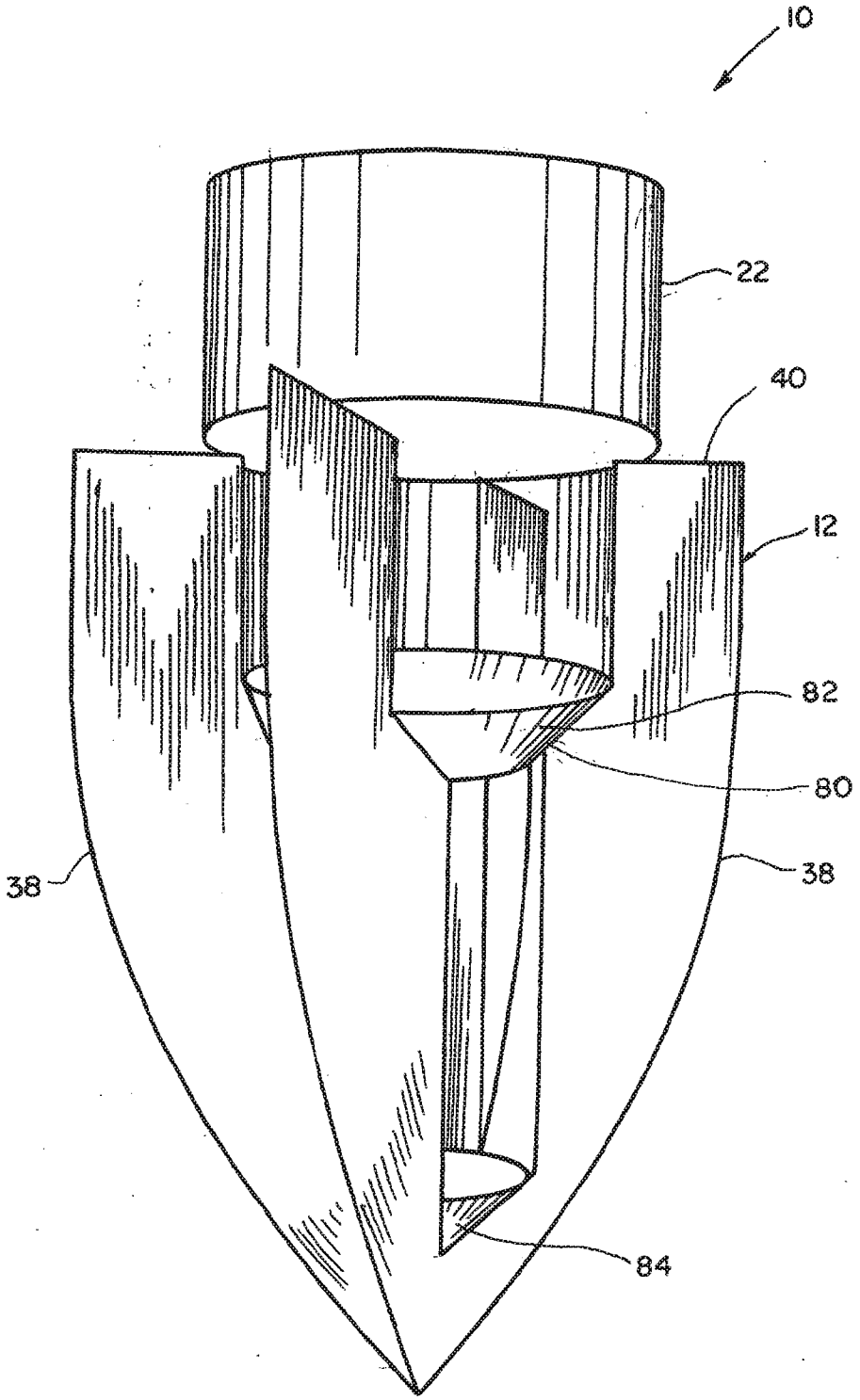


FIG. 1

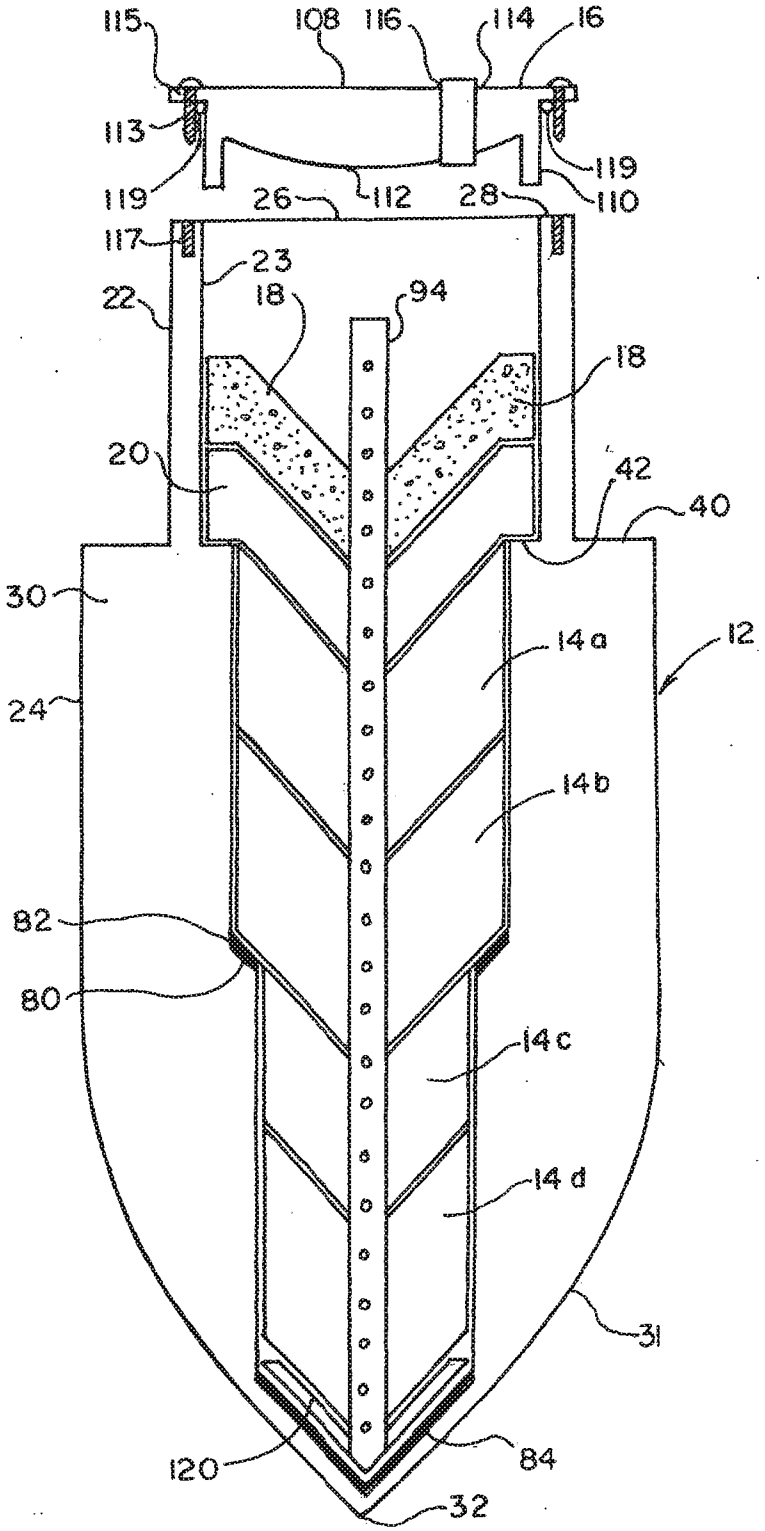

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FIG. 2

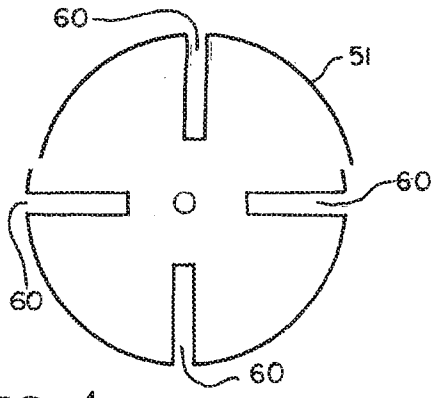

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FIG. 4

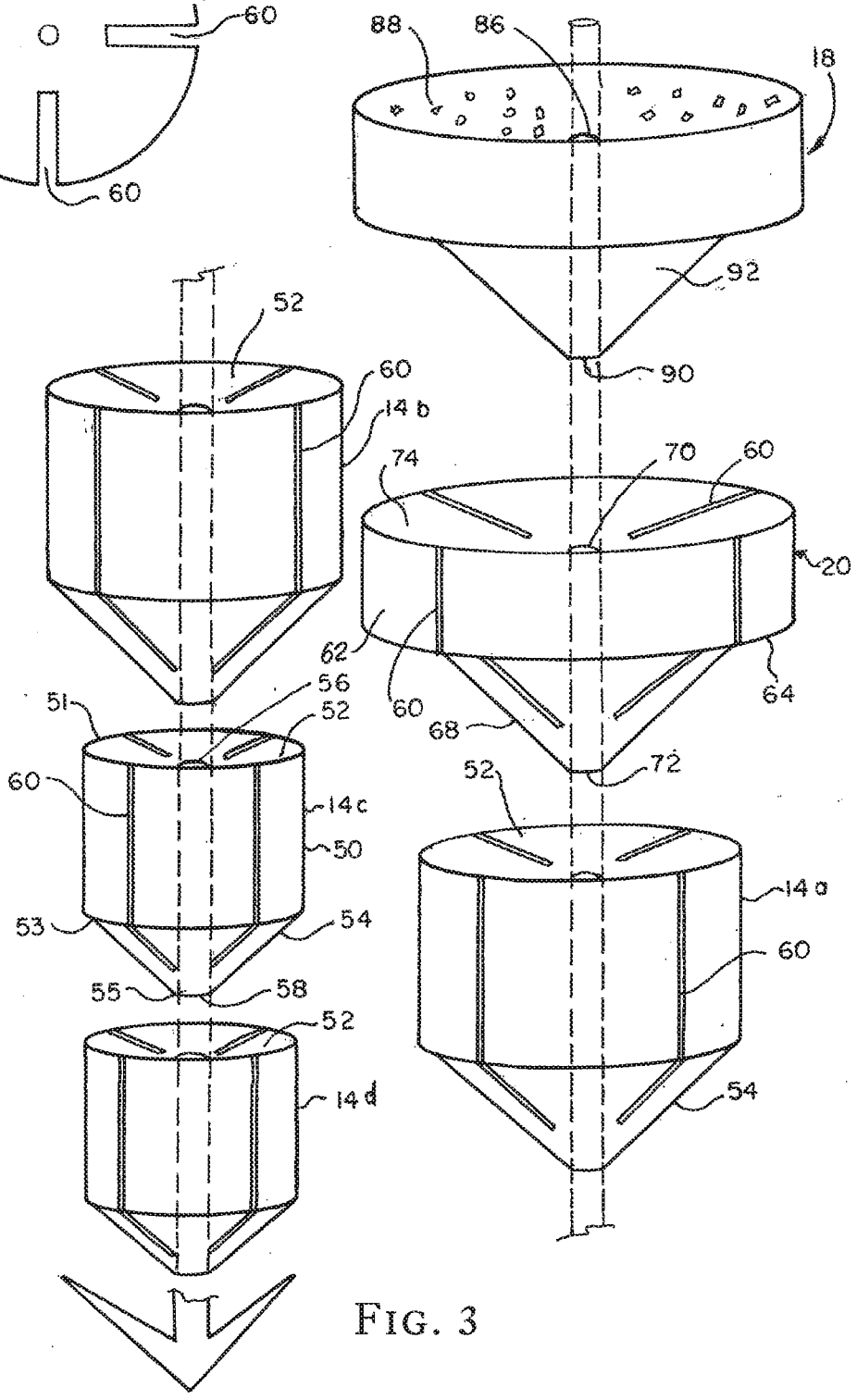

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FIG. 3

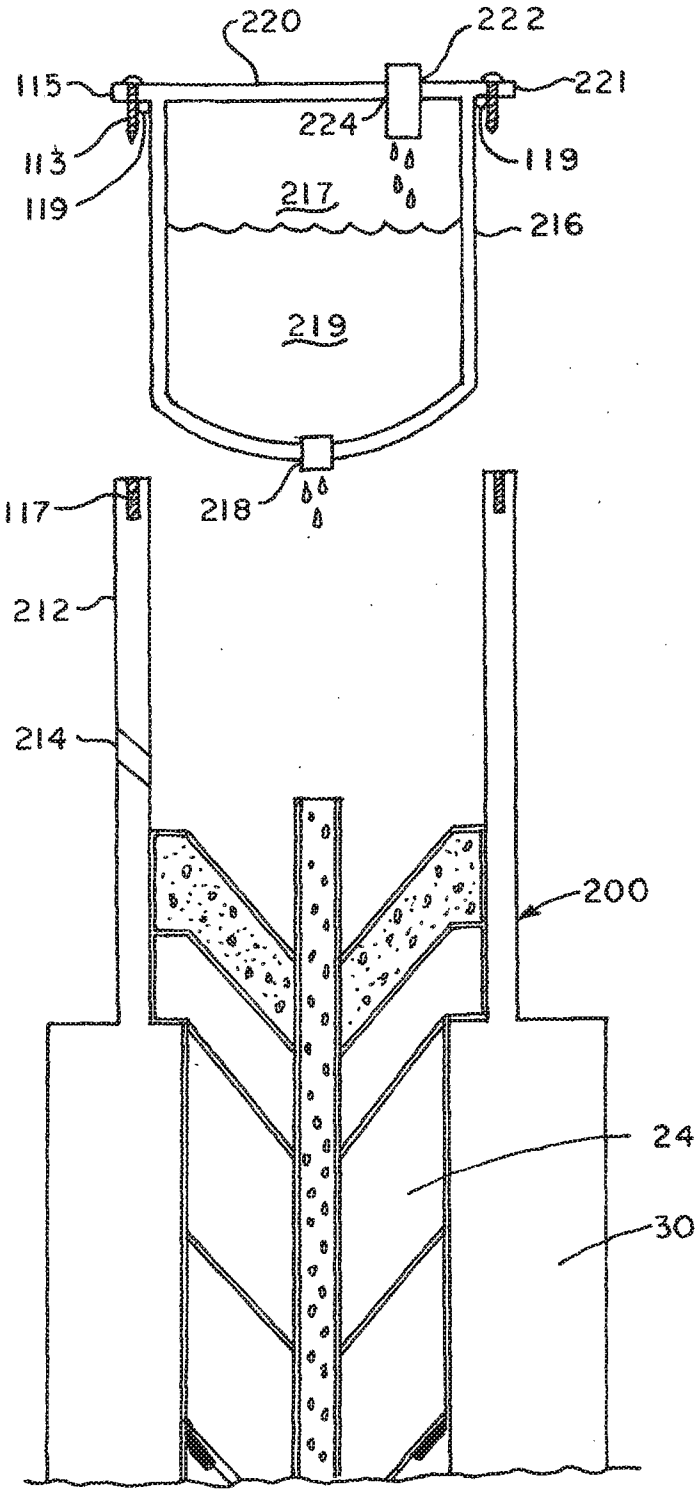

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FIG. 5

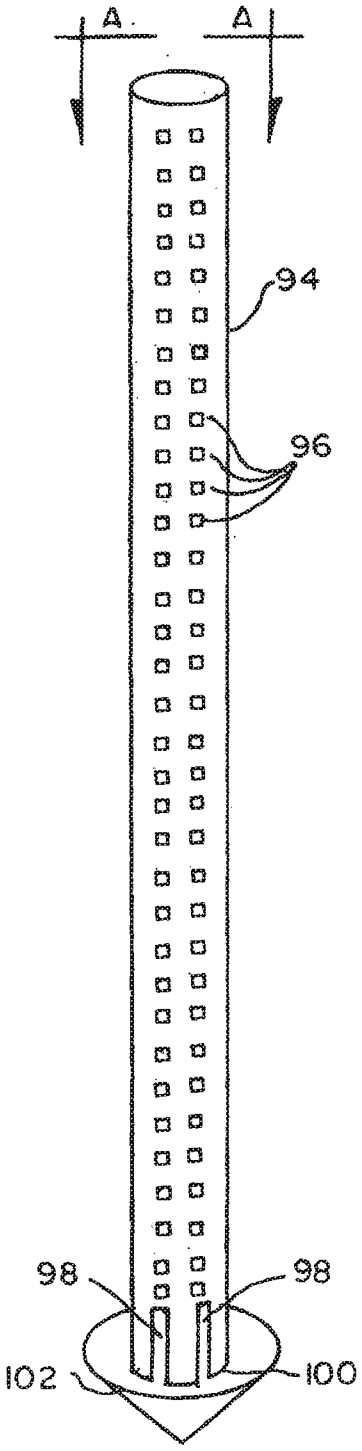


FIG. 6

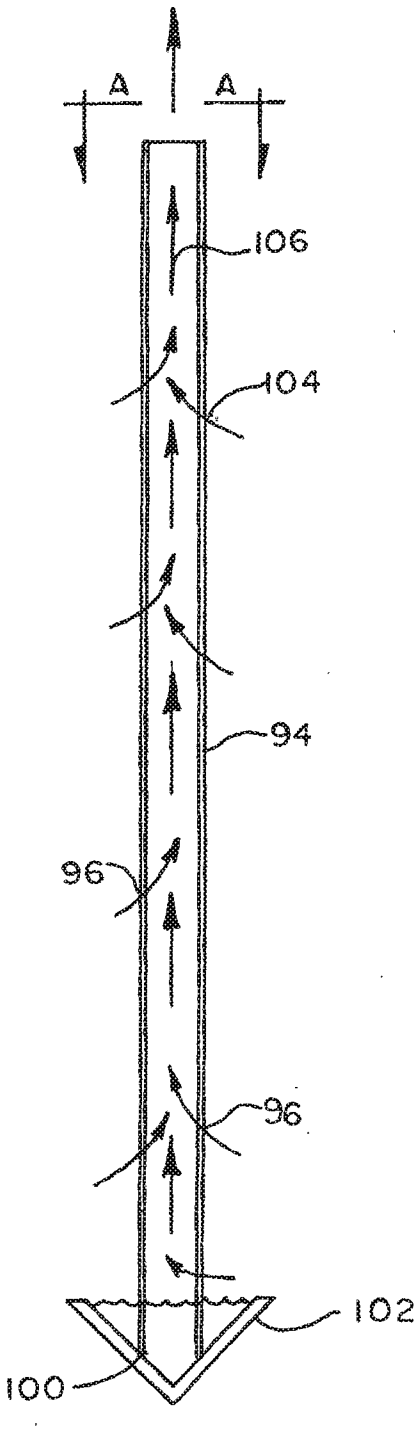


FIG. 7

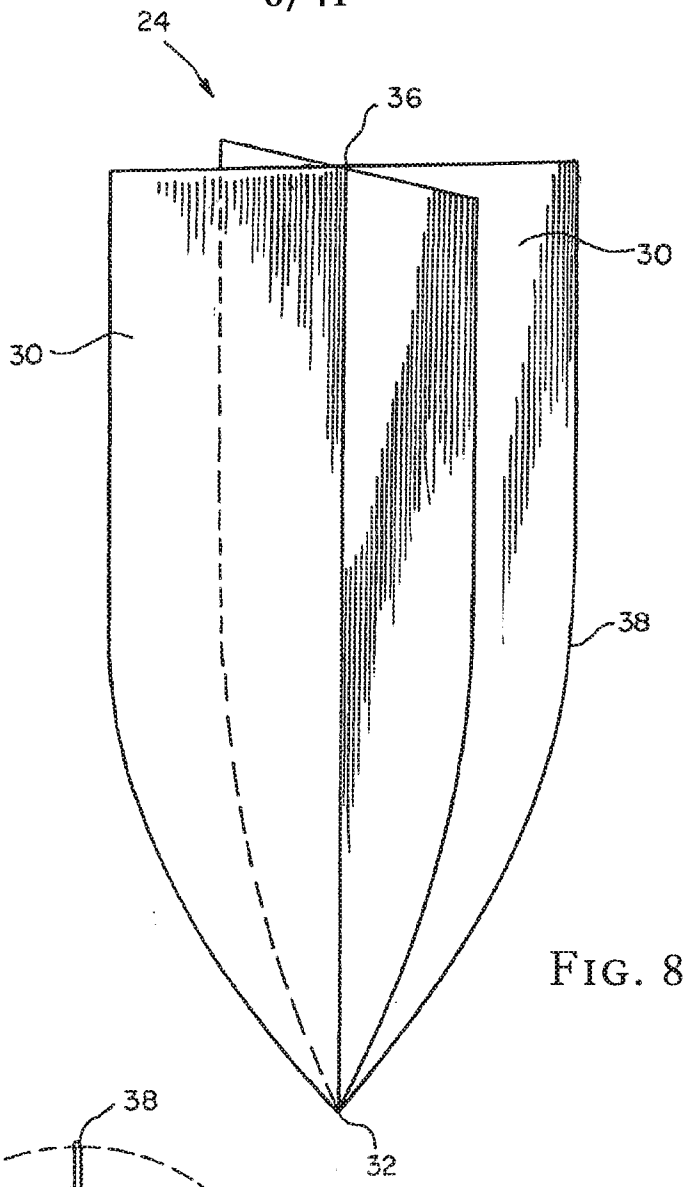


FIG. 8

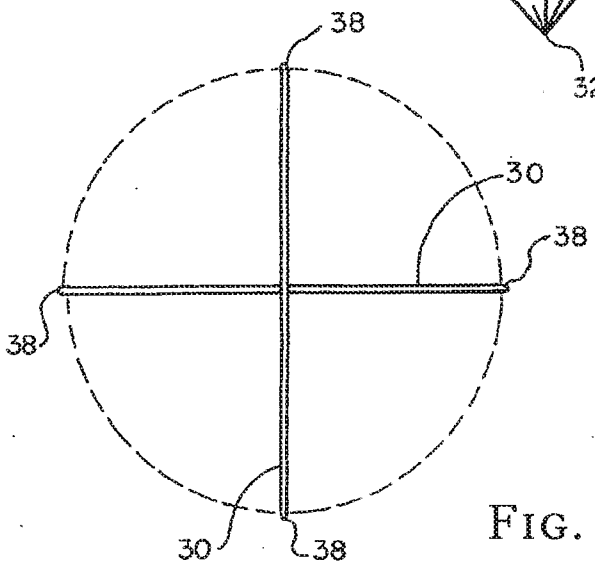


FIG. 9

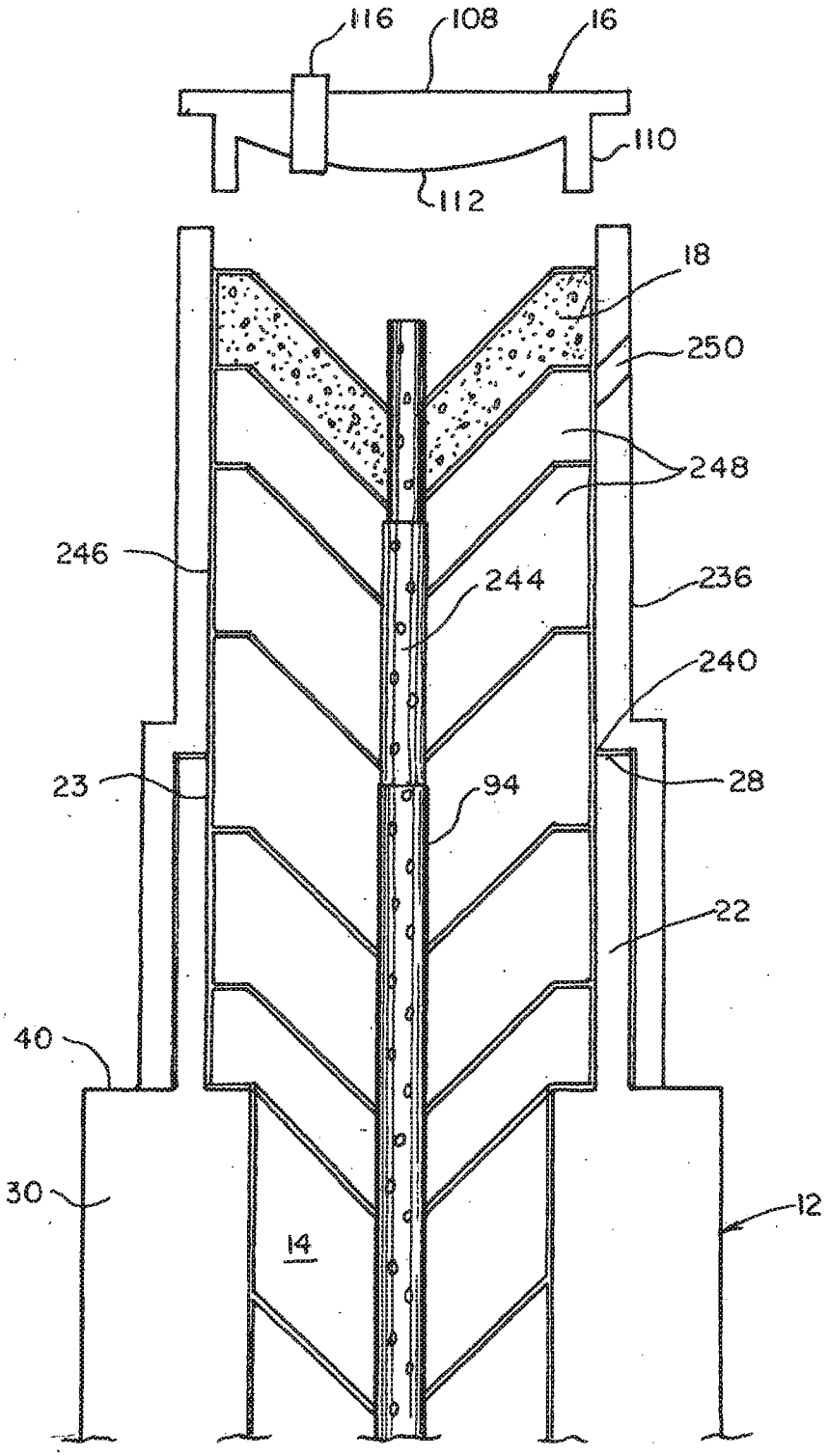

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FIG. 10

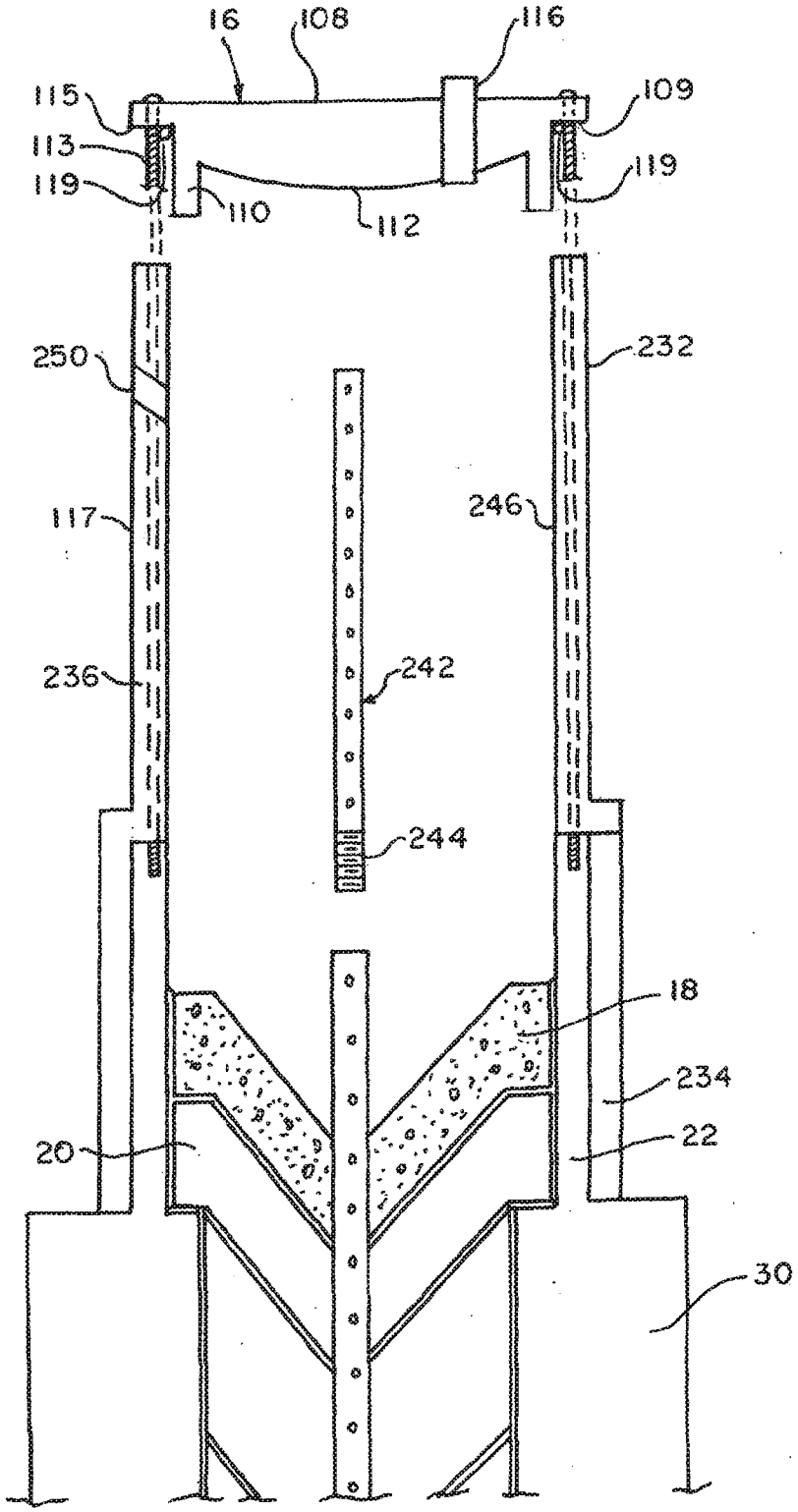

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FIG. 11

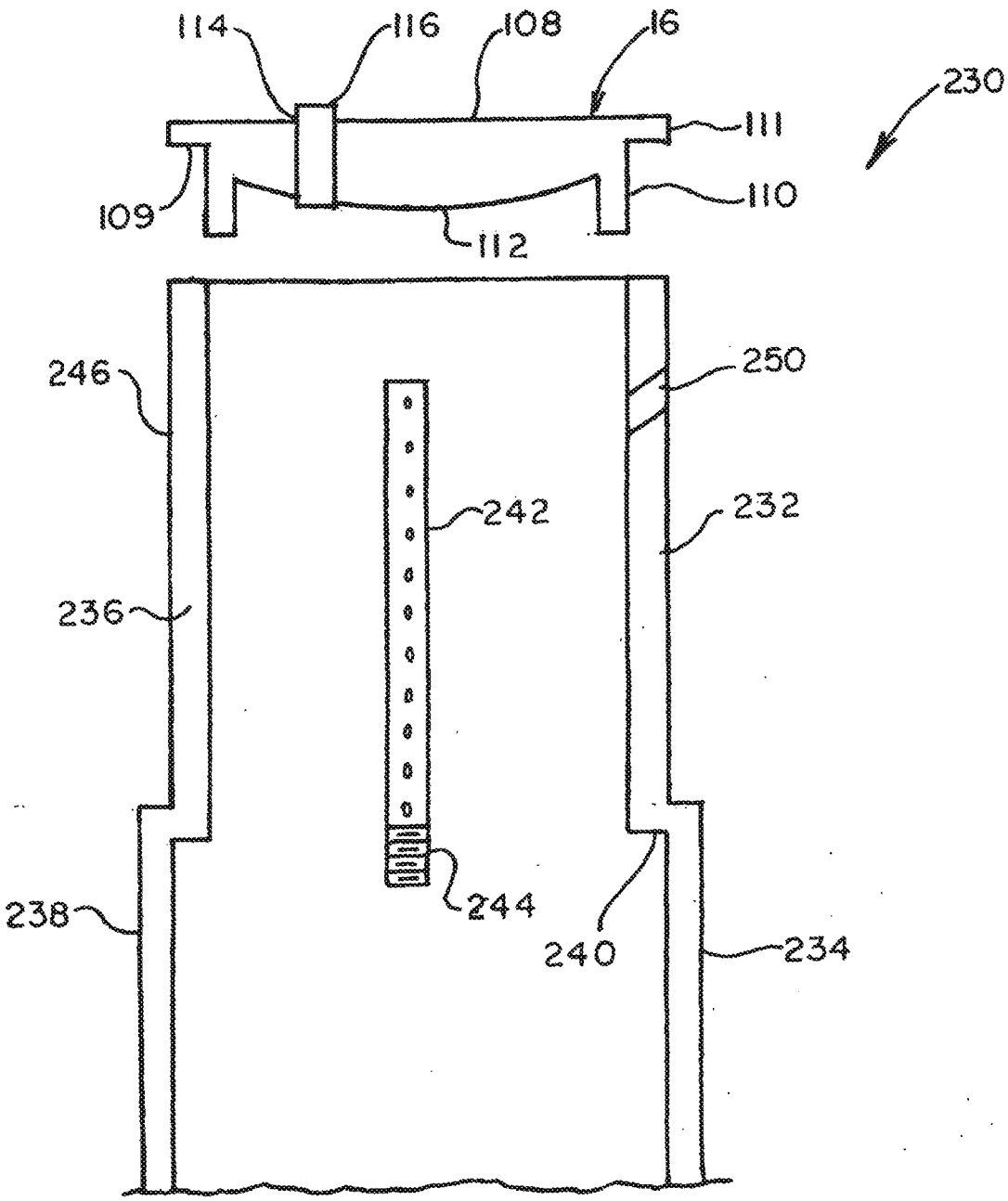

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FIG. 12

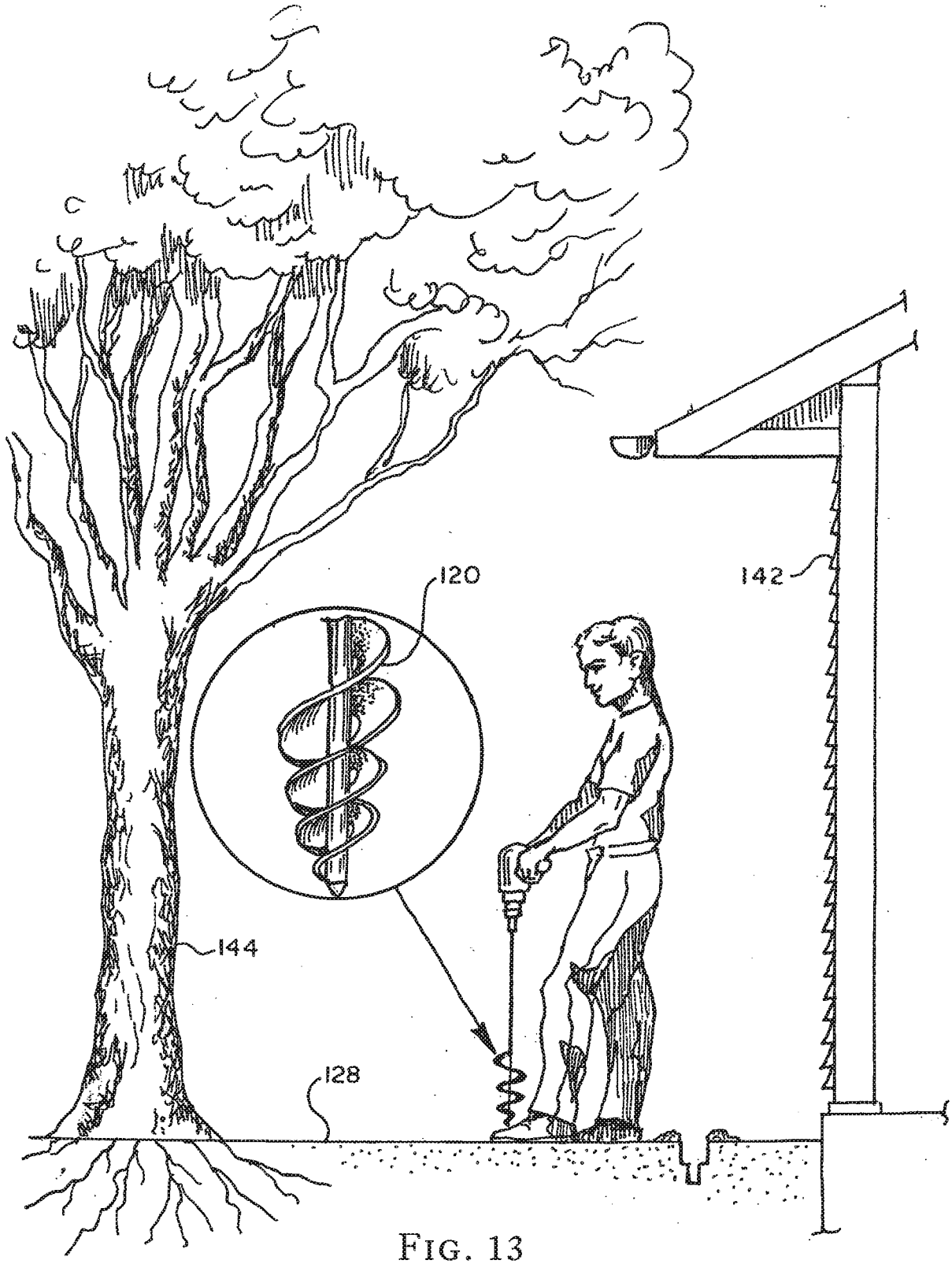


FIG. 13

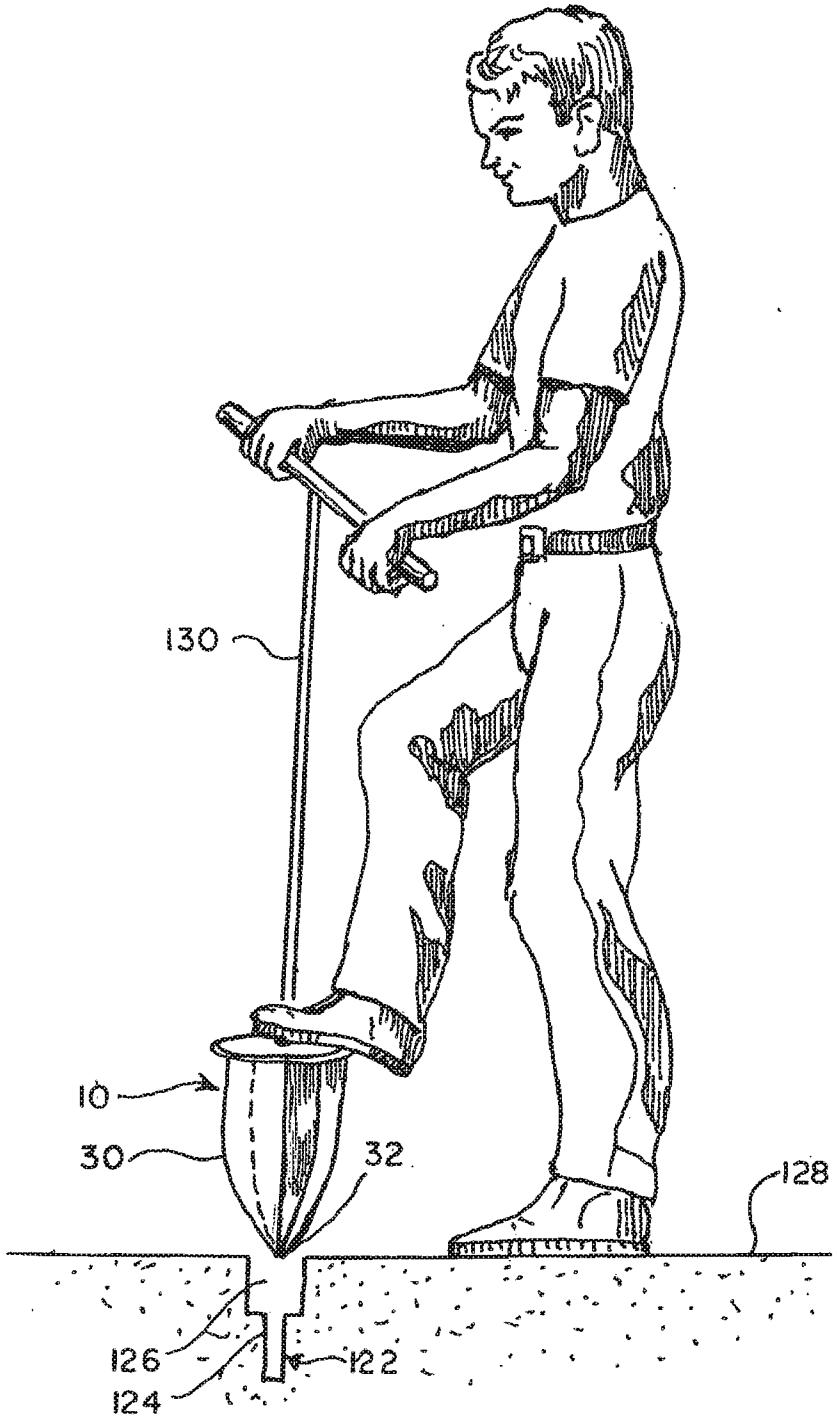


FIG. 14

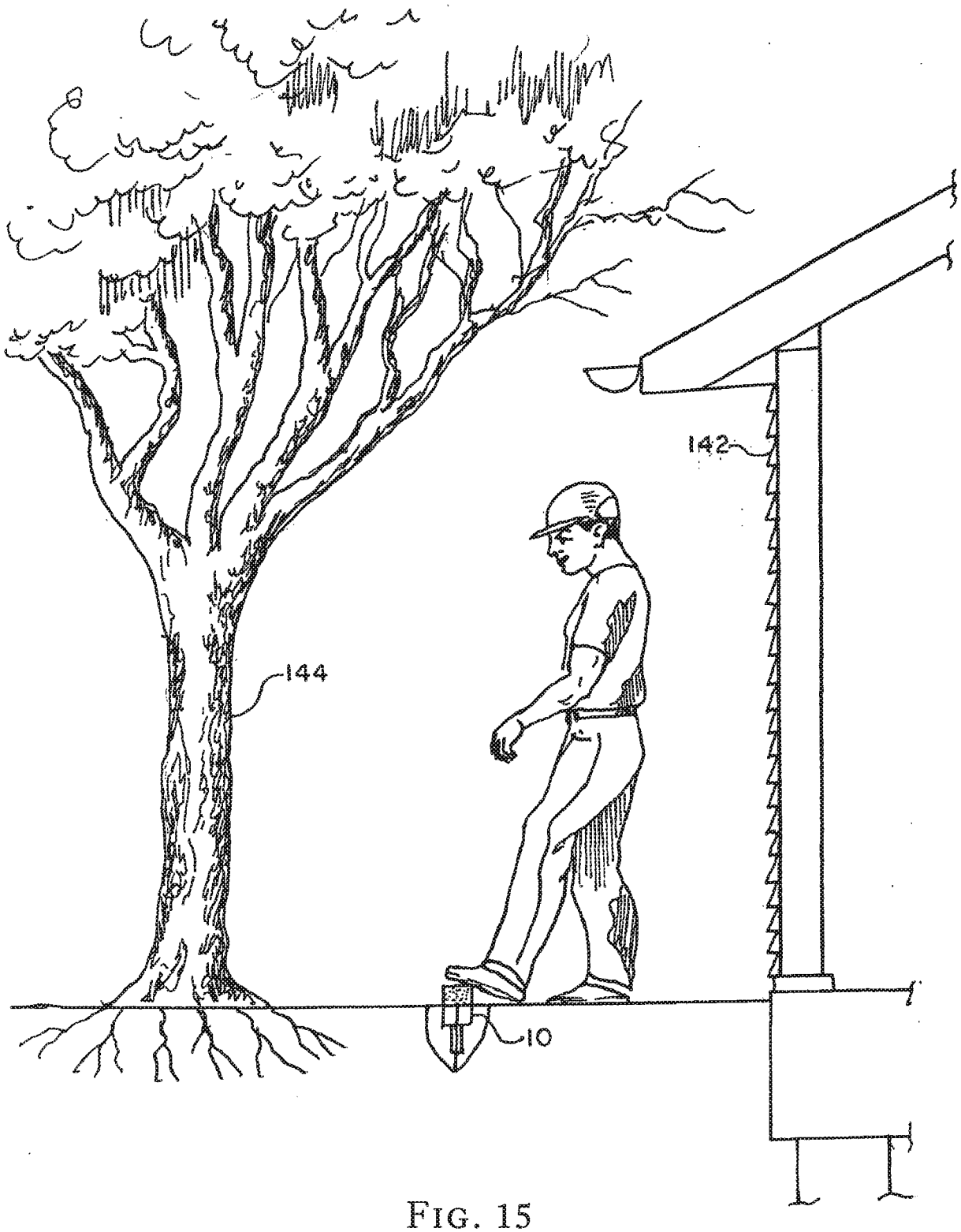


FIG. 15

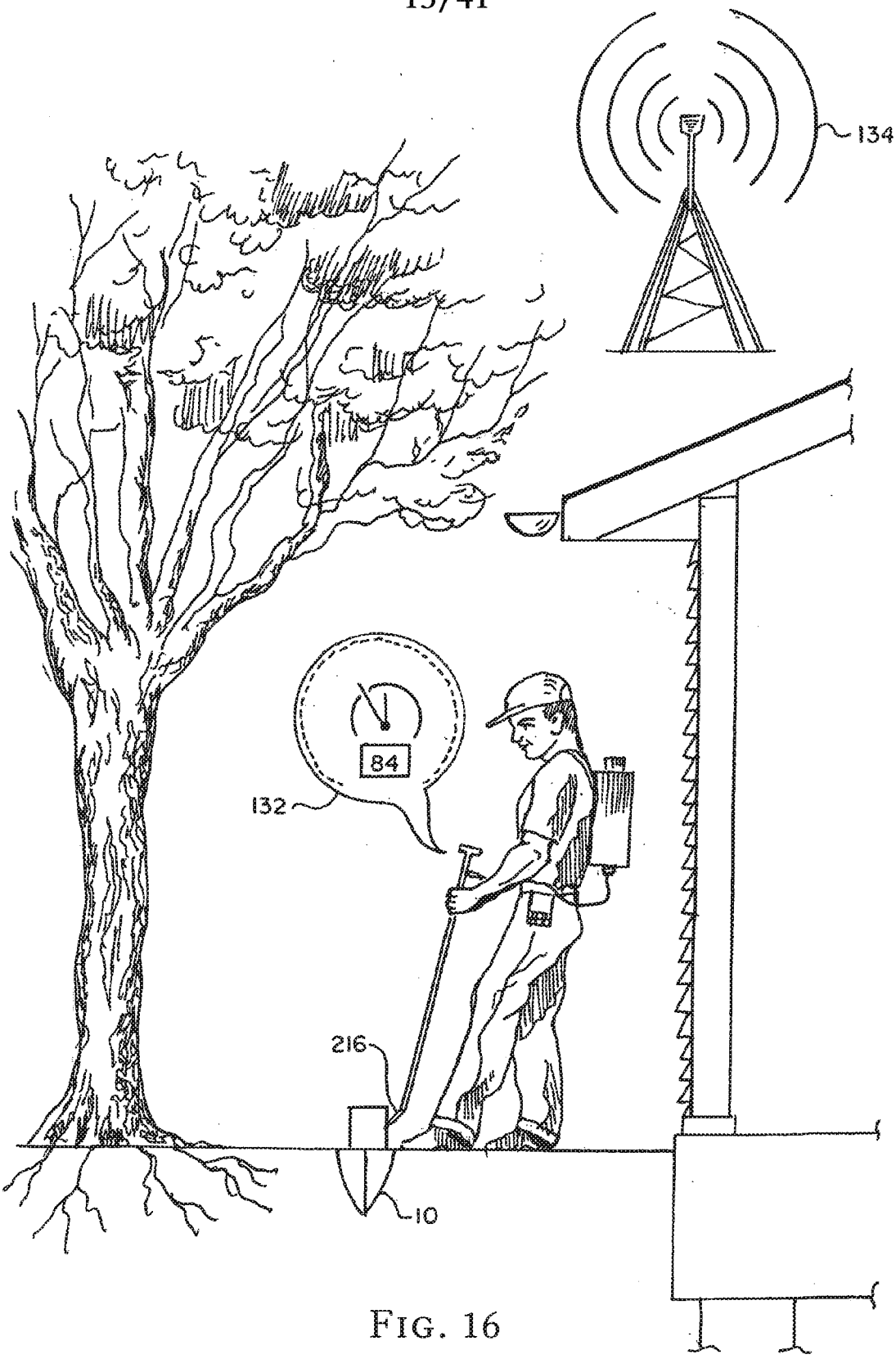
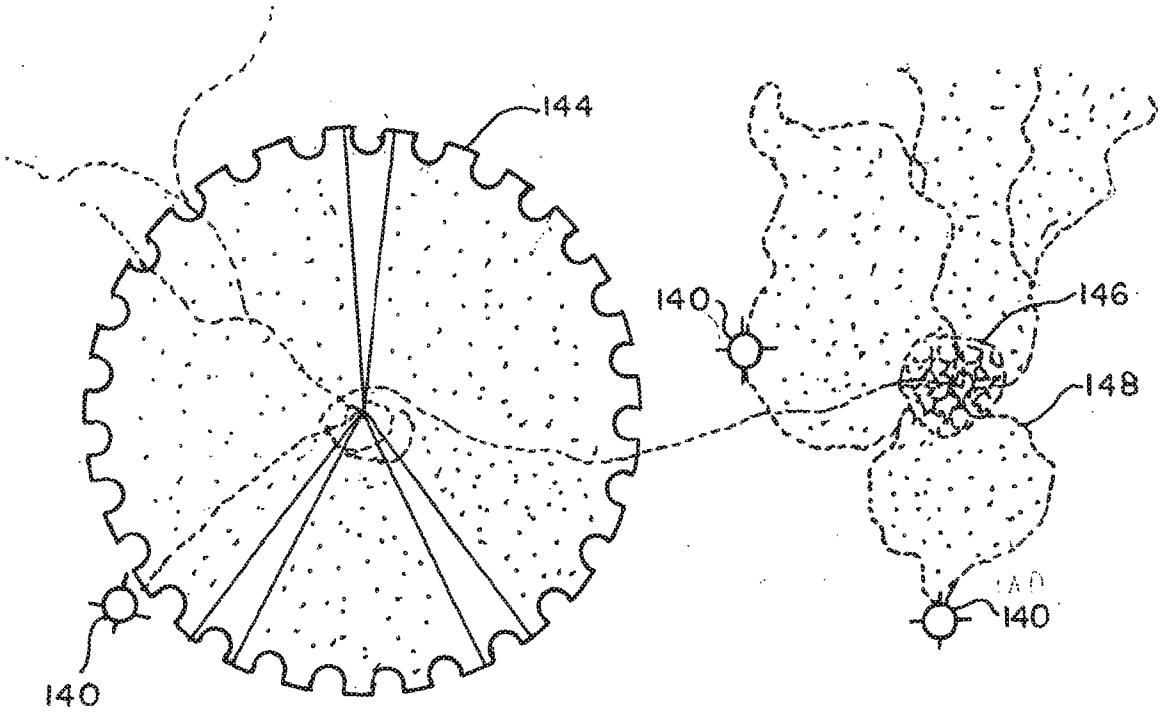


FIG. 16



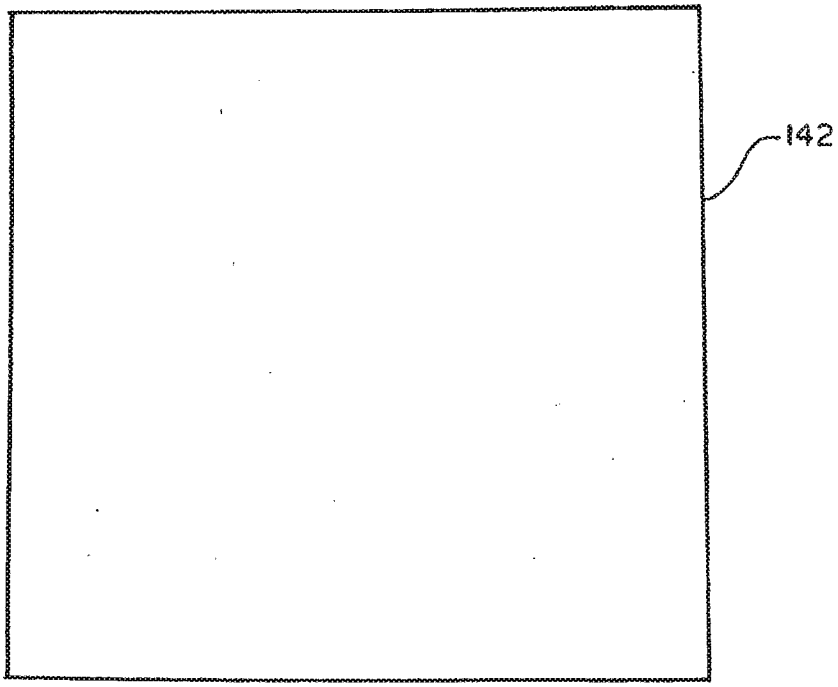


FIG. 17

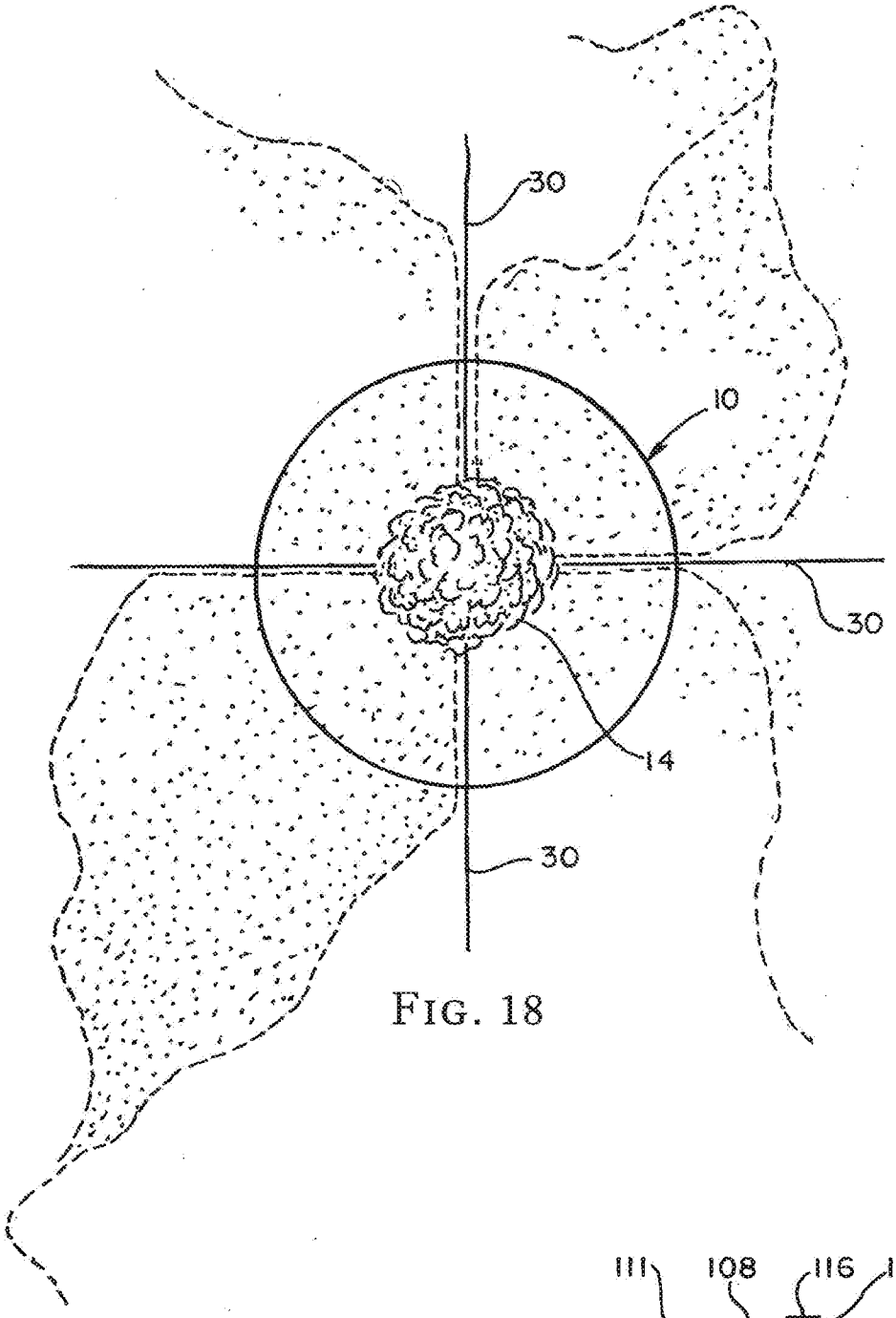


FIG. 18

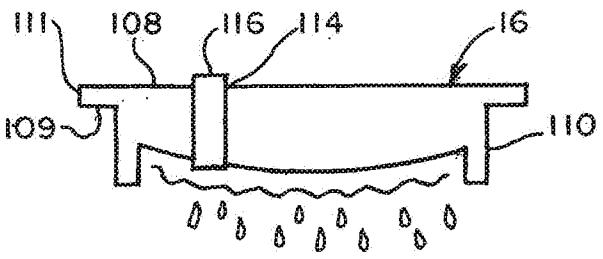


FIG. 19

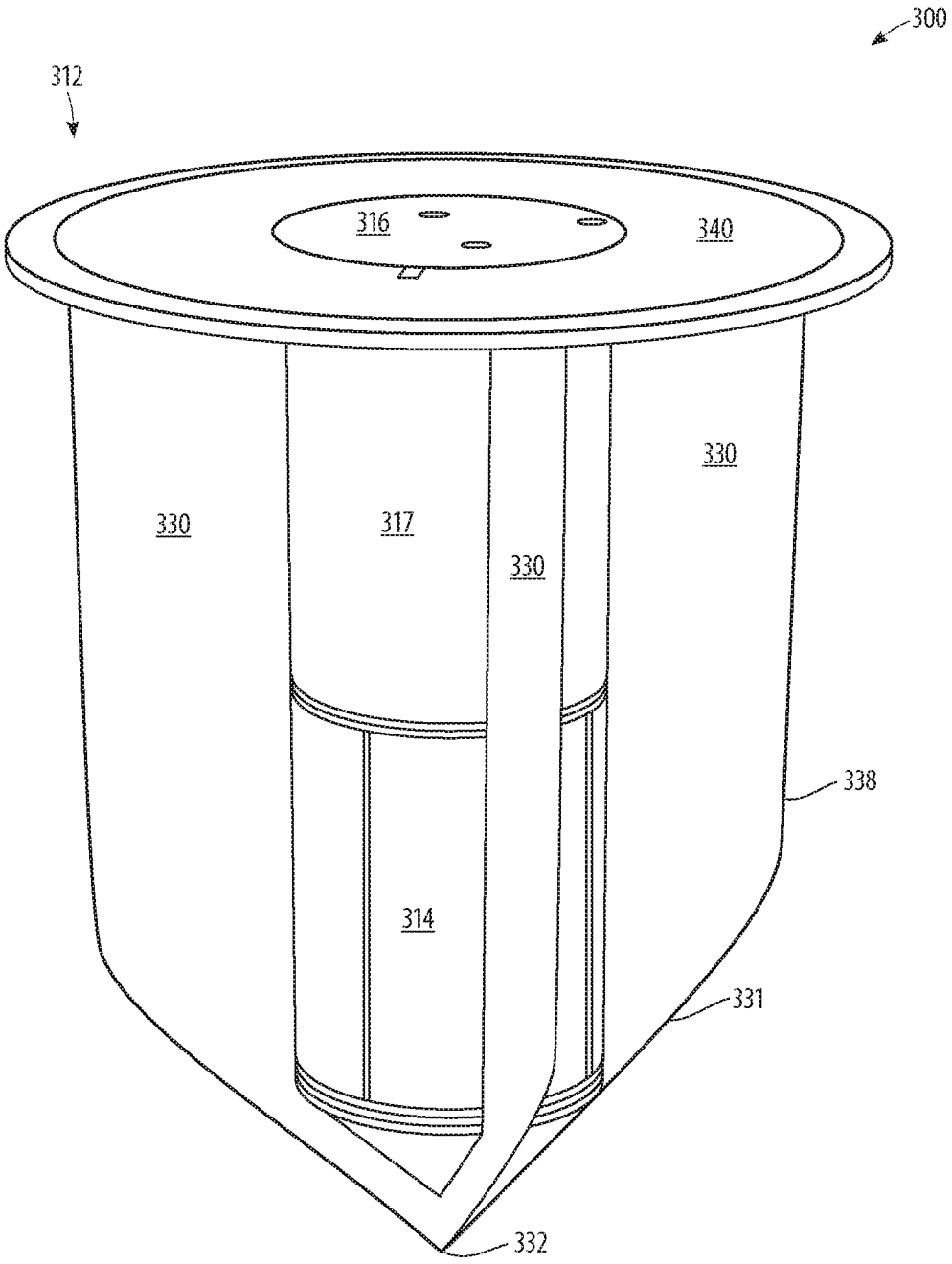


FIG. 20

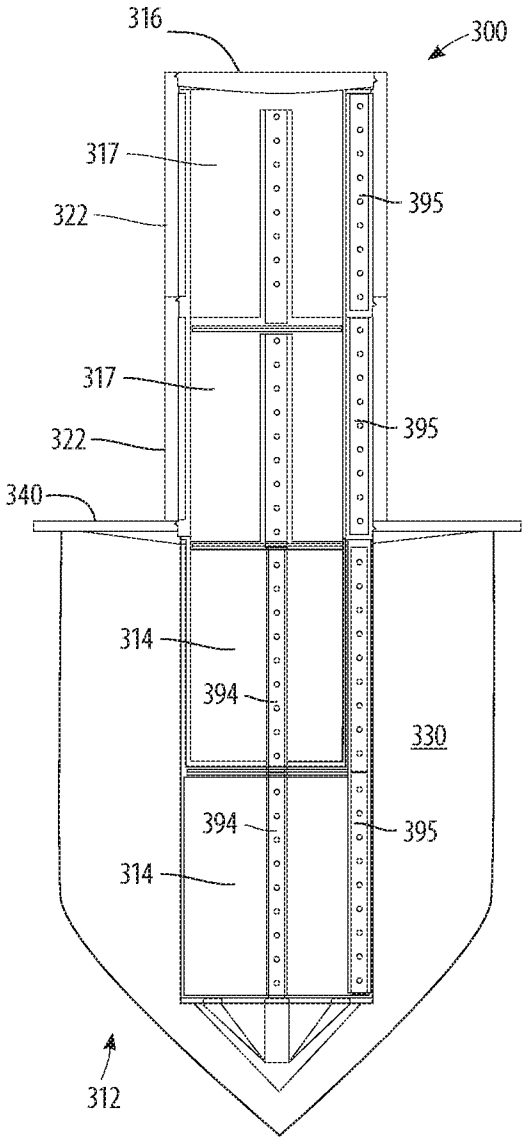


FIG. 21

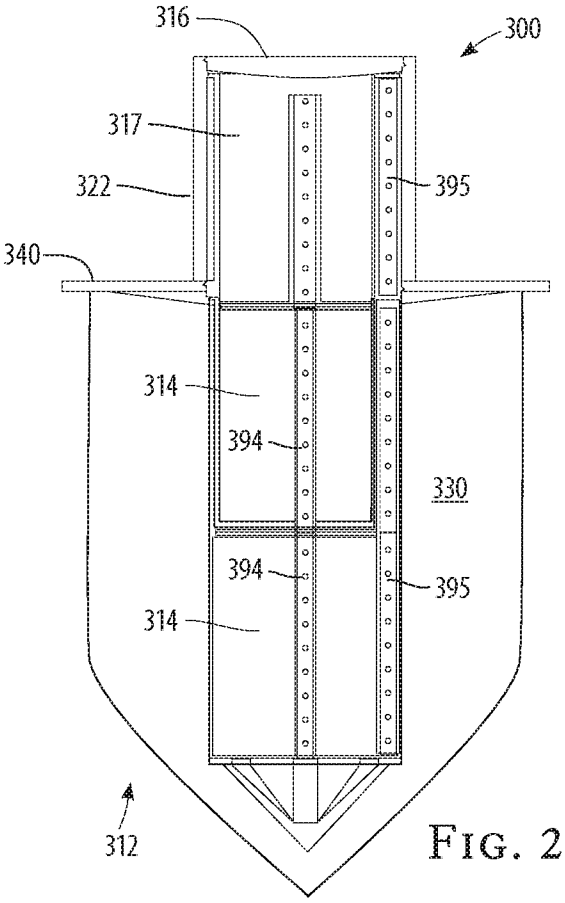


FIG. 22

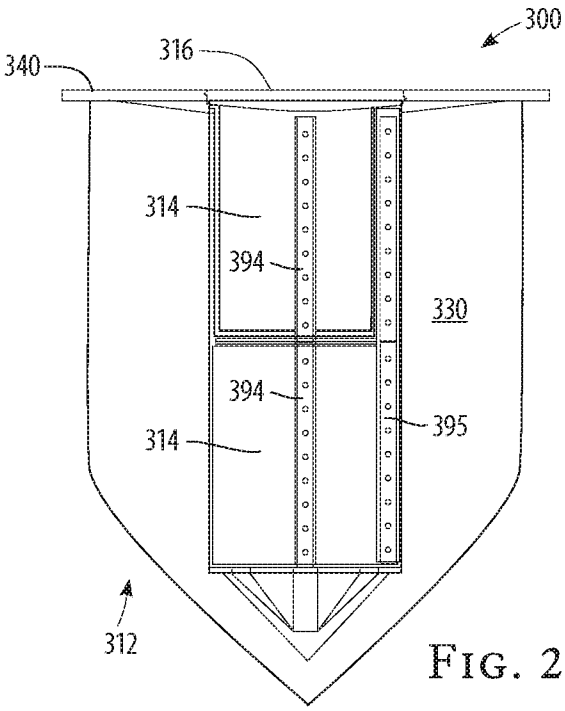


FIG. 23

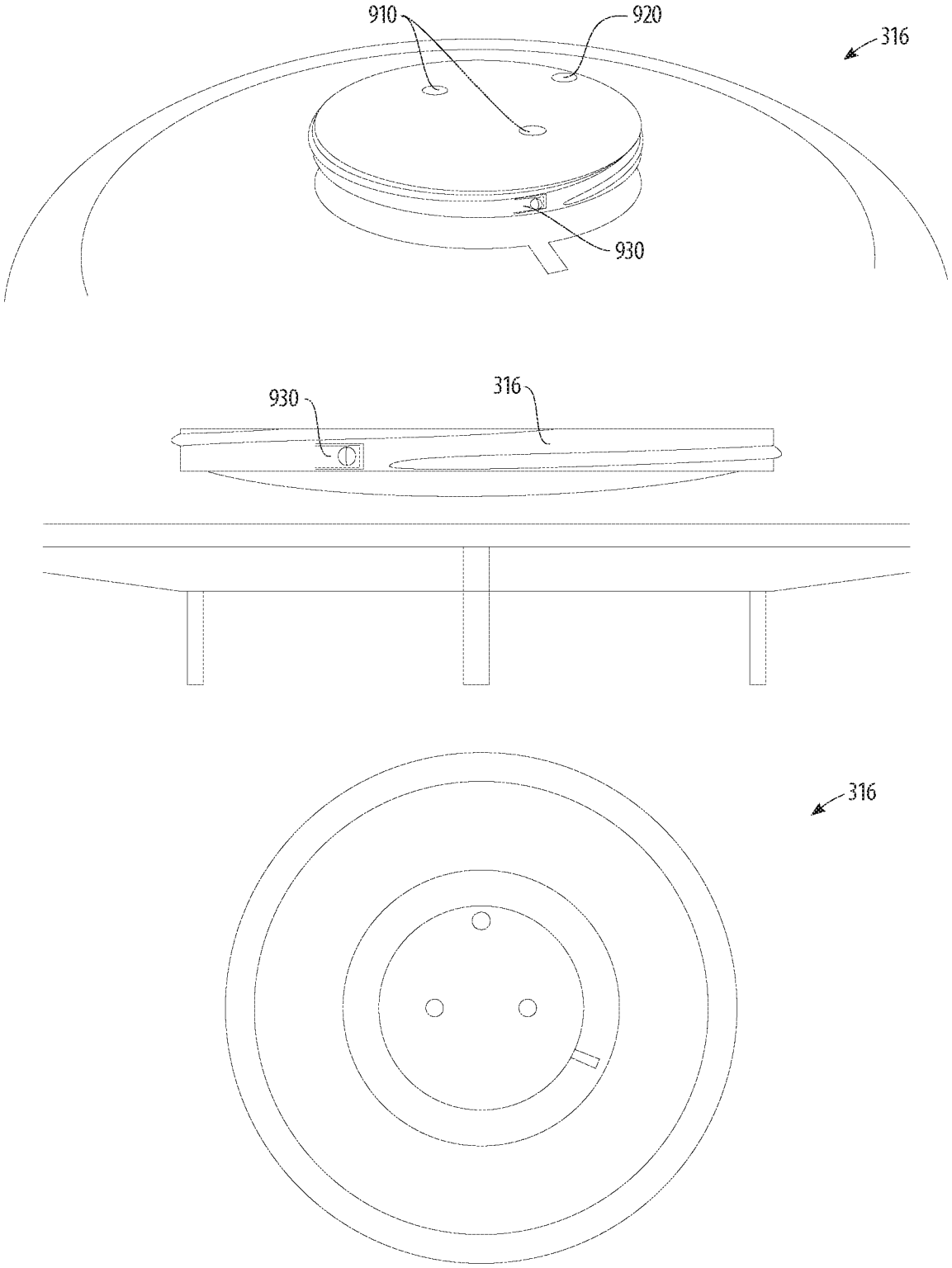


FIG. 24

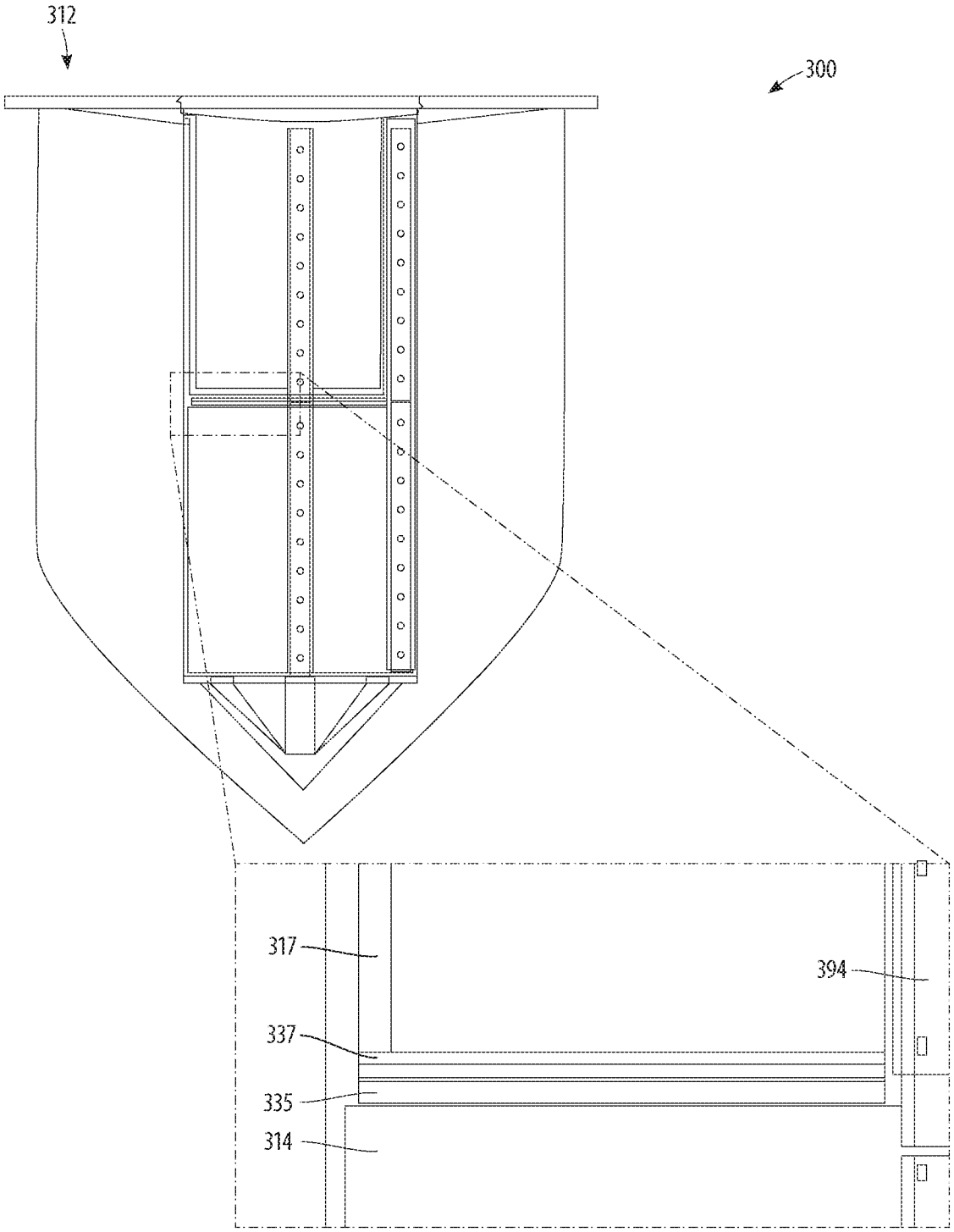


FIG. 25

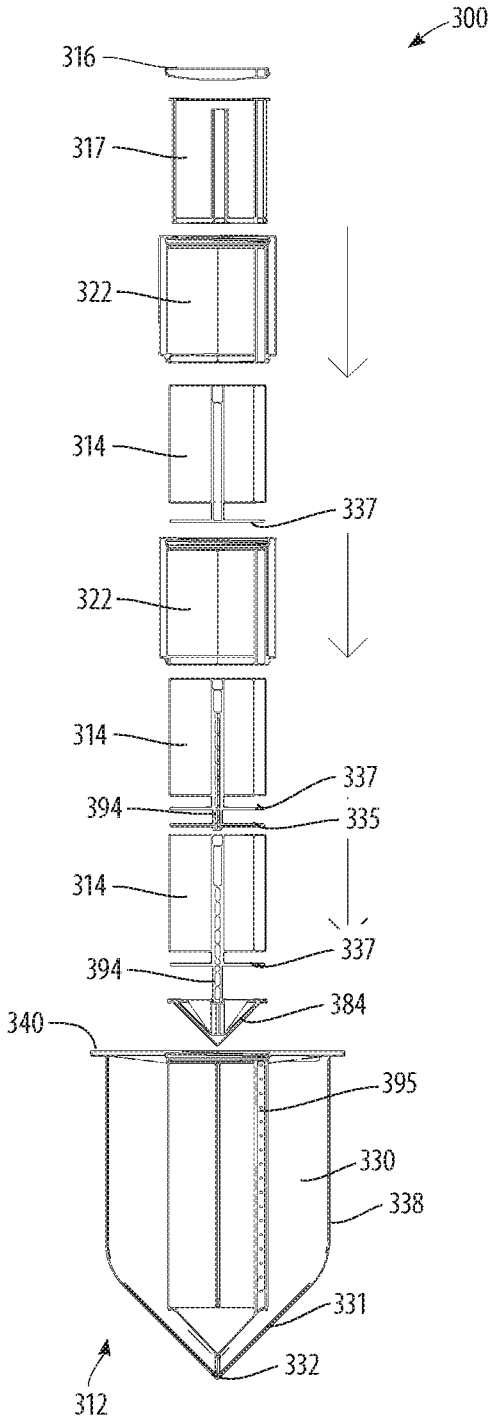

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FIG. 26

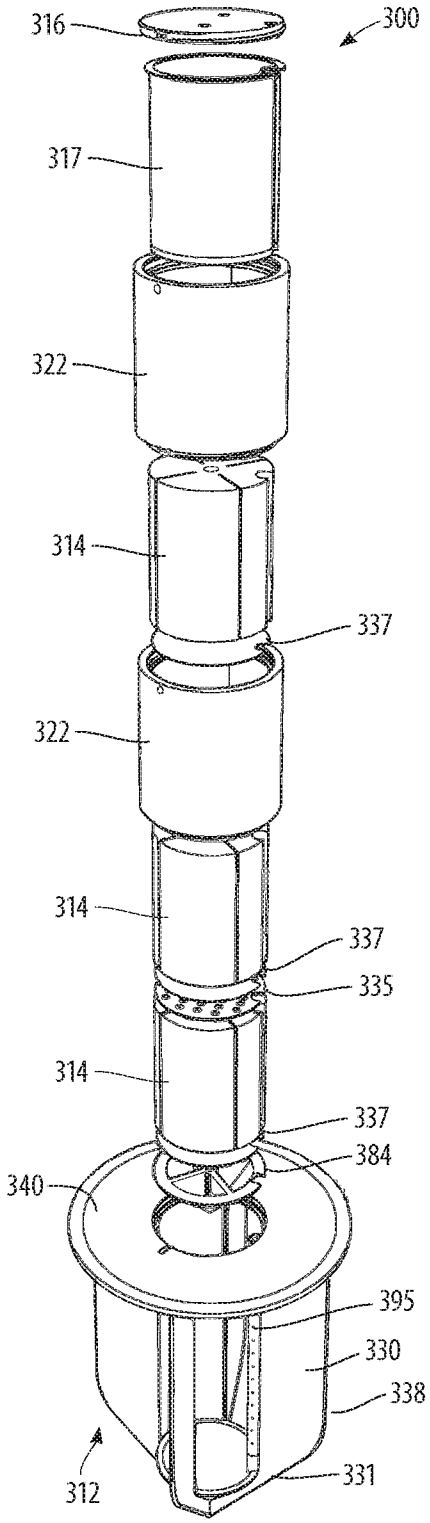

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FIG. 27

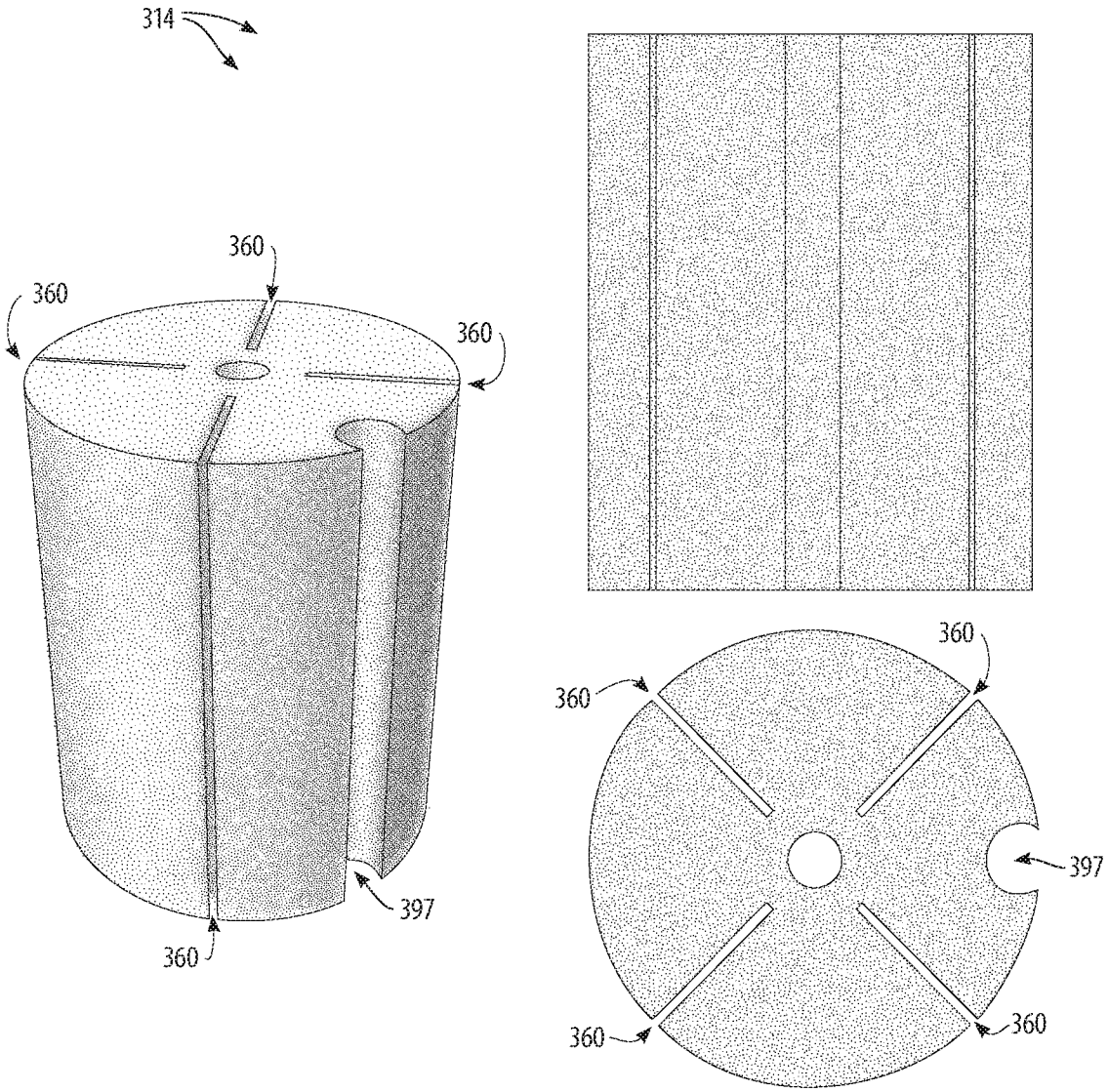


FIG. 28

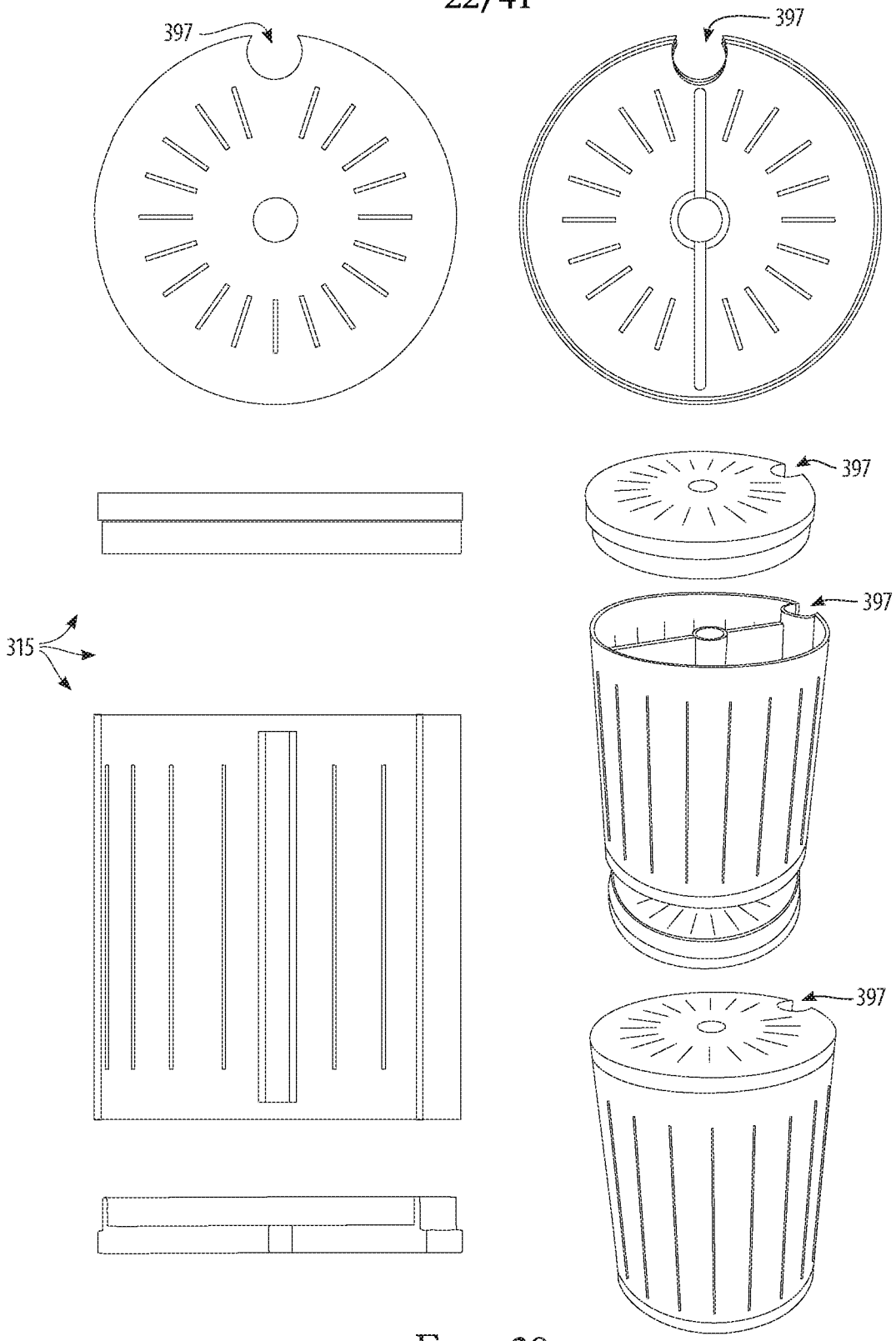


FIG. 29

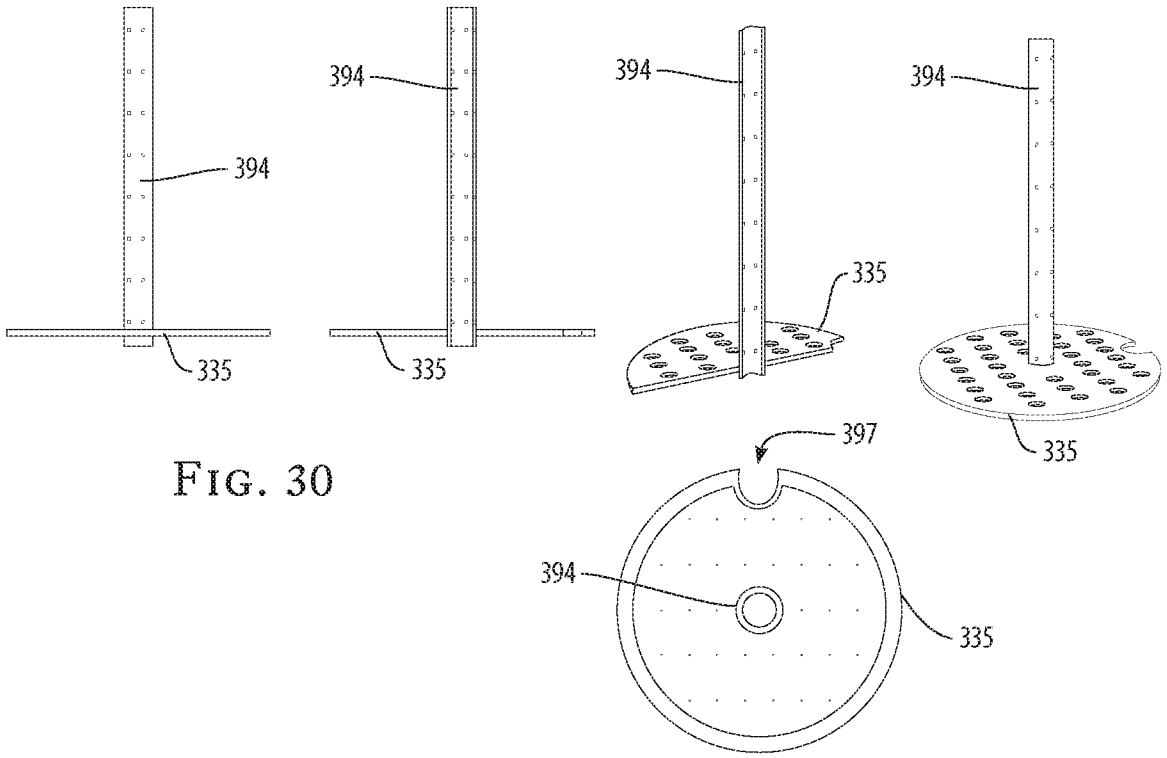

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FIG. 30

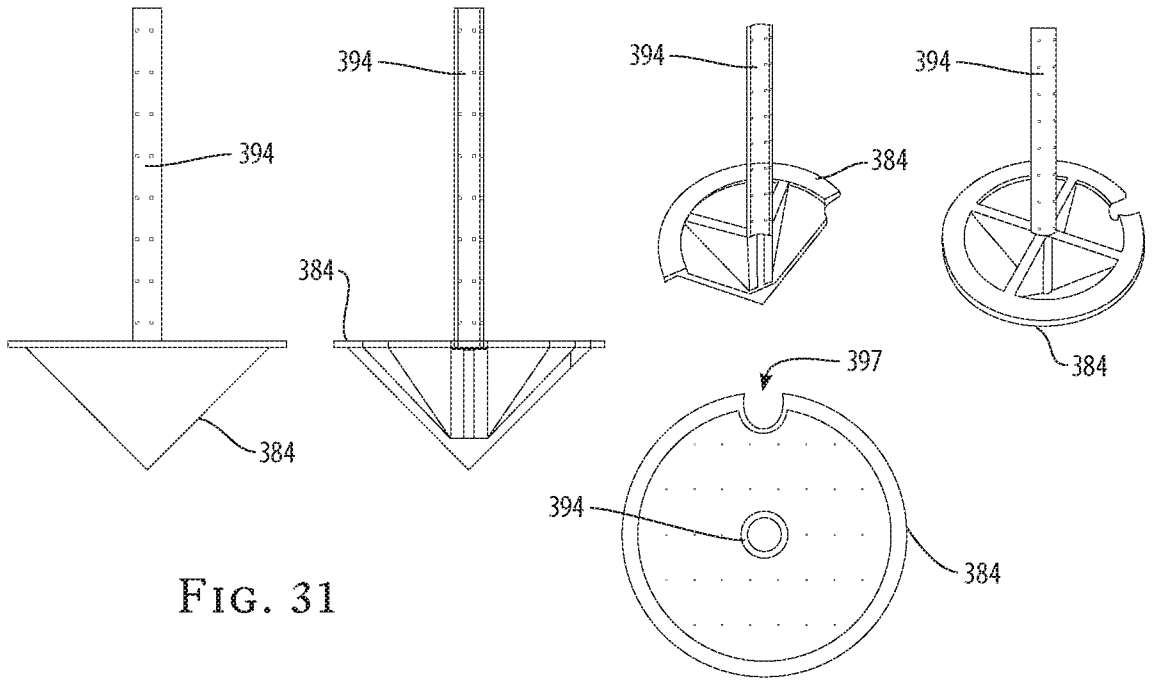

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FIG. 31

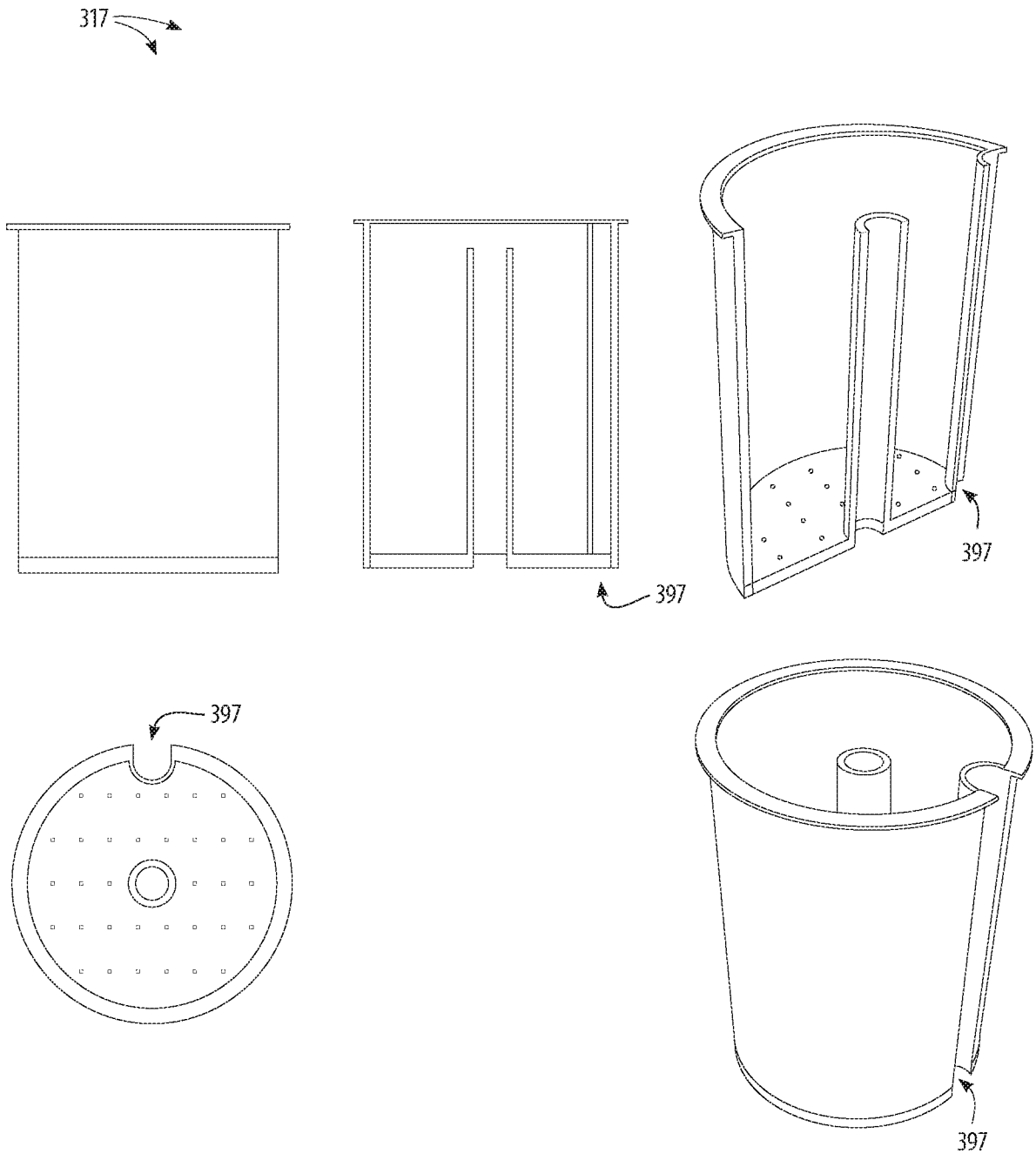


FIG. 32

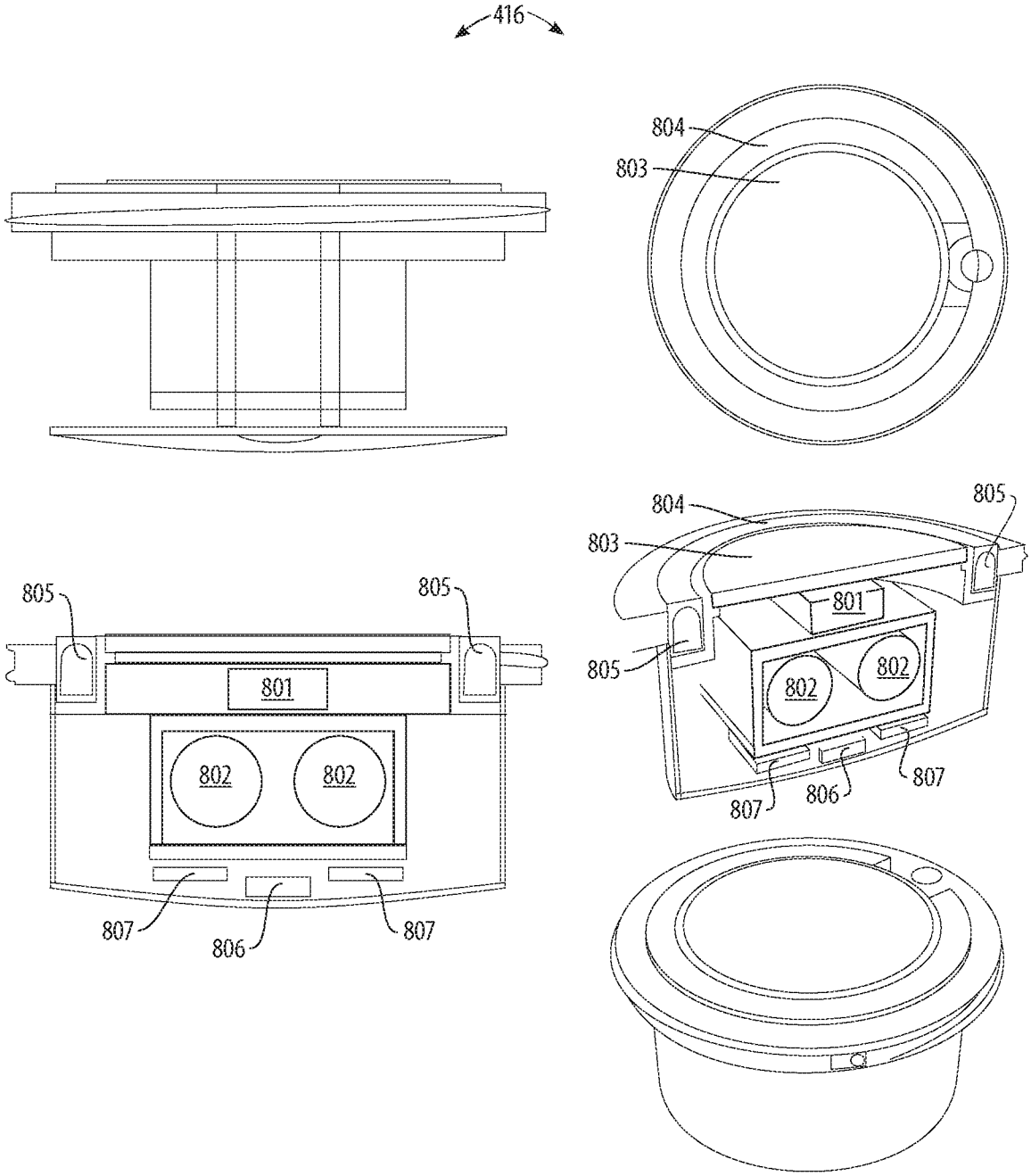

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FIG. 33

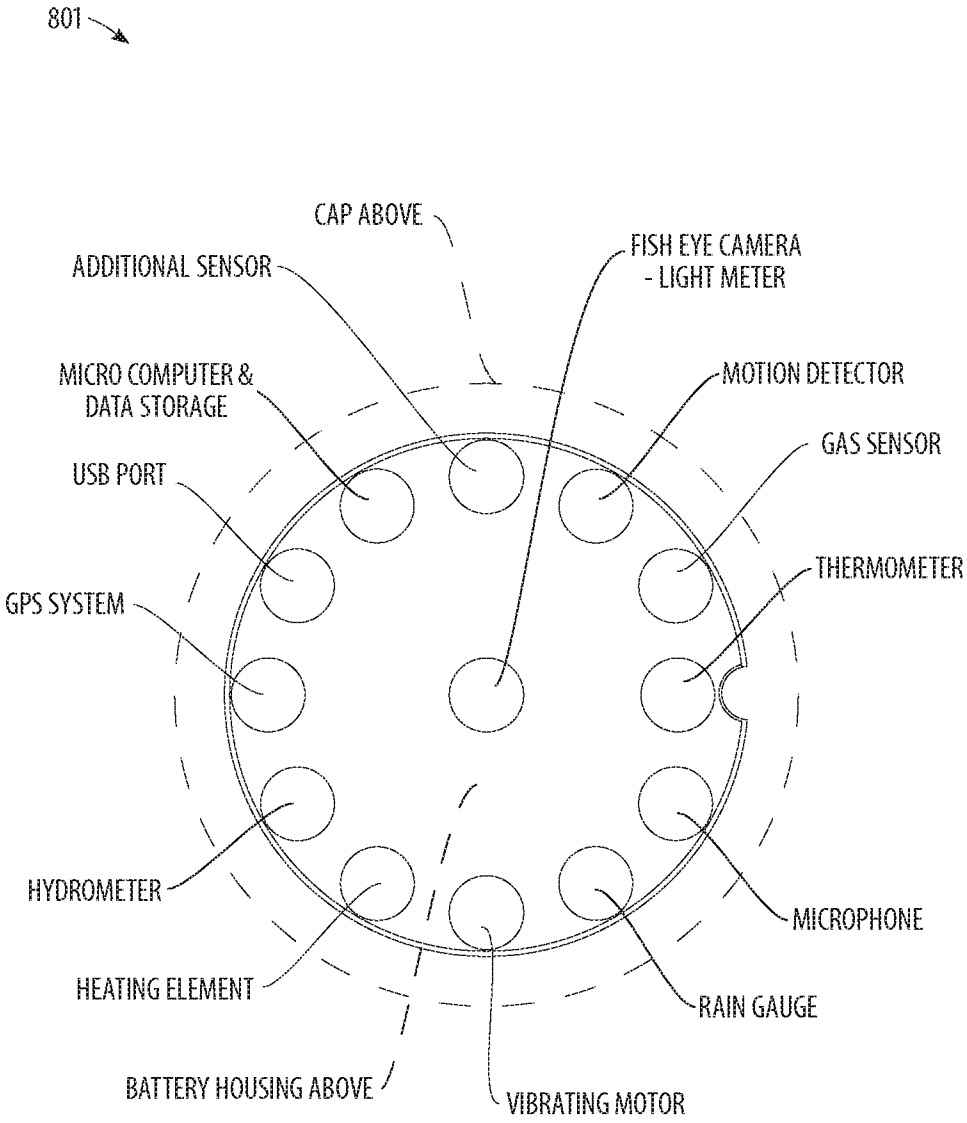

801
CAP ABOVE
ADDITIONAL SENSOR
FISH EYE CAMERA
- LIGHT METER
MICRO COMPUTER &
DATA STORAGE
MOTION DETECTOR
GAS SENSOR
USB PORT
THERMOMETER
GPS SYSTEM
HYDROMETER
MICROPHONE
HEATING ELEMENT
RAIN GAUGE
BATTERY HOUSING ABOVE
VIBRATING MOTOR

FIG. 34

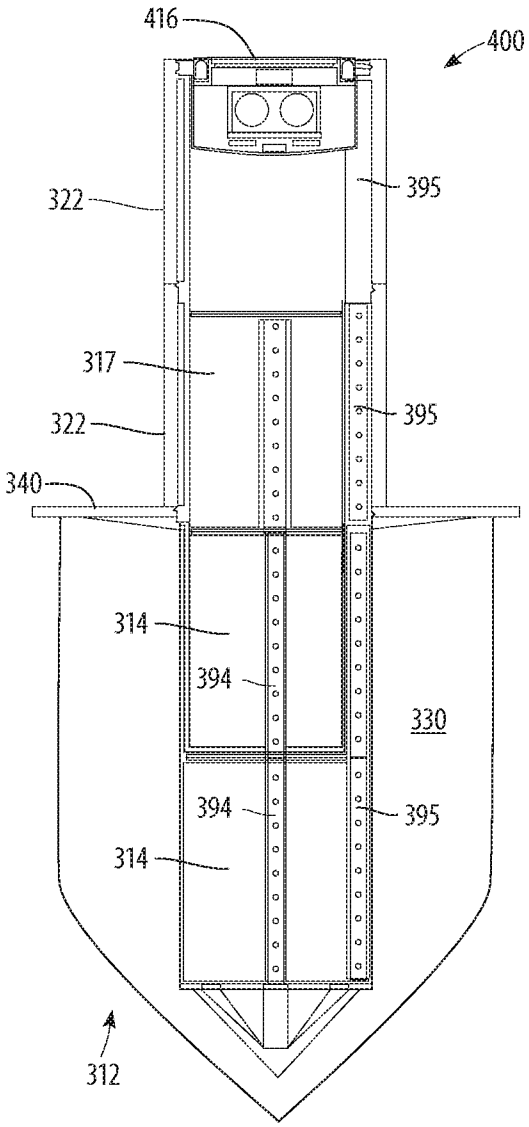


FIG. 35

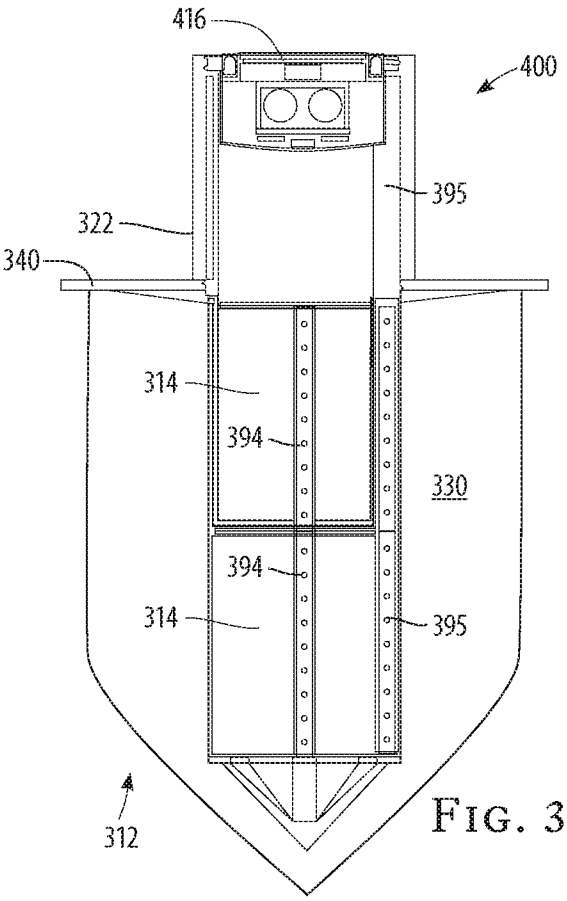


FIG. 36

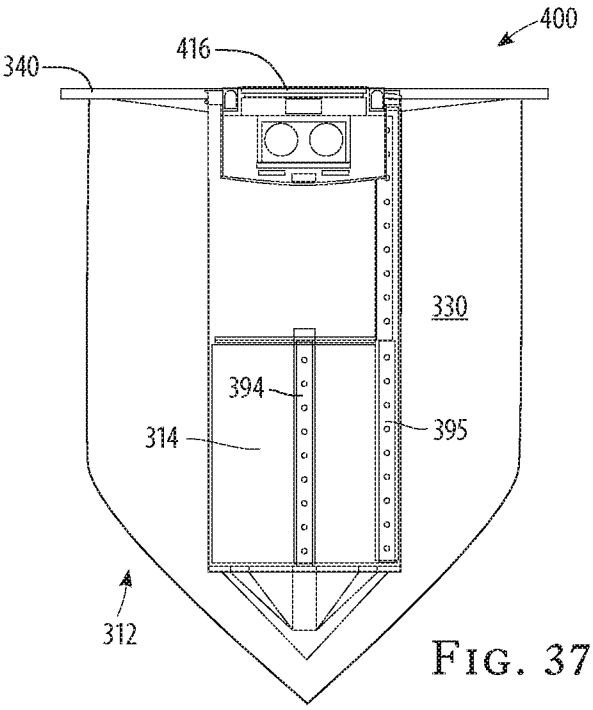


FIG. 37

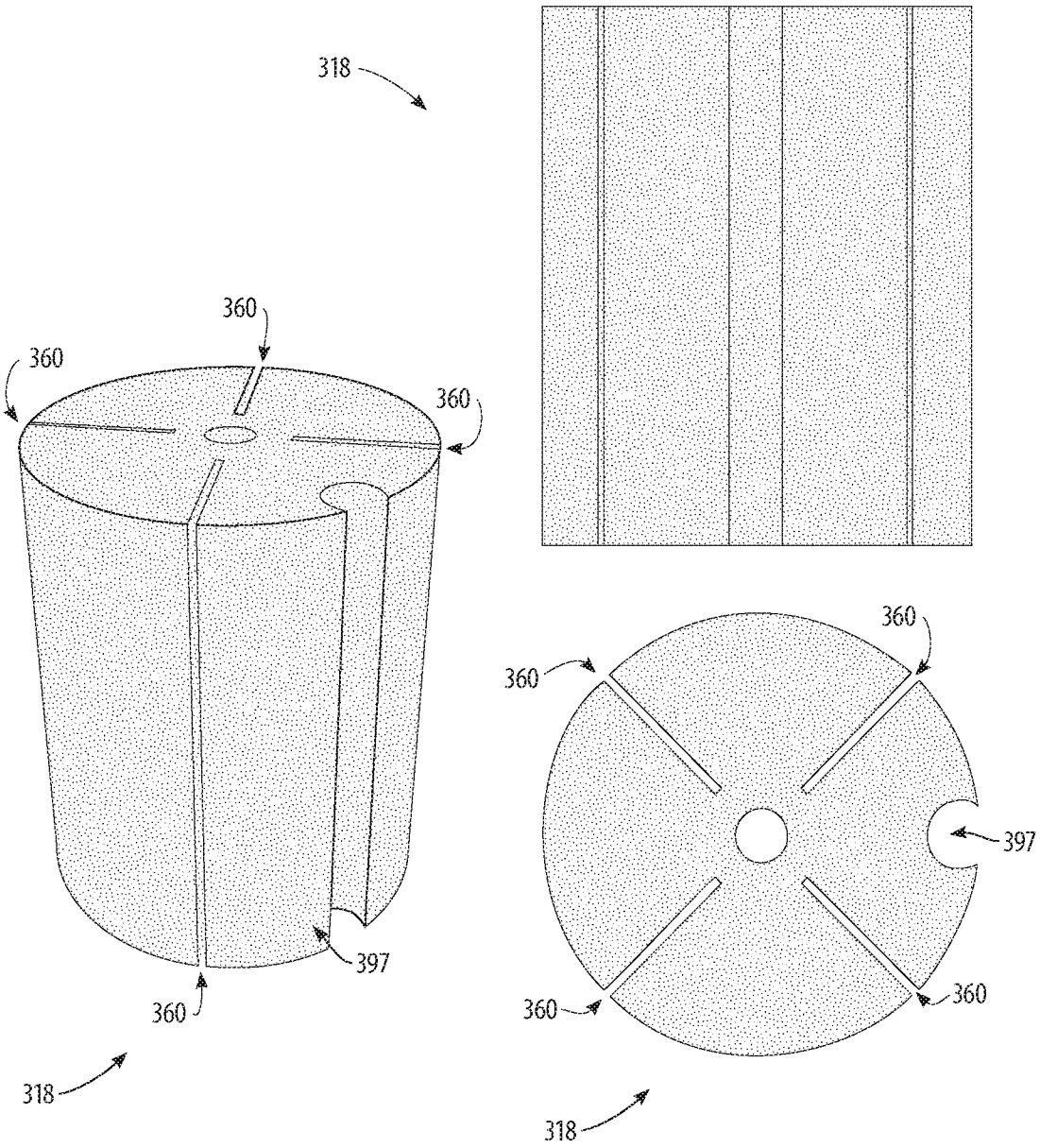


FIG. 38

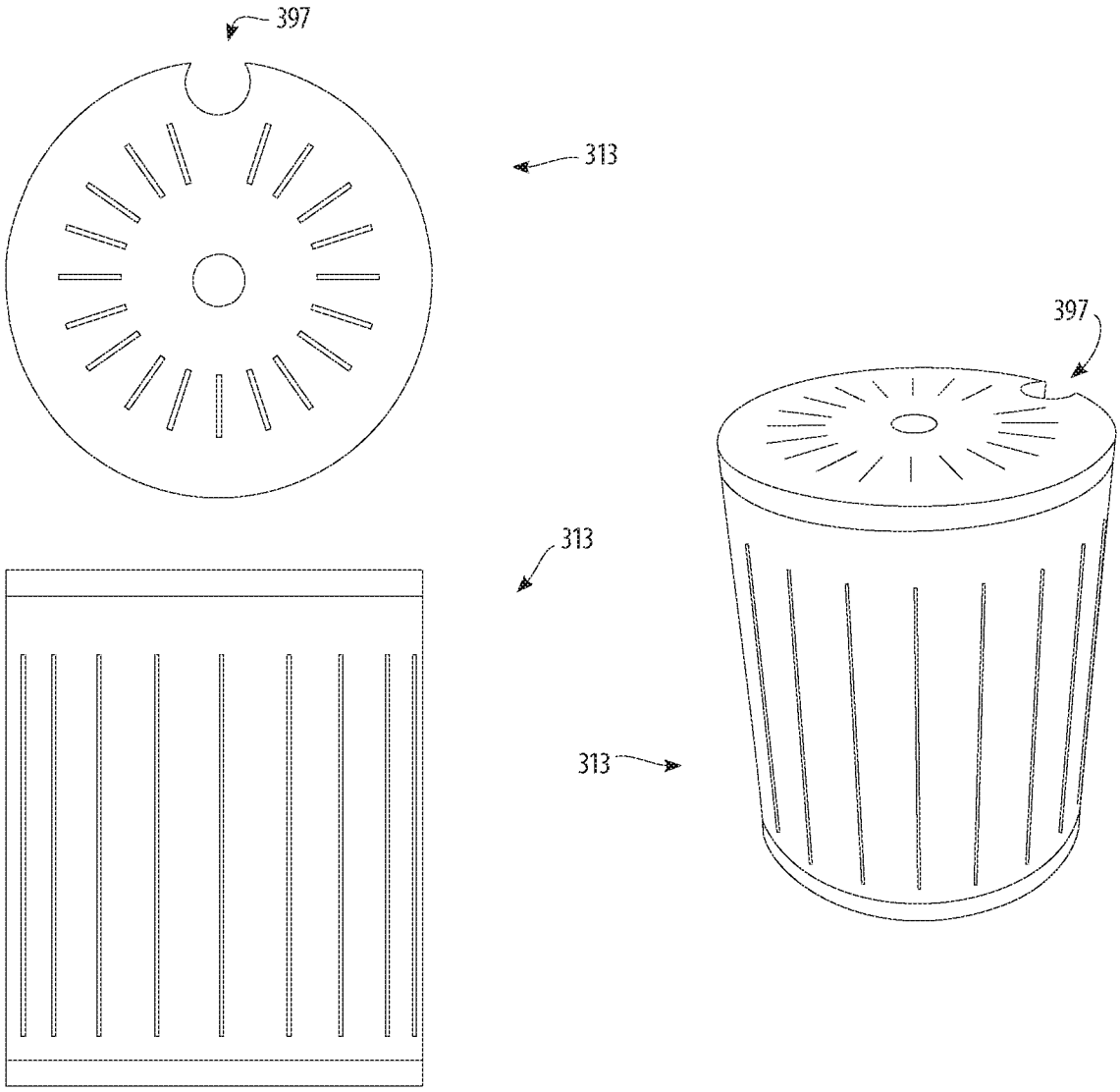


FIG. 39

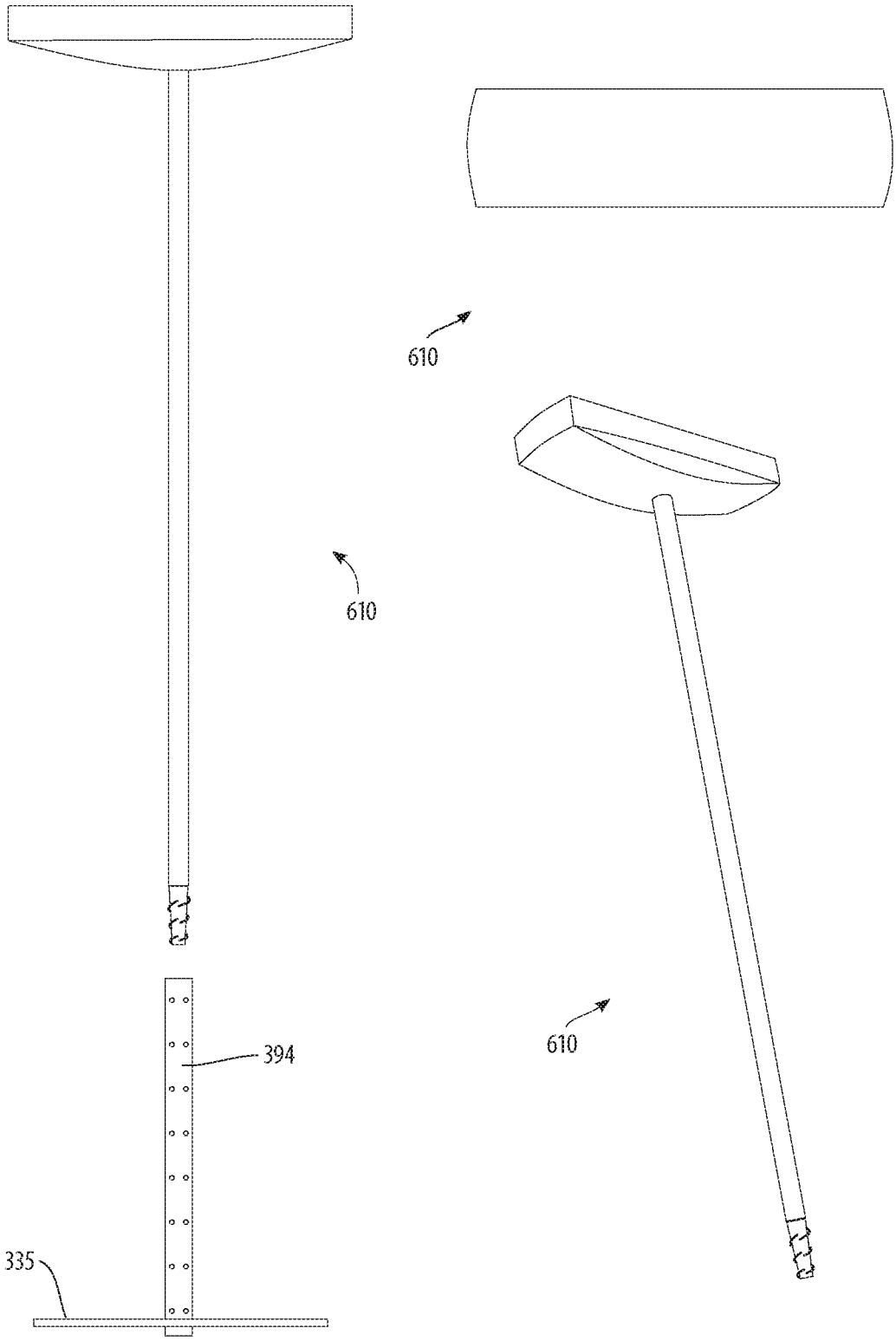


FIG. 40

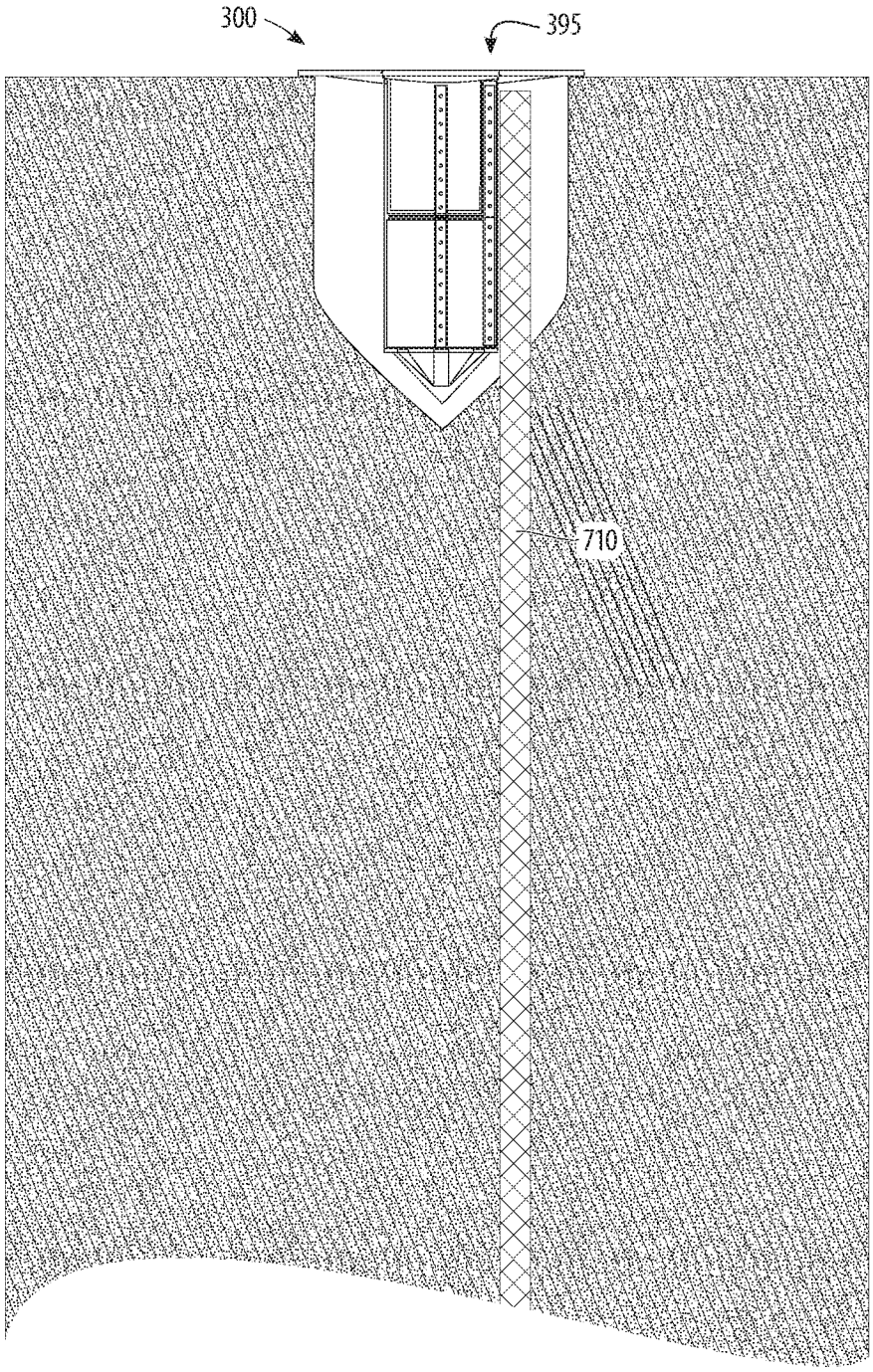


FIG. 41

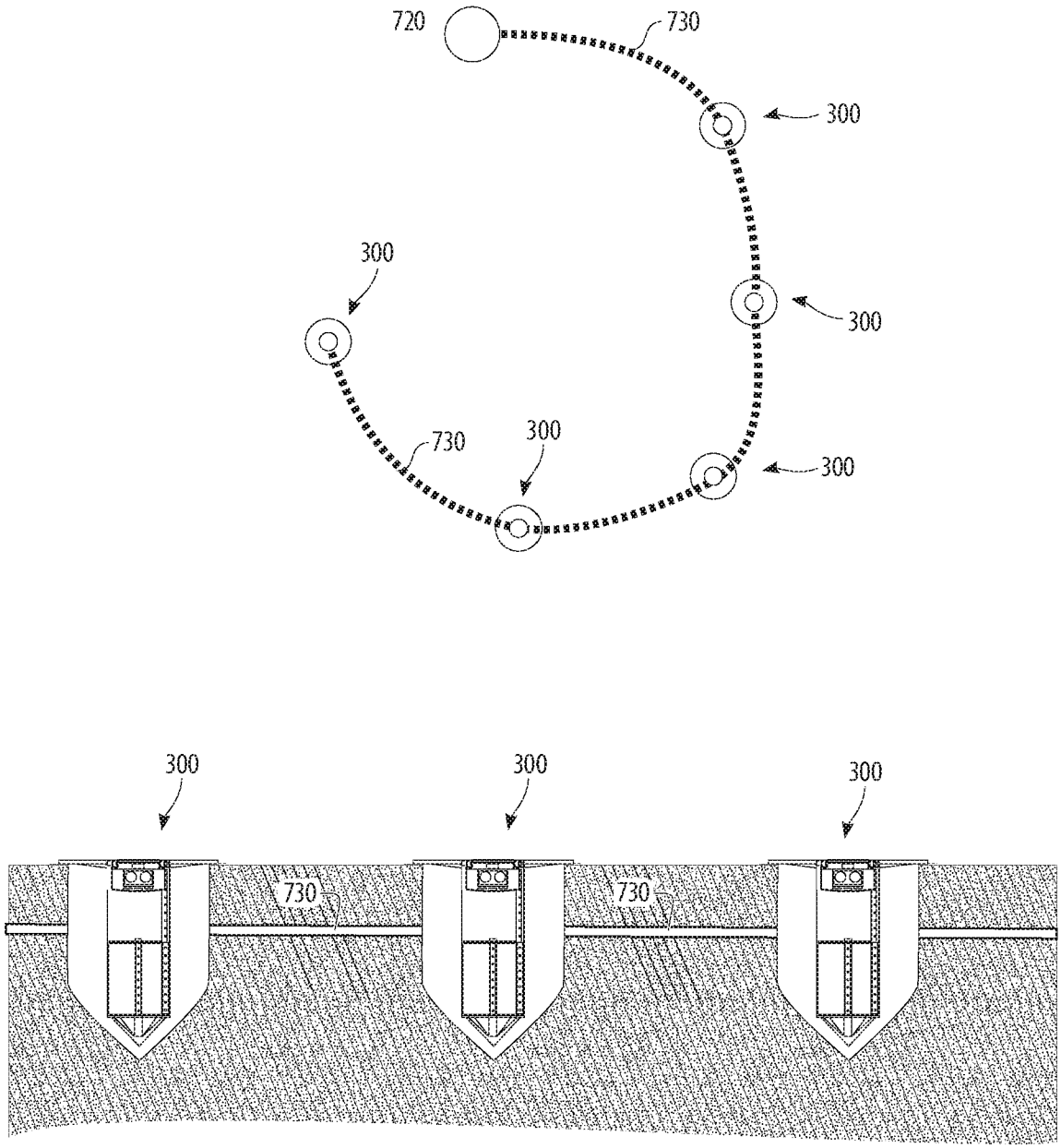


FIG. 42

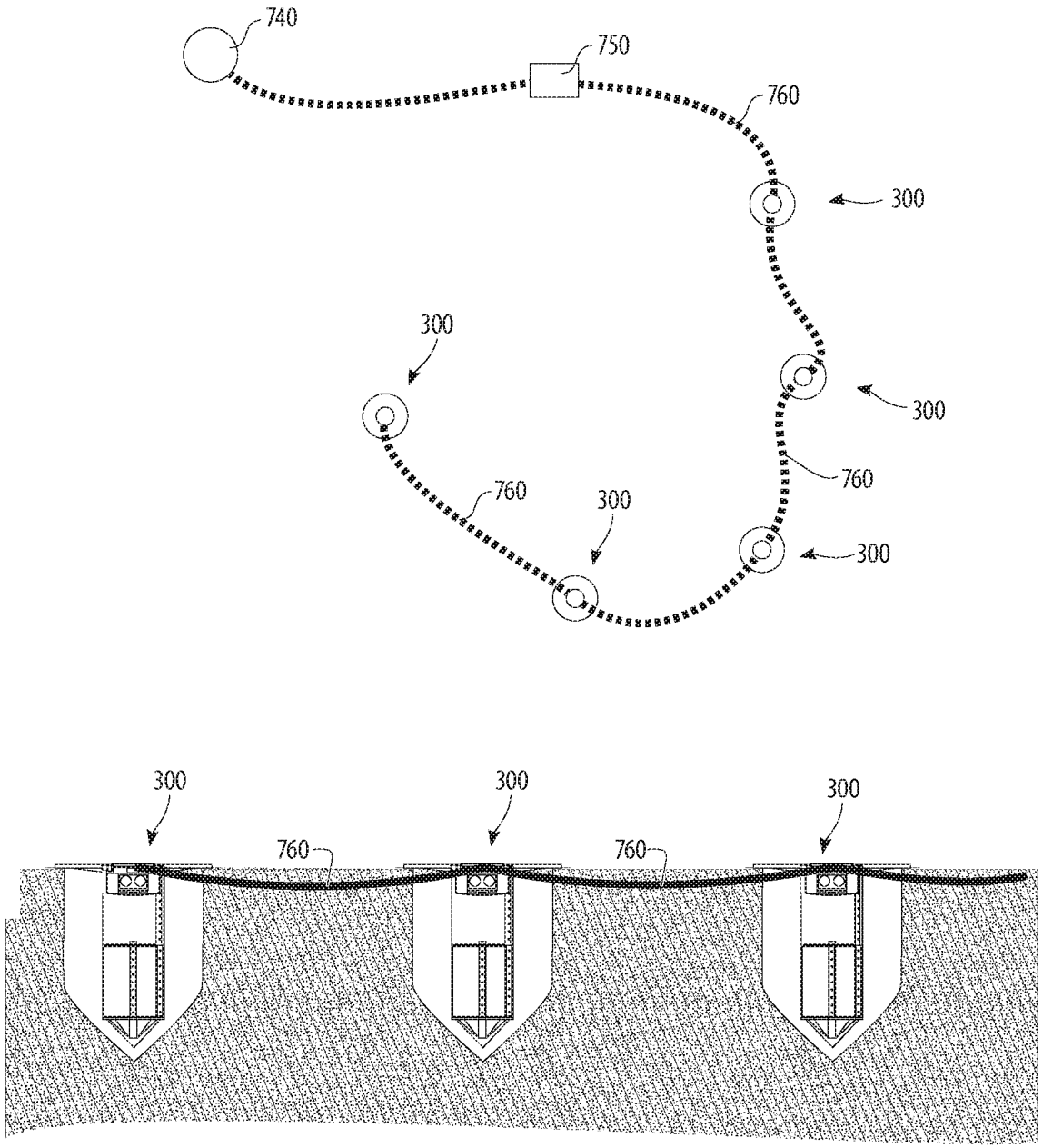


FIG. 43

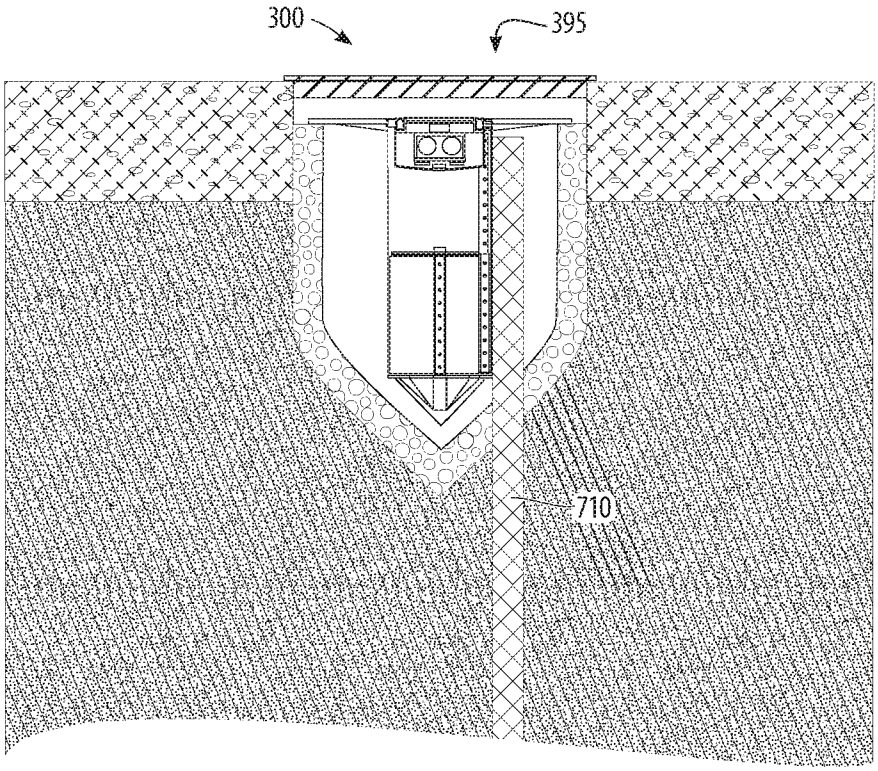


FIG. 44

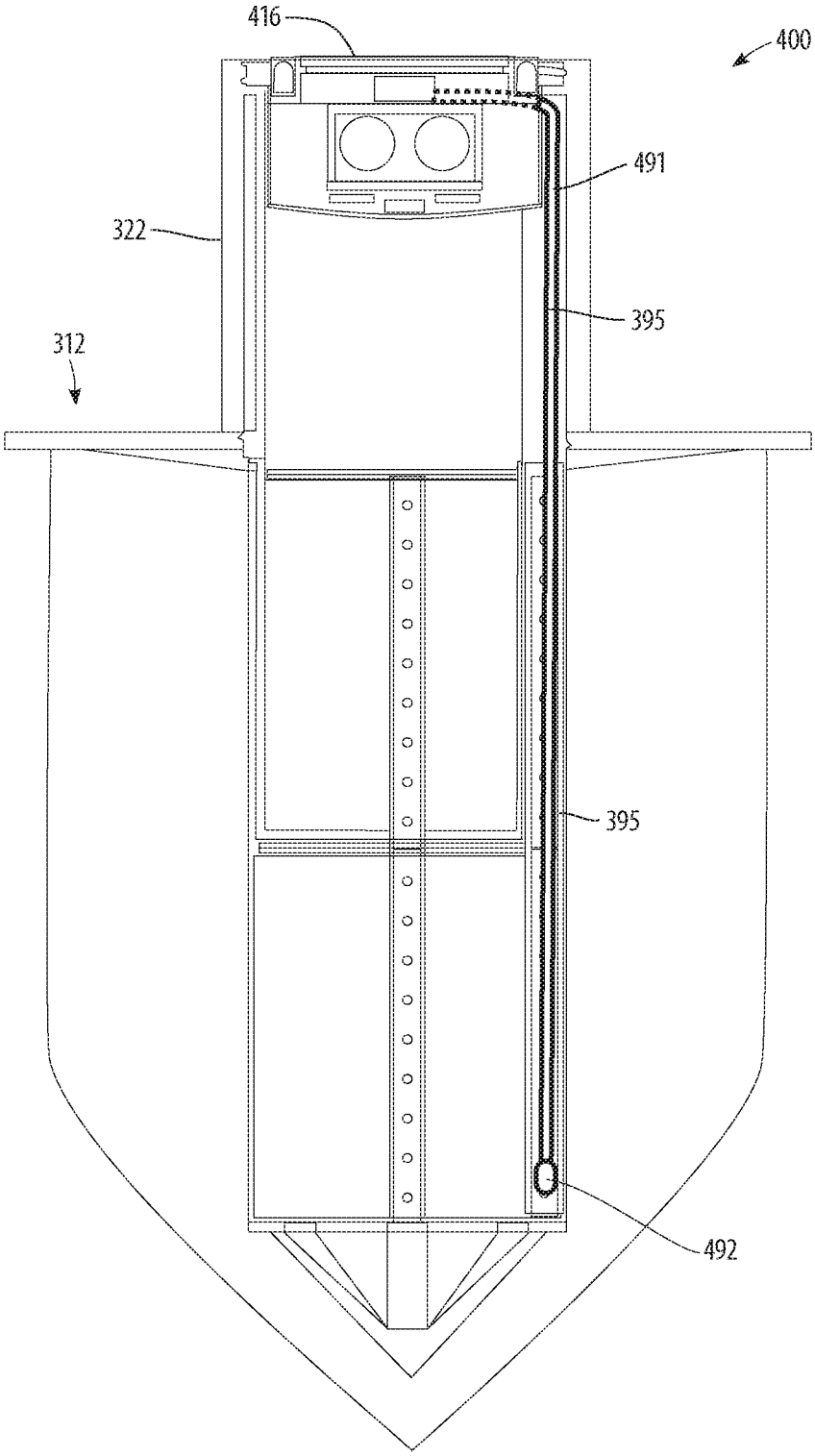


FIG. 45

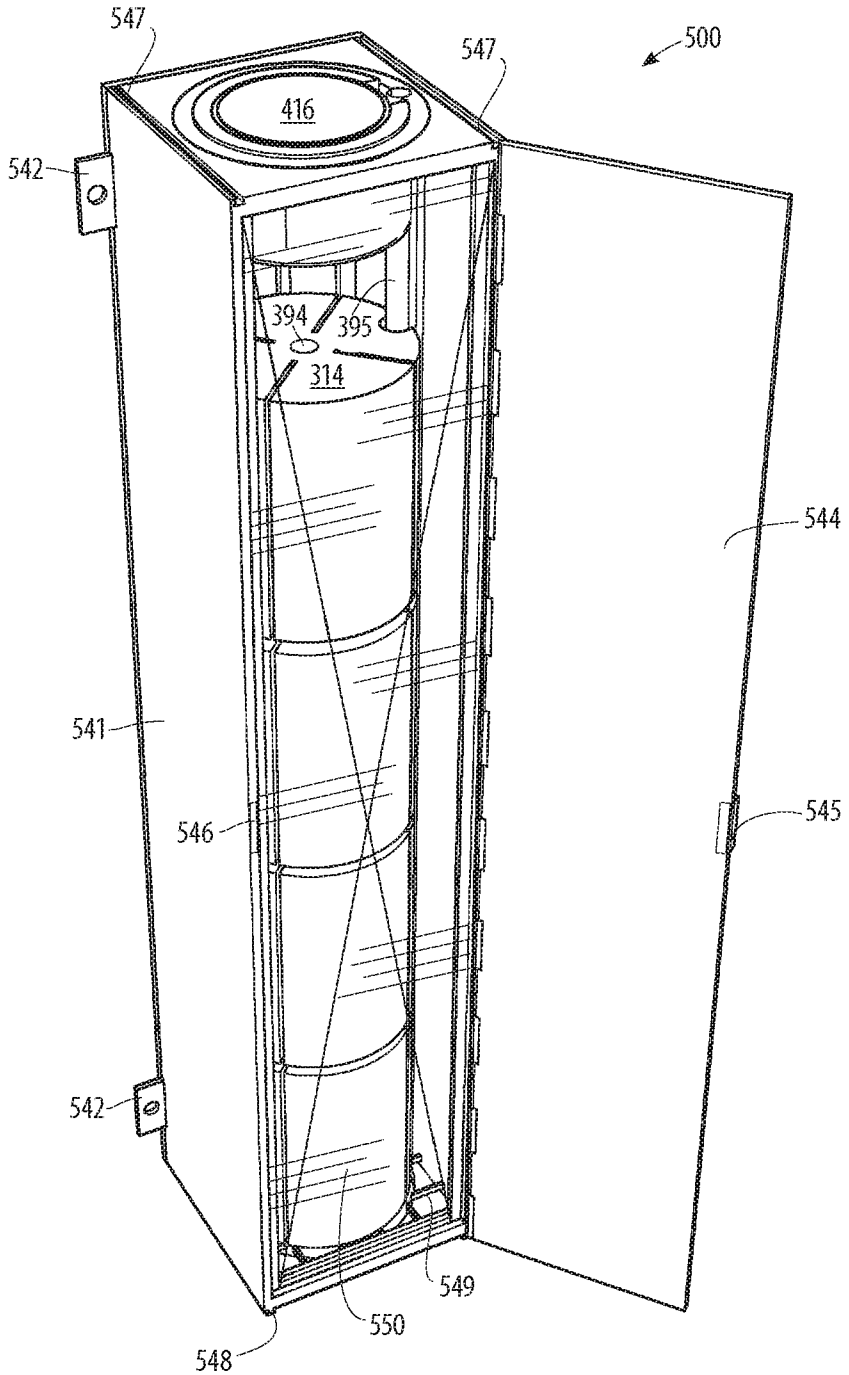


FIG. 46

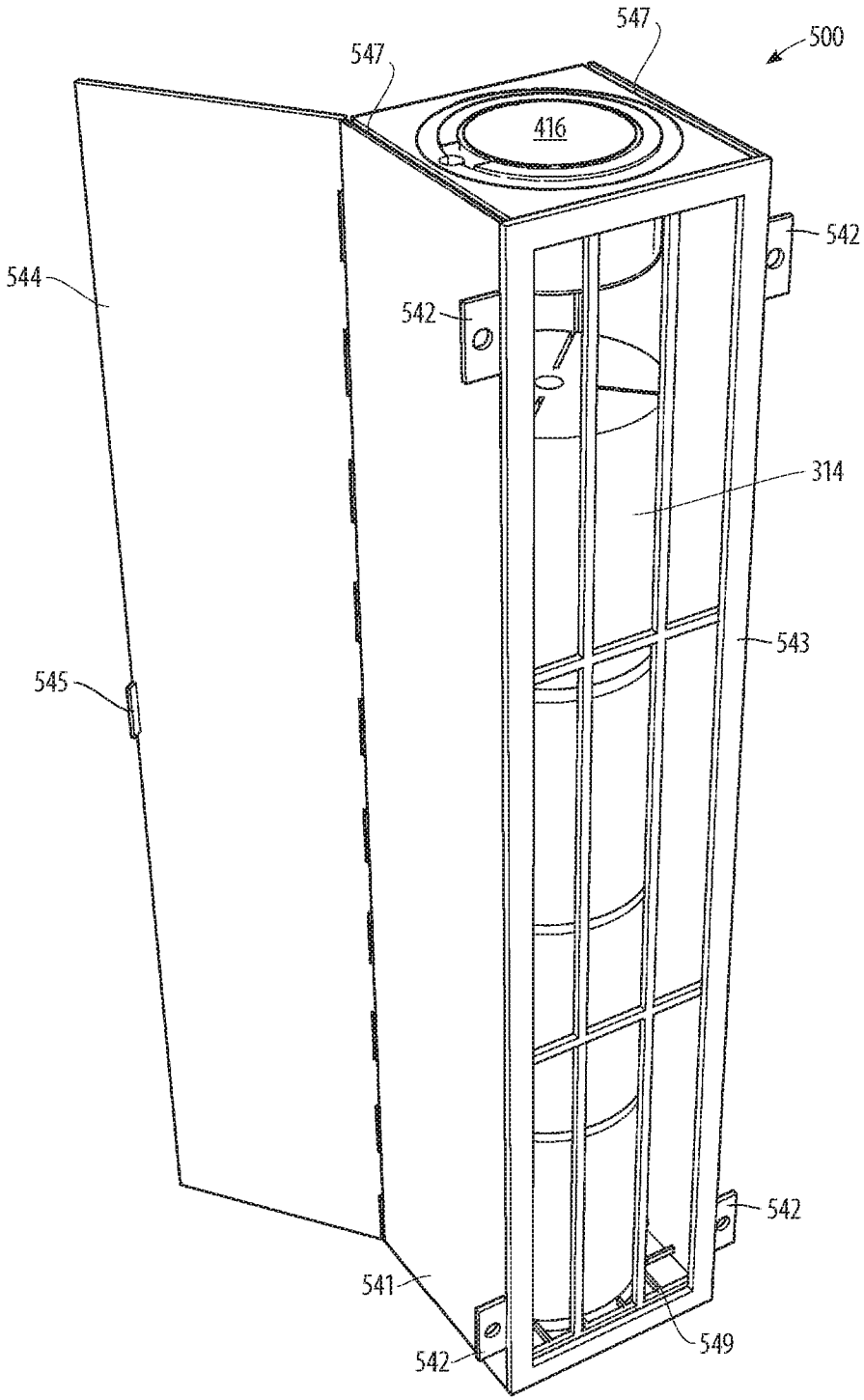


FIG. 47

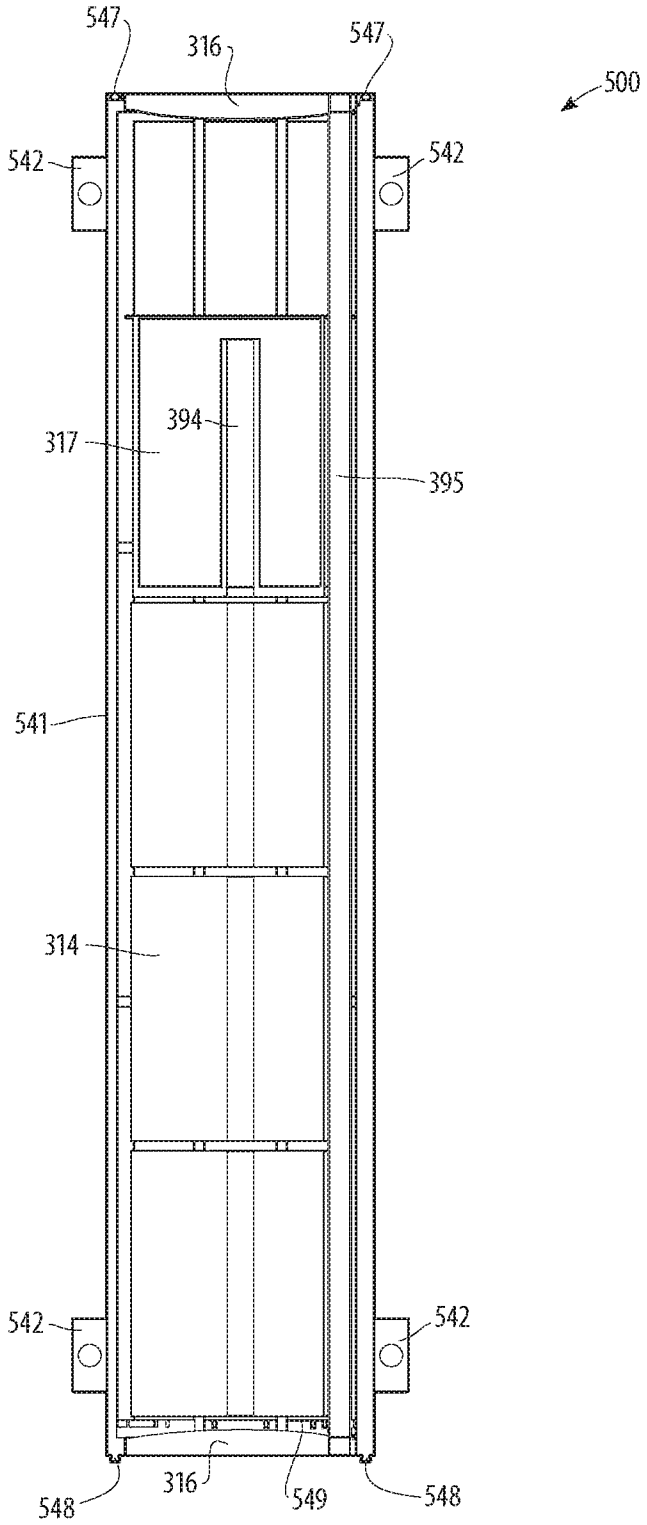

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FIG. 48

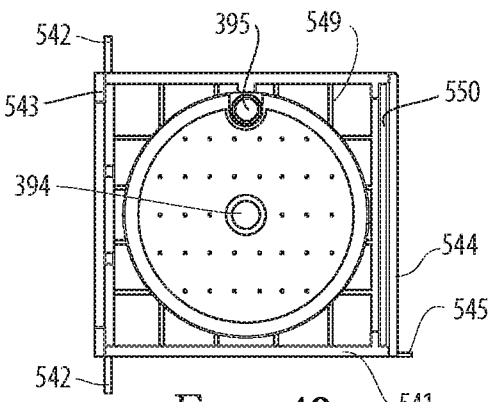


FIG. 49

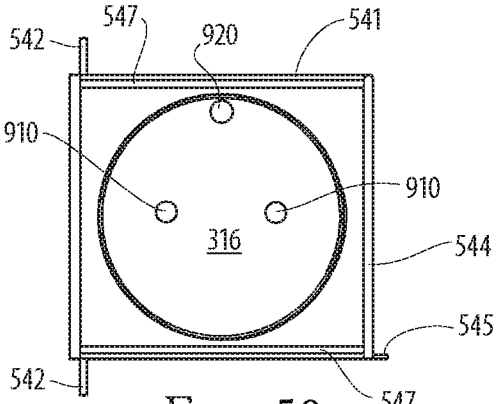


FIG. 50

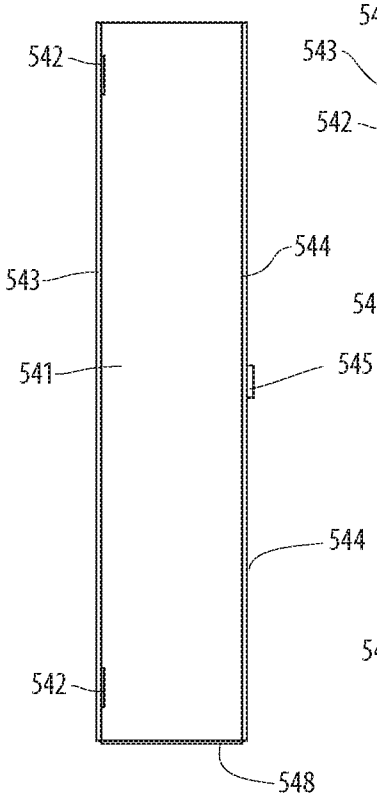


FIG. 51

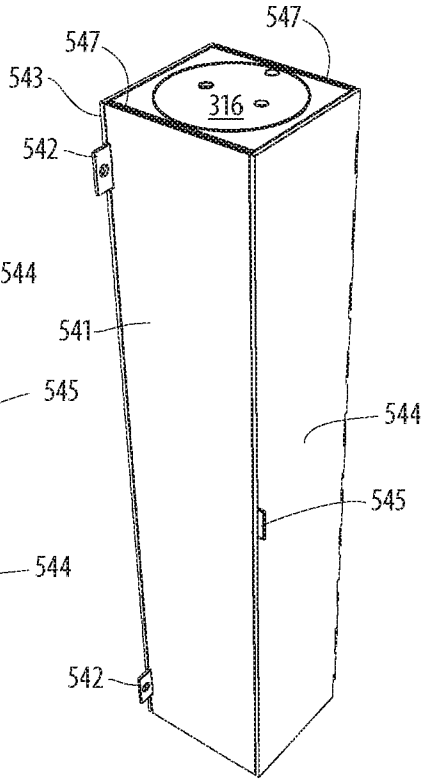


FIG. 52

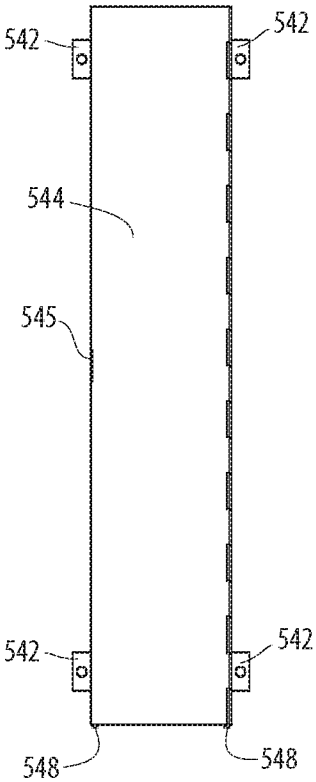


FIG. 53

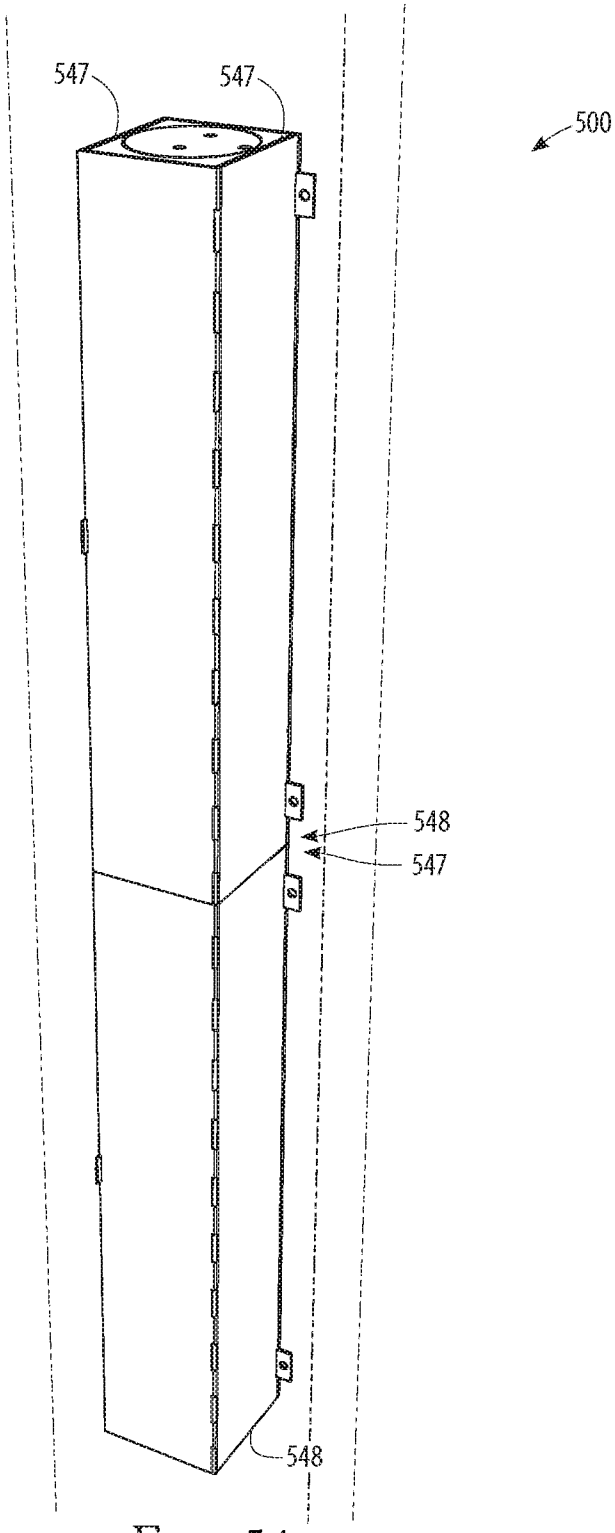


FIG. 54

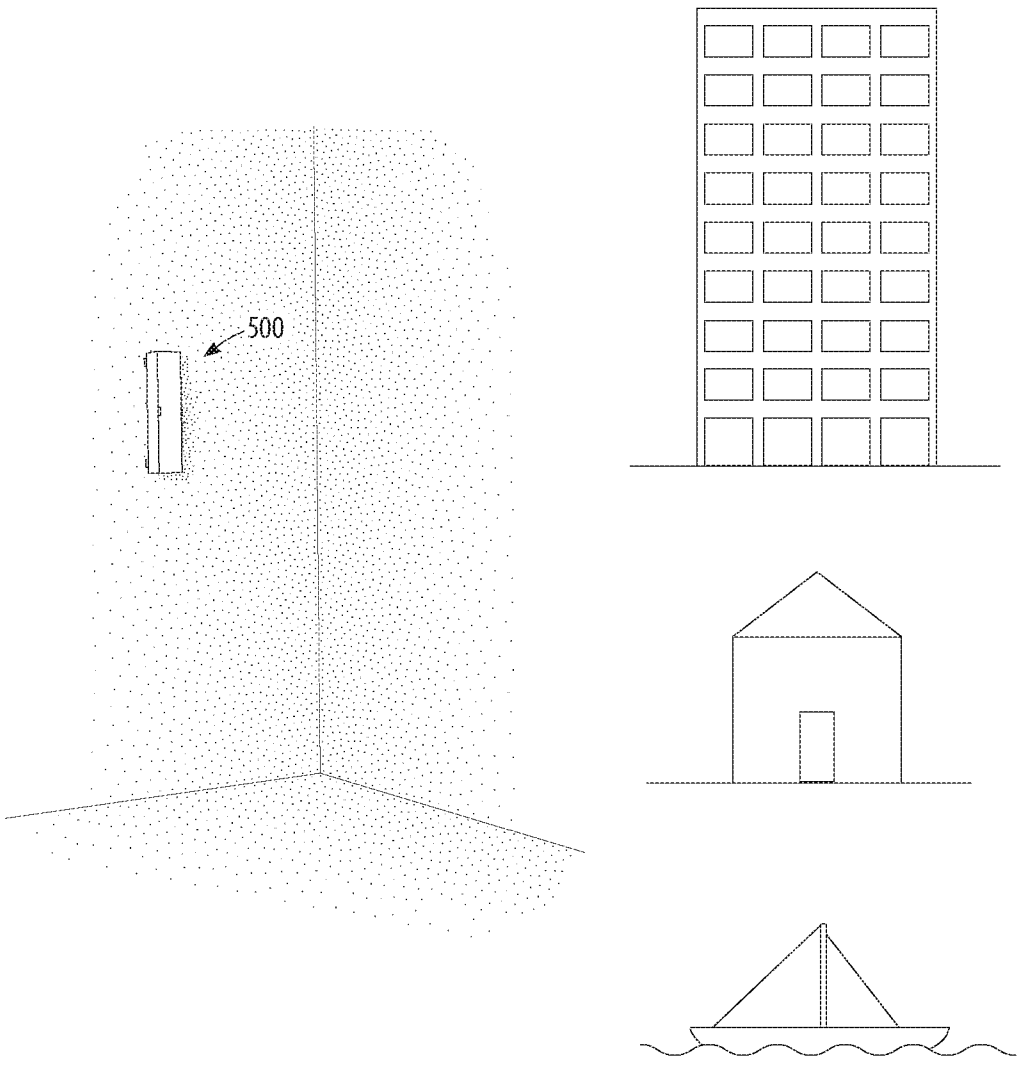


FIG. 55

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US17/15264

A. CLASSIFICATION OF SUBJECT MATTER
IPC - A01M 1/02, 1/20, 1/24 (2017.01)
CPC - A01M 1/02, 1/026, 1/20, 1/2005, 1/2011, 1/24

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
See Search History document

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
See Search History document

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
See Search History document

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2014/0331544 A1 (AZZARELLO J. F. et al.) November 13, 2014; entire document	1-40
A	WO 2007/051873 A1 (TERMITANIA S.L.) May 10, 2007; entire document	1-40
A	US 2006/0117645 A1 (CINK J. H. et al.) June 8, 2006; entire document	1-40
A	US 2,038,495 A (KELLER A. F.) April 21, 1936; entire document	1-40
A	US 2002/0178648 A1 (FRASIER K. L.) December 5, 2002; entire document	1-40
A	US 5,845,843 A (KULLER M.) December 8, 1998; entire document	1-40
A	US 2011/0041384 A1 (WILLCOX J. C. et al.) February 24, 2011; entire document	1-40
A	US 6,678,995 B1 (CARVIEL J.) January 20, 2004; entire document	1-40
P, X	US 2016/0374326 A1 (AZZARELLO M. et al.) December 29, 2016; claims 1-20	1-20
P, X	US 2017/0105403 A1 (AZZARELLO M. et al.) April 20, 2017; claims 1-20	21-40

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
26 May 2017 (26.05.2017)	16 JUN 2017
Name and mailing address of the ISA/ Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-8300	Authorized officer Shane Thomas PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US17/15264

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

-***-Continued Within the Next Supplemental Box-***-

1. ☒ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☒ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/US17/15264

-***-Continued from Box No. III Observations where unity of invention is lacking-***-

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I: Claims 1-20 are directed toward a pest control method comprising, a main body having a plurality of spaced blades, a flange, and installing said main body of said pest control system in the ground of the predetermined location.
Group II: Claims 21-40 are directed toward a pest control method comprising, a main box body adapted to be mounted to a wall, a hinged door, a magnetic latch, a door handle, an adhesive foam gasket, and a module stop.

The inventions listed as Groups I-II do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons.

The special technical features of Group I include the main body having a plurality of spaced blades meeting at a lowermost point and defining a sharp bottom point, defining an essentially cylindrical inner area, adapted to be placed into the ground, and having a ground-level surface, in use, a flange adapted to facilitate removal and reinstallation of said cellulose-food module; (e) at least one vent-shaft extension having a vent shaft adapted to coaxially join the vent shaft originating from said bottom vent shaft section, forming a longer vent shaft, and having a perforated flange to allow vertical distribution of gases and liquids, where, in use, said cellulose-food modules are supported by the flanges of said bottom vent shaft section and said vent-shaft extension, and (ii) installing said main bodies of said pest control system in the ground of the predetermined location (which is not present in Group II). The special technical features of Group II include the main box body adapted to be mounted to a wall, defining an inner area, having an open front, a partially open back, and sides, top, and bottom surface impermeable to light and air flow; (b) a hinged door impermeable to light and air flow covering said front of said main box body; (c) a magnetic latch adapted to keep said hinged door closed against said main box body; (d) a door handle affixed to said hinged door, adapted to allow opening of said hinged door; (e) at least one mounting tab adapted for mounting said main box body to a wall; (f) an adhesive foam gasket affixed to said partially open back of said main box body, adapted to create a seal with the wall which is tamper-proof and impermeable to light and air flow; (g) a transparent window impermeable to air flow forming a front surface of said main box body, a locking top adapted to be removably attached to said main box body at said top surface; and (1) a module stop placed inside and near said bottom surface of said main box body, adapted to support said cellulose-food modules; where, in use, said cellulose-food modules are supported by said module stop, and (ii) installing said main box bodies of said pest control above ground system on the walls of the pre-determined location (which is not present in Group 1).

The common technical features of Groups I and II include (i) providing a pest control system, in turn comprising: (a) a main body (b) a portway extending vertically along the side of the inner area of said main body adapted to allow continuing access to the lower portion of said main body, in use; (c) at least one cellulose-food module fitted in the inner area of said main body, and having a central essentially cylindrical void and a essentially cylindrical peripheral void; (d) a bottom vent shaft section having a vent shaft adapted to allow vertical distribution of gases and liquids, and (f) a locking top adapted to be removably attached to said main body, where, in use, said cellulose-food modules are supported, gases and liquids are distributed vertically within said main body by said vent shafts, said cellulose food modules can be installed, removed, and re-installed, and monitoring of said system can be performed through said portway; (ii) installing said main body of said pest control system, (iii) installing at least one said cellulose-food module into said main body; (iv) monitoring said pest control system for presence of cellulose-consuming pests; (v) adding a poison to the inner cylindrical area of each said main body; and (vi) monitoring said pest control system for elimination of cellulose-consuming pests.

These common technical features are disclosed by US 2014/0331544 A1 (AZZARELLO): (i) providing a pest control system, in turn comprising: (a) a main body (12; figure 2), (b) a portway (hollow cylindrical portion 22 and coaxially extending portion 24; figure 2; paragraph [0034]) extending vertically along the side of the inner area of said main body (12, as shown; figure 2), adapted to allow continuing access to the lower portion of said main body (a continuous path is shown from hollow cylindrical portion 22 into coaxially extending portion 24 and to the bottom of main body 12; figure 2; paragraph [0034]), in use; (c) at least one cellulose-food module (14a-14d; paragraph [0039]) fitted in the inner area of said main body (as shown; figure 2), and having a central essentially cylindrical void (as shown; figures 3, 4) and a peripheral void (60; figure 3); (d) a bottom vent shaft section (bottom of riser tube 94 with slots 98; figures 2, 6) having a vent shaft (interior of tube 94) adapted to allow vertical distribution of gases and liquids (as shown; figures 2, 6), and (f) a locking top adapted to be removably attached to said main body (cap 16 frictionally fits onto main body 12 and is locked into place with screws; figure 2; paragraphs [0048], [0049]), where, in use, said cellulose-food modules are supported (as shown via tube 94; figure 2), gases and liquids are distributed vertically within said main body by said vent shafts (shaft 94 is shown to provide even vertical distribution of liquid and gases; figures 2, 5), said cellulose food modules can be installed, removed, and re-installed (as shown; figure 2; paragraph [0039]), and monitoring of said system can be performed through said portway (cylindrical portion 22 is hollow and so system is capable of being monitored through the portway; figure 2; paragraph [0034]); (ii) installing said main body of said pest control system (as shown; figures 13-15), (iii) installing at least one said cellulose-food module into said main body (as shown; figure 2); (iv) monitoring said pest control system for presence of cellulose-consuming pests (paragraphs [0010], [0039]); (v) adding a poison to the inner cylindrical area of each said main body (bait units are substituted with poisonous substance; paragraph [0012]); and (vi) monitoring said pest control system for elimination of cellulose-consuming pests (pests are monitored, and pests carry poison away to the colonies (elimination of pests from the system); paragraphs [0010], [0012]). Although Azzarello does not disclose wherein the peripheral void for the blade (Azzarello; paragraph [0039]) is essentially cylindrical, in order to use an alternate ground penetrating means such as cylindrical spikes, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Azzarello's slots to be essentially cylindrical since such a modification involves a mere change in shape of an element.

Because the common technical features are disclosed by Azzarello, the inventions are not so linked as to form a single general inventive concept. Therefore, Groups I and II lack unity.