

(19) World Intellectual Property Organization
International Bureau



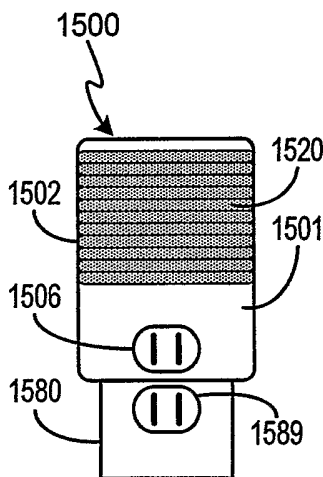
(43) International Publication Date
2 March 2006 (02.03.2006)

PCT

(10) International Publication Number
WO 2006/023796 A1

- (51) International Patent Classification⁷: **A61L 9/03**, F24F 3/12
- (74) Agent: **BOYD, Damon, L.**; Snell & Wilmer L.L.P., One Arizona Center, 400 East Van Buren, Phoenix, AZ 85004 (US).
- (21) International Application Number: PCT/US2005/029664
- (81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.
- (22) International Filing Date: 19 August 2005 (19.08.2005)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data: 60/603,093 20 August 2004 (20.08.2004) US
- (84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).
- (71) Applicant (for all designated States except US): **THE DIAL CORPORATION** [US/US]; 15501 North Dial Boulevard, Scottsdale, AZ 85260 (US).
- (72) Inventors; and
- (75) Inventors/Applicants (for US only): **HE, Mengtao, Pete** [US/US]; 10814 East Palm Ridge Drive, Scottsdale, AZ 85259 (US). **PAPPALARDO, Paul** [US/US]; 5056 East Paradise Lane, Scottsdale, AZ 85254 (US). **UCHIYAMA, Winston** [US/US]; 15440 North 71st Street, Unit 176, Scottsdale, AZ 85254 (US). **TRIPLETT, Carl** [US/US]; 9202 East Pershing Avenue, Scottsdale, AZ 85260 (US).
- Published:**
— with international search report
- For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: METHODS AND APPARATUS FOR A LOW-PROFILE AIR PURIFIER



(57) Abstract: An air purifier (100) having dimensions that enable the air purifier to be more discrete is disclosed. The air purifier (100) also includes components that enable the air purifier to mimic a particular environment in which the air purifier may be placed. In addition, the air purifier includes electrical plugs such that the air purifier is able to be plugged into a traditional wall outlet and the components enable the air purifier to mimic the appearance and function of the wall outlet. Furthermore, the air purifier includes one or more modules to sanitize incoming air (110), facilitate air flow through the air purifier, and/or dispense scented vapors (130).

WO 2006/023796 A1

METHODS AND APPARATUS FOR A LOW-PROFILE AIR PURIFIER

FIELD OF THE INVENTION

The invention relates, generally, to air-purification devices and, in particular, to a
5 low-profile air purifier configured, for example, to plug into a traditional household power
outlet.

BACKGROUND OF THE INVENTION

In recent years there has been an increased emphasis on improving the quality of the
10 air or "air health" of living spaces. This has in turn increased the popularity of consumer air
purification systems for use in an individual's home. It is often convenient to use an
available receptacle (e.g., a conventional household electrical outlet) as a source of electrical
power for systems configured to perform some type of environment-altering task. Due to the
location and accessibility of conventional wall outlets, and the size and shape of known
15 devices, it is common for such devices to be relatively conspicuous when plugged into a
wall outlet.

In some instances, it is desirable to enhance the extent to which vapor-dispensing
devices and/or air purifiers integrate or blend in with their environment. The level of
discreetness is generally related to a device's overall geometry and the manner in which the
20 device contacts the wall and/or receptacle to which it is connected. In addition, there are
instances where it is advantageous to provide an environment-altering apparatus with
enhanced functional discreetness. Thus, there is a need for vapor-dispensing devices and air
purifiers which do not eliminate, reduce, or otherwise alter a user's access to the functional
features of the receptacle.

25 SUMMARY OF THE INVENTION

In general, the present invention provides an air purification device that is low-
profile, compact, or otherwise configured to integrate with its environment in a discreet
manner. In general, the device includes an air sanitation module and an optional airflow
module. In accordance with a further embodiment, the air purification device includes a
30 vapor dispensing module configured to add one or more fragrances to the purified air.

The device may accomplish this discreetness in a number of ways -- for example, by
blending in with one or more components of the environment (e.g., a wall outlet or other

surface), by covering or otherwise occluding all or a portion of the receptacle, and/or by appearing to be something other than an environment-altering device.

A low-profile air purifier configured to mimic an electrical outlet according to various exemplary embodiments of the invention includes a housing having an anterior surface with an electrical receptacle pattern substantially similar to the electrical receptacle pattern of the electrical outlet; a posterior surface including a plug pattern having at least one plug; and a device interposed between said anterior surface and said posterior surface. In one embodiment, the device is configured to intake air, purify the air, and output the purified air.

10 BRIEF DESCRIPTION OF THE DRAWINGS

The subject invention will hereinafter be described in conjunction with the appended drawing figures, wherein like numerals denote like elements, and:

FIGS. 1A-1C are schematic block diagrams of various embodiments of the present invention;

15 FIG. 2 is an air purifier in accordance with one embodiment of the present invention;

FIG. 3 is an alternate view of the air purifier shown in FIG. 2;

FIG. 4 is an air purifier in accordance with an alternate embodiment of the present invention;

FIG. 5 is an alternate view of the air purifier shown in FIG. 4;

20 FIG. 6 is a diagram of an air purifier in accordance with an alternate embodiment of the present invention;

FIGS. 7A and 7B are diagrams of one embodiment of an air purifier capable of rotating around an axis normal to a front surface of an electrical outlet;

25 FIG. 8 is a diagram of an embodiment of an air purifier including a rotational air sanitizer module;

FIGS. 9A-9E are diagrams of one embodiment of an air purifier including a rotational housing;

FIG. 10 is a schematic overview of a system providing a context in which the present invention may be practiced;

30 FIG. 11 is a diagram of a side view of a vapor-dispensing device and receptacle in accordance with one embodiment of the present invention;

FIG. 12 is a diagram of a side view of a vapor-dispensing device and receptacle in accordance with another embodiment of the present invention;

FIG. 13 is a diagram of a side view of a vapor-dispensing device and receptacle in accordance with yet another embodiment of the present invention;

FIG. 14 is a diagram of a front view of an exemplary receptacle having a number of outlets;

5 FIG. 15 is a diagram of conventional dual-outlet receptacles;

FIG. 16 is a diagram of a conventional quad-outlet receptacle;

FIG. 17 is a diagram illustrating a variety of exemplary receptacle and outlet configurations;

FIG. 18 is a diagram of an exemplary vapor dispensing device;

10 FIG. 19 shows diagrams of various cross-section diagrams defining blending contours;

FIGS. 20A-20D are diagrams of various configurations of vapor-dispensing device geometries with respect to a receptacle;

FIG. 21 is a diagram of exemplary vapor-dispensing device geometries;

15 FIG. 22 is a diagram of exemplary vapor-dispensing device symmetries; and

FIG. 23 is a diagram illustrating an isometric view of exemplary vapor-dispensing device geometries.

DETAILED DESCRIPTION OF THE INVENTION

The detailed description of exemplary embodiments of the invention herein makes
20 reference to the accompanying figures, which show the exemplary embodiment by way of illustration. While these exemplary embodiments are described in sufficient detail to enable one skilled in the art to practice the invention, it should be understood that other embodiments may be realized, and that changes may be made without departing from the spirit and scope of the invention. Thus, the detailed description herein is presented for
25 purposes of illustration only and not by way of limitation.

For the sake of brevity, functional embodiments of the apparatus and systems (and components of the individual operating components of the systems) may not be described in detail herein. Furthermore, the connecting lines shown in the various figures contained herein are intended to represent exemplary functional relationships and/or physical
30 connections between the various elements. It should be noted that many alternative or additional functional relationships or physical connections may be present in a practical system.

Systems and methods in accordance with various embodiments of the present invention generally provide a low-profile air purifier configured to integrate with its environment in a discreet manner. For example, the air purifier may blend in with one or more components of the environment by covering or otherwise occluding all or a portion of the receptacle, and/or by appearing to be something other than an air purifier (e.g., an electrical outlet). Furthermore, the air purifier may include dimensions (e.g., length, width, diameter, thickness, shape, and the like) that allow the air purifier to be discrete. In other words, less noticeable than air purifiers having different dimensions.

Turning now to the figures, FIG. 1A is a block diagram of one exemplary embodiment of an air purifier 100 in accordance with the present invention. Air purifier 100 includes an air intake 105, an air sanitizer module 110, and an air output 115. FIG. 1B is a block diagram of air purifier 100 further including an airflow module 120 in communication with air sanitizer module 110, wherein airflow module 120 is configured to push, pull, or otherwise facilitate the movement of air from air intake 105 through air sanitizer module 110, and eventually to air output 115. FIG. 1C is a block diagram illustrating yet another embodiment of air purifier 100, wherein air purifier 100 further includes a vapor dispensing module 130 configured to add one or more fragrances to the air from airflow module 120 and/or air sanitizer module 110. In other words, air purifier 100 may act such that air output 115 is fragranced and/or purified, and may also include one or more controls configured to modulate the relative degree of fragrancing and/or purification.

Air sanitizer module 110, in various embodiments, may include any device, component, or combination of components suitably configured to scrub, purify, filter, sanitize, or otherwise process incoming air to produce cleaner air as an output. In this regard, air sanitizer module 110 may be configured to address the presence of germs (e.g., bacteria, viruses, and the like), allergens (e.g., pollen, dander, lint, dust, smog, mold, and the like), and/or malodors (e.g., chemical odors, microorganism odors, and the like) produced in various environments. Notably, the term environment, as used herein, corresponds to any defined space, whether open or enclosed by one or more surfaces, walls, ceilings, floors, or other solid or fictitious boundaries. For example, environment may correspond to, a residential room (e.g., bedroom, bathroom, kitchen, and the like), commercial space (e.g., factory floor, office cubicles, and the like), automotive enclosure (e.g., car, truck, recreation-vehicle, and the like), airline compartment, or any other space in which it is desirable to deliver a purified and/or fragranced air.

Airflow module 120 may include any device, component, or combination of components suitably configured to move air within and/or through air purifier 100. In this regard, airflow module 120 may include any device now known or later developed capable of causing air to move within and/or through air purifier 100.

5 Vapor dispensing module 130 may include any device, component, or combination of components suitably configured to add a fragrance, scent, or other vapor (e.g., insecticide) to air output by air purifier 100. Notably, the invention contemplates that air purifier 100 may include any suitable vapor dispensing technique or device now known in the art or later developed.

10 Air purifiers in accordance with various exemplary embodiments of the invention include components enabling the air purifier to be more discrete. For example, FIG. 2 illustrates an air purifier 200 including a low-profile housing 202, which may be formed of any material suitable for use in forming an air purifier. Examples of suitable materials for housing 202 include, but are not limited to, plastic, metal, ceramic, cermet, and the like.
15 Furthermore, housing 202 may include a relatively small width, height, depth, and/or the like such that housing 202 is less conspicuous than it would otherwise be if housing 202 included larger dimensions. For example, housing 202 may include a width in the range of about 6 centimeters (cm) to about 14 cm, a height in the range of about 10 cm to about 20, and a depth (thickness) in the range of about 2 cm to about 7 cm, preferably 5 cm, and most
20 preferably 3 cm.

In accordance with one embodiment of the invention, air purifier 200 includes an air intake 205. Air intake 205 may be any device, component, or combination of components known in the art or developed in the future capable of allowing air 207 to move into air purifier 200. In one exemplary embodiment of the invention, air intake 205 includes one or
25 more vents and/or other aperture(s) to allow air 207 to flow into air purifier 200.

Air purifier 200, in another exemplary embodiment, includes an airflow module 220 similar to airflow module 120 discussed above. In accordance with an aspect of the invention, airflow module 210 includes a fan configured to cause air 207 to flow into air intake 205, and cause air 207 to move through or across at least a portion of an air sanitizer
30 module 210 (discussed below). In accordance with various aspects of the invention, the fan may be an AC or DC micro fan, a squirrel cage fan, a cross-flow fan, and/or the like. In another exemplary embodiment, airflow module 220 includes ionization technology configured to create an active air flow through air purifier 100 via an electric field. In yet

another exemplary embodiment, airflow module 220 includes a pump suitably configured to cause air 207 to flow through air purifier 200. Notably, the invention contemplates that airflow module 220 may incorporate any suitable active air flow technique or device known in the art or developed in the future.

5 Air sanitizer module 210 may be any device, component, or combination of components suitably configured to substantially prevent unwanted particles and/or particulates from passing through it. In other words, air sanitizer module 210 may be any device that at least partially purifies air 207 as it passes through it. In one exemplary embodiment, air sanitizer module 210 includes one or more filters to purify incoming air
10 207. In accordance with an aspect of one exemplary embodiment of the invention, the filter may be a fiber filter such as, for example, a high efficiency particulate air (HEPA) filter. In another aspect of the invention, the filter may be a Filtrete filter manufactured by 3M Corporation of St. Paul, Minnesota.

In accordance with another exemplary embodiment, air sanitizer module 210
15 includes one or more chemical absorbents to purify air 207. Examples of chemical absorbents include, but are certainly not limited to, carbon; baking soda; an anti-germ, chemical-reaction-type air sanitizer; and the like. In yet another exemplary embodiment, air sanitizer module 210 incorporates ultraviolet, ozonation, and/or ionization air sanitization technologies to purify air 207. Notably, the invention contemplates that air sanitizer module
20 210 may incorporate any technique, process, device, and/or components known in the art or developed in the future for purifying air 207.

In another exemplary embodiment, air purifier 200 includes an air output 215. In accordance with an aspect of one exemplary embodiment, air output 215 includes one or more vents and/or apertures suitably configured to output purified air 218 into the
25 environment surrounding air purifier 200.

Air purifier 200, in one exemplary embodiment, includes an outlet pattern including one or more plug receptacles 206 suitably configured to accept one or more electrical connectors from an external electrical device (not shown). Plug receptacles 206 may be any plug receptacle known in the art capable of having an electric plug inserted within it and
30 providing electric current to the device connected to the plug. Thus, plug receptacles 206 may be configured to function similar to standard plug receptacles found, for example, in a wall outlet or on a power strip. As such, plug receptacles 206 may also function to mimic (i.e., resemble in appearance) a standard outlet such that air purifier 200 is less likely to be

detected as an air purifying device. In another embodiment of the invention, plug receptacles 206 are not functional, but are simply configured to mimic the standard outlet similar to the embodiment discussed above. Notably, air purifier 200 may include any shape and/or dimensions suitable for purifying air 207. However, embodiments desiring that air purifier 200 mimic a standard duplex wall outlet, power strip, or quadplex should include dimensions (e.g., height, width, depth, and the like) and/or shapes (e.g., rectangular, square, and the like) similar to well-accepted dimensions/shapes for these outlets and/or dimensions/shapes less likely to be otherwise noticed.

In operation, airflow module 220 causes air 207 to enter air purifier 200 via air intake 205. Airflow module 220 then causes air 207 and pass over, across, and/or pass through air sanitizer module 210, wherein impurities in air 207 are trapped within air sanitizer module 210 resulting in purified air 218. Airflow module 220 forces purified air 218 to exit air purifier 200 through air output 215 to the surrounding environment.

Another embodiment of a low-profile air purifier includes vents for facilitating air flow through the air purifier. For example, FIG. 3 illustrates an air purifier 300 including a housing 302, one or more plug receptacles 306, an air output 315 for purified air 318, and an air sanitizer module (not shown) similar to housing 205, an air intake 205 for air 207, plug receptacles 206, air output 215 for purified air 218, and air sanitizer module 210, respectively, discussed above with reference to FIG. 2. In accordance with one exemplary embodiment of the invention, a cover 350 including air intake 305 is included a part of air purifier 300, wherein air intake 305 includes vents for allowing air 307 to enter air purifier 300.

In yet another embodiment of the invention, a air purifier includes a vapor-dispensing module to add scented and/or fragranced vapor to the environment surrounding the air purifier. As illustrated in FIG. 4, an air purifier 400 includes a housing 405, an airflow module 420, one or more plug receptacles 406, an air output 415 for purified air 418, and an air sanitizer module (not shown) similar to housing 205, airflow module 220, plug receptacles 206, air output 215 for purified air 218, and air sanitizer module 210 discussed above, respectively, with reference to FIG. 2.

In accordance with one exemplary embodiment, air purifier 400 includes a vapor-dispensing module 430 similar to vapor-dispensing module 130 discuss above with reference to FIG. 1C. In accordance with an aspect of one exemplary embodiment, vapor-dispensing module 430 includes a reservoir 433 (or other form of air additive component) to

store a volatilizable material (e.g., oil, gel, and the like), and one or wicks 438 (or an eminator pad associated therewith, as discussed below). Furthermore, various embodiments of vapor-dispensing module 430 may include an end of use indicator (not shown) to alert a user that reservoir 433 is substantially out of volatilizable material or includes a low level of volatilizable material. In accordance with aspects of one exemplary embodiment, the end of use indicator may be a visual indicator (e.g., a light) and/or an audible indicator (e.g., a continuous or intermittent noise emitted through a speaker).

In operation of one embodiment of air purifier 400, airflow module 420 is configured to move air 407 through, around, or across wick 438 such that air 407 is fragranced before being purified by the air sanitizer module. In this embodiment, the air sanitizer is configured in a manner that will not substantially filter out any fragrance added to air 407. In operation of another embodiment of air purifier 400, airflow module 420 is configured to move purified air 418 through, around, or across wick 438 such that purified air 418 includes a fragrance after being purified by the air sanitizer module so that a fragranced, purified air is output by air output 418. In operation of yet another embodiment of air purifier 400, airflow module 420 is configured to move air 407 through, around, or across a first wick 438 such that air 407 is fragranced before being purified by the air sanitizer module, and is configured to move the purified, fragranced air through, around, or across a second wick 438 after being purified by the air sanitizer module.

The amount of vapor dispensed by a vapor-dispensing module of one embodiment of an air purifier may be controlled utilizing a controller. An air purifier 500, as shown in FIG. 5, includes a housing 502, one or more plug receptacles 506, an air output 515 for purified air 518, an air sanitizer module (not shown), and a cover 550 providing air intake 505 similar to housing 305, plug receptacles 306, air output 315 for purified air 318, the air sanitizer module, and cover 350 providing air intake 305, respectively, discussed above with respect to FIG. 3. Furthermore, air purifier 500 includes a vapor-dispensing module (not shown) including a reservoir, a wick (or eminator), and/or an end of use indicator similar to vapor-dispensing devices 130 and 430 (including reservoir 433 and wick 438) discussed above with respect to FIGS. 1 and 4, respectively.

In an exemplary embodiment, air purifier 500 also includes a control lever 575 in communication with the vapor-dispensing device. Control lever 575 may be any device, component, or combination of components capable of controlling the rate at which additives, fragrances, and/or other vapors are introduced into air 507 and/or purified air

518. As such, control level 575 may be any controller known in the art or developed in the future. In accordance with an aspect of one exemplary embodiment of the invention, lever controller 575 is a sliding lever.

5 Air purifier 500, in another exemplary embodiment, includes a use-up indicator 580 in communication with the reservoir. Use-up indicator 580 may be any device, component, or combination of components suitably configured to display the amount of vapor-releasing substance(s) (e.g., oil, water, gel-based materials, and the like) remaining within the reservoir.

10 Embodiments of a low-profile air purifier 600, as shown in FIG. 6, include a housing 602, one or more plug receptacles 606, and an air output 615 for purified air 618 similar embodiments discussed above with respect to FIGS. 2-5. Air purifier 600, in one exemplary embodiment, includes an air intake 605 and an air sanitizer module 610 similar to air intakes and air sanitizers discussed above. Air intake 605, in accordance with one aspect of the invention, includes vents and apertures to allow air 607 to enter air purifier 600. In another
15 aspect of the invention, air sanitizer module 610 is a filter. In this manner, air intake 605 and air sanitizer module 610 are combined such that as air 607 pass through air intake 605, impurities in air 607 are filtered out.

In another exemplary embodiment, air purifier 600 includes a vapor-dispensing module formed of a reservoir 633 and a wick 638 similar to reservoir 433 and wick 438
20 discussed above with respect to FIG. 4. In accordance with an aspect of one exemplary embodiment of the invention, reservoir 433 and/or wick 438 may be configured to be a removable refill for air purifier 600. Notably, the invention contemplates that air purifier 600 may also include a fan or other airflow module (not shown) to facilitate movement of air 607 and/or purified air 618 into, within, and/or out of air purifier 600.

25 Another embodiment of the invention includes a low-profile air purifier capable of rotating on an axis normal to an electrical outlet. For example, in FIG. 7A an air purifier 700 including a housing 702, one or more plug receptacles 706, an airflow module 720 and/or an air intake (not shown), and an air sanitizer module (not shown) similar to embodiments discussed above is illustrated. Housing 702, in various embodiments, is
30 configured to rotate within a range of rotational angles. The axis of rotation passes through substantially a center of an electrical receptacle (not shown) with which air purifier 700 is attached. Furthermore, housing 702 includes a perimeter 797 having a curved edge profile 799 with a radius of curvature (i.e., the curvature from A to A'). In an aspect of one

exemplary embodiment of the invention, the radius of curvature of curved edge profile 799 is in the range of about 3 cm to about 7 cm. In another exemplary embodiment, housing 702 is configured such that it is capable of rotating about 270 degrees without occluding an electrical receptacle 788 of an electrical outlet 780 with which air purifier 700 is attached
5 (see, for example, FIG. 7B). In other words, housing 702 may be configured such that the distance (d' or d'') from the substantial center of the electrical receptacle with which air purifier 700 is attached to pre-determined points on perimeter 797 is less than a distance (d) from the substantial center of the electrical receptacle with which air purifier 700 is attached to a point (C) of electrical receptacle 788.

10 Other embodiments of the invention include a low-profile air purifier that purifies the air utilizing a rotating air sanitizer module. An air purifier 800, as illustrated in FIG. 8, according to these embodiments includes a housing 802 and one or more plug receptacles 806 similar to embodiments discussed above in addition to a rotational air sanitizer module 810.

15 In one exemplary embodiment, air sanitizer module 810 includes a filter similar to filter embodiments discussed above. Furthermore, air sanitizer module 810 is configured to rotate around housing 802. As air sanitizer 810 rotates, air pass over/through air sanitizer module 810 and any unwanted particles and/or particulates are trapped within the filter of air sanitizer module 810.

20 Referring to FIGS. 9A-9E, a rotatable air purifier 1500 according to various exemplary embodiments of the invention is illustrated. Air purifier 1500, in one exemplary embodiment, includes a housing 1502 to least partially house an air sanitizer module (not shown), a vapor-dispensing module (not shown), and an airflow module 1520 similar to
25 embodiments of air sanitizer modules, vapor-dispensing modules, and airflow modules discussed above, respectively. Furthermore, housing 1502 is suitably configured to rotate about a plug receptacle 1506 included within an anterior surface 1501 of housing 1502, wherein plug receptacle 1506 are similar to embodiments plug receptacles discussed above. Housing 1502, in accordance with an exemplary embodiment of the invention, is configured to rotate around plug receptacle 1506 on an axis normal to an electrical outlet 1580. In an
30 aspect of one exemplary embodiment of the invention, housing 1502 is configured to rotate 360 degrees around plug receptacle 1506 as illustrated in FIGS. 9A, 9B, 9C, and 9D.

In another exemplary embodiment of the invention, plug receptacle 1506 is configured not to rotate and/or move when housing 1502 is rotated. In other words, plug

receptacle 1506 is configured to remain static such that a plug may be inserted in its traditional upright manner. Moreover, in one embodiment, plug receptacle 1506 is connected to electrical plugs (not shown) extending from a posterior surface (not shown) of air purifier 1500. In accordance with an aspect of one exemplary embodiment of the invention, plug receptacle 1506 and the electrical plugs are configured to remain in place while housing 1502 is rotated around them. FIGS 9A-9D illustrate air purifier 1500 attached to a top electrical receptacle 1588 (shown in FIG. 9E) of electrical outlet 1580 and include positions wherein electrical receptacle 1588 is not completely or substantially occluded by air purifier 1500, FIG. 9E illustrates that air purifier 1500 may likewise be attached to a bottom electrical receptacle 1589 (shown in FIG. 9A) of electrical outlet 1580 and include positions wherein electrical receptacle 1589 is not completely or substantially occluded by air purifier 1500. Notably, as shown in FIGS. 9A-9E, air purifier 1500 is capable of functioning properly when attached "upside-down", "side ways", "right side-up", and/or anywhere in between to electrical outlet 1580.

FIG. 10 is a block diagram of an air purifier 900 generally interfacing with an electrical outlet 980 within an environment. Air purifier 900 may include any suitable device, component, or combination of components suitably configured to alter the environment in some manner such as, for example, altering its aromatic vapor density and/or by purifying the ambient air. In accordance with another embodiment, a refill may be included as a portion of air purifier 900, wherein the refill includes air filtration and/or fragrance elements configured to be replaced at substantially the same time. Notably, air purifier may be any of air purifiers 100, 200, 300, 400, 500, 600, 700, 800, or 1500.

In accordance with yet another embodiment of the present invention, air purifier 900 is configured to give the appearance that it is something other than an air purifier. For example, the air purifier may be configured to mimic an electrical receptacle having an outlet pattern (discussed in greater detail below). In this embodiment, air purifier 900 has a front surface which includes an outlet pattern substantially corresponding to the outlet pattern of the receptacle, and a plug configured to interface with the electrical receptacle.

For example, FIG. 11 illustrates air purifier 900 interfacing with an electrical outlet 980 through one or more plugs (or other interface structures) 978 corresponding to an outlet pattern 983. Electrical outlet 980 may be any device, component, or combination of components suitable for providing electrical current to air purifier 900. For example, electrical outlet 980 may be a standard wall outlet (duplex), a power strip, or a quadplex.

Air purifier 900 includes a front surface 909 (which may or may not be planar) that includes one or more plug receptacles 906 which substantially corresponds to outlet pattern 983 of electrical outlet 980. In addition, air purifier 900 is generally configured to removeably attach to receptacle outlet 980.

5 An assembly 912 is configured to modify one or more attributes of the environment as described above such as, for example, purifying and, optionally, fragrancng the air in the environment. In this regard, assembly 912 is used herein to collectively refer to the various components depicted in FIGS. 1A-1C (e.g., sanitizer module 110, air module 120, and/or vapor dispensing module 130).

10 Assembly 912 is suitably interposed between (and/or to the side of) front surface 909 and plug receptacles 906. In an embodiment wherein assembly 912 corresponds includes a vapor dispensing device, it may also include one or more components (e.g., wicks, capillary tubes, and the like) which provide a means for transporting volatizable material from one location to another (e.g., from a reservoir to an evaporation pad or eminator), and/or one or
15 more components (e.g., eminator pads, secondary wicks, and the like) which provide a surface or surfaces from which the transported material undergoes mass transfer or evaporation to a surrounding environment.

Notably, it is advantageous to utilize electrical outlet 980 as a power source to provide any electrical functionality required by air purifier 900. For example, the fragrance
20 delivery device may include one or more emimators or heating elements designed to control the rate at which the volatizable material evaporates into the environment. In such a case, assembly 912 may include various terminals, wires, conductive traces, plugs, and other such components facilitating interface and power delivery from electrical outlet 980. In a particularly preferred embodiment, for example, assembly 912 includes a resistive heating
25 element that is thermally coupled to an eminator pad or wick which communicates with a volatizable material.

Although air purifier 900 is illustrated as generally rectilinear in cross-section, it may in fact include any number of discrete or integrated housings having any arbitrary shape. Furthermore, in accordance with this embodiment, it is not necessary for air purifier 900 to
30 exhibit a geometry which is similar in size or shape to that of electrical outlet 980 or any face-plates provided in conjunction with electrical outlet 980. That is, as shown in FIG. 12, air purifier 900 may actually be smaller than an electrical outlet 980 (e.g., on the order of the size of plug receptacles 906). Similarly, as shown in FIG. 13, air purifier 900 may be

asymmetrical with respect to electrical outlet 980 and/or any plug receptacles 906 provided in electrical outlet 980. As shown in FIG. 13, for example, the lower boundary of front face 909 may extend below (or above) electrical outlet 980.

FIG. 14 shows a general configuration for electrical outlet 980 which includes an
5 outer boundary and/or faceplate perimeter 983 along with one or more outlets 988. Outlets 983 may exhibit any suitable shape, and may include any suitable combination of male, female, or other connection types. For example, referring now to FIG. 15, electrical outlet 980 may consist of a conventional dual-outlet power receptacle including a pair of two-prong outlets 988 and a faceplate perimeter 983. Similarly, as shown in FIG. 16, electrical
10 outlet 980 may consist of a conventional quad-outlet power receptacle including four two-prong outlets 988 and a faceplate perimeter 983. FIG. 17 presents a matrix of additional standard receptacle designs with which the present invention may be employed. Note also that the present invention may be used in connection with ground-fault interrupt (GFI) electrical outlets.

15 It will be appreciated that the present invention is not limited to electrical receptacles. Indeed, electrical outlet 980 may comprise any suitable structure configured to provide electricity, data, or any other power and/or information source to air purifier 900 through a suitable interface. For example, suitable receptacles include RJ-11 and RJ-45
20 jacks used in connection with high-speed data transfer (and analog telephone communication), co-axial connectors used in connection with electrical and optical cable networks, and any other receptacle design now known or developed in the future.

To achieve the goal of appearing to be something other than a vapor-dispensing device, air purifier 900 may be designed to mimic not only an electrical receptacle, but any
25 number of other objects which might typically appear in the target environment. For example, the vapor-dispensing device might be configured to mimic a wall switch, a multi-outlet power strip, a night-light, or any other suitable object.

As mentioned above, discreetness of the environment-altering device may also be achieved by configuring the device such that it blends in with its environment. This blending
30 may be accomplished, for example, by including a housing configured such that a cross-section orthogonal to and through the perimeter of the housing defines a blending contour from the front surface to the wall outside the perimeter of the electrical receptacle.

Referring to FIG. 18, for example, electrical outlet 980 includes a faceplate perimeter 983, which may or may not be rectangular as illustrated. Faceplate perimeter 983 generally

fits against or flush with a wall 1000. A housing 985 has a perimeter 990 (which need not be rectangular, and need not correspond to the shape of faceplate perimeter 983) that is characterized by a cross-section 'A' as shown, wherein the cross-section defines a blending-contour with respect to wall 1000, thus providing added discreteness.

5 More particularly, referring to FIG. 18 in connection with the six example cross-sections illustrated in FIG. 19, a cross-section 1100 near the perimeter 990 of housing 985 forms a blending-contour between a front 1002 and wall 1000. In general, blending contour 1000 forms a continuous (but not necessarily smooth or differentiable) curve extending from the front 1002 of housing 985 to a terminus 1004 near or in contact with wall 1000. It will
10 be appreciated that the exemplary shapes shown in FIG. 19 do not exhaust the range of blending-contour shapes that may be used in accordance with the present invention.

In accordance with a further aspect of the present invention, air purifier 900 blends in with its environment by including at least two antipodal points on the perimeter of housing 985 make contact with wall 1000 outside a housing perimeter 1102 of faceplate perimeter
15 983 when air purifier 900 is connected to electrical outlet 980.

Referring to FIG. 22, housing perimeter 1102 is configured such that at least two points on opposite sides of housing perimeter 1102 make contact with wall 1000 outside of faceplate perimeter 983. For example, housing perimeter 1102 may make contact with wall 1000 at one or more of the following pairs of points: points 1302 and 1304; points 1306 and
20 1308; and points 1310 and 1312. The word "point" is used in the sense of a location, and need not correspond to a small circular contact point; indeed, any arbitrary contact region (or closely situated regions) may be considered a "point" as that term is used in connection with this embodiment.

In accordance with a further aspect of the present invention, an air purifier has low-
25 profile dimensions. More particularly, referring now to FIG. 23, an air purifier 2000 includes a housing 2002 having a front surface 2009 and a back surface 2014 separated by a thickness t , wherein back surface 2014 has a minor axis dimension x and a major axis dimension y . A first device outlet 2016 and a second device outlet 2019 are provided on the front surface 2009 of housing 2002. The device outlets 2016 and 2019 are separated by an
30 inter-outlet distance d ; wherein: x/d is between approximately 2.0 and 2.5, preferably about 2.125, y/d is between approximately 3.0 and 3.5, preferably about 3.25, and t/d is between approximately 0.5 and 1.0, preferably about 0.625. In accordance with yet a further aspect

of the present invention, the thickness t is less than approximately 20 percent of the major axis dimension y .

To achieve the goal of blending in with the environment, any number of other attributes of the device may be designed to match or be thematically consistent with one or more attributes of the environment. For example, the color, texture, and/or geometry of air purifier 2000 may be selected to better blend in with the wall, furniture, and/or other components of the environment.

Discreetness of air purifier 2000 may also be achieved by configuring the device such that it covers all or a portion of the electrical receptacle. In accordance with one aspect of the present invention, for example, air purifier 2000 substantially covers the receptacle by including a housing whose perimeter substantially encompasses the perimeter of the electrical receptacle's faceplate when the vapor-dispensing device is connected to the electrical receptacle.

More particularly, referring to the four exemplary configurations shown in FIG. 20, faceplate perimeter 983 (or, alternatively, receptacle perimeter) is substantially encompassed by housing perimeter 1102. That is, housing perimeter 1102 may fully encompass faceplate perimeter 983 such that all points on faceplate perimeter 983 fall within the area defined by housing perimeter 1102 (as shown in FIGS. 20A and 20D) or so that a portion of faceplate perimeter 983 lies at the border of (or indeed, slightly outside of) housing perimeter 1102 (as shown in FIGS. 20B and 20C). While the illustrated faceplates and housings shown in FIG. 20 are generally rectangular and generally correspond to each other, the faceplates and housings may have any variety of shapes, and it is not necessary for the shapes to generally correspond to each other. For example, faceplate perimeter 983 may be rectangular while housing perimeter 1102 is circular or elliptical. In accordance with a further aspect of the present invention, a vapor-dispensing device includes a housing whose aspect ratio is substantially similar to the aspect ratio of a receptacle faceplate, and whose center is substantially coincident with the center of the faceplate.

Referring to FIG. 21, faceplate perimeter 983 is characterized by a center (or centroid) 1202 and height and length dimensions h and l respectively. Similarly, housing perimeter 1102 is characterized by a center (or centroid) 1204 and height and length dimensions H and L respectively. Faceplate perimeter 983 has an aspect ratio defined as H/L , and housing perimeter 1102 has an aspect ratio defined as h/l . In accordance with one aspect of the present invention, center 1202 substantially coincides with center 1204. In

accordance with a further aspect of the present invention, the aspect ratio of faceplate perimeter 983 is substantially equal to the aspect ratio of housing perimeter 1102. In one embodiment, for example, the faceplate aspect ratio is substantially equal to the aspect ratio of a standard dual-outlet faceplate such as, for example, between approximately 1.3 and 1.7, and preferably about 1.5. It will be appreciated that the aspect ratio may be defined in any convenient matter depending upon the shape of the respective faceplate and housing.

Although the invention has been described herein in conjunction with the appended drawings, those skilled in the art will appreciate that the scope of the invention is not so limited. Modifications in the selection, design, and arrangement of the various components and steps discussed herein may be made without departing from the scope of the invention.

CLAIMS

1. An air purifier configured to mimic an electrical outlet, the electrical outlet having a first electrical receptacle pattern comprising a first electrical receptacle, the air purifier
5 comprising:
a housing comprising:
an anterior surface having a second electrical receptacle pattern, said second electrical pattern comprising a second electrical receptacle, said second electrical pattern substantially corresponding to the first electrical receptacle pattern;
10 a posterior surface comprising a plug pattern, said plug pattern comprising at least one plug; and
a device interposed between said anterior surface and said posterior surface, said device configured to:
intake air,
15 purify said air, and
output said purified air.
2. The air purifier of claim 1, said device comprising:
an air intake;
an air sanitizer module in communication with said air intake, wherein said air
20 sanitizer module is configured to purify air from said air intake; and
an air output in communication with said air sanitizer module, wherein said air output is configured to output said purified air.
3. The air purifier of claim 2, said device further comprising:
an airflow module in communication with said air intake, said air sanitizer module,
25 and said air output; wherein said airflow module is configured to facilitate movement of said air from said air intake to said air sanitizer module, and said purified air from said air sanitizer module to said air output.
4. The air purifier of claim 3, wherein said airflow module is one of a fan, a micro fan, a squirrel cage fan, a cross-flow fan, an ionization device, and a pump.
- 30 5. The air purifier of claim 2, wherein said air sanitizer module is configured to address the presence of one of a germ, an allergen, and a malodor.

6. The air purifier of claim 5, said air sanitizer module comprising one of a filter, a chemical absorbent material, an ultraviolet device, an ozonation device, and an ionization air sanitation device.
7. The air purifier of claim 2, wherein said device is configured to evenly distribute said
5 air across said air sanitizer module.
8. The air purifier of claim 3, said device further comprising:
a vapor-dispensing module in communication with said airflow module, wherein said vapor-dispensing module is configured to add a fragrance to one of said air and said purified air.
- 10 9. The air purifier of claim 8, said vapor-dispensing module comprising:
a reservoir configured to store a volatizable material; and
one of a wick, an eminator pad, a heating element, and a capillary tube in communication with said reservoir.
10. The air purifier of claim 8, wherein said vapor-dispensing module and said air
15 sanitizer module comprise a refill portion of the air purifier.
11. The air purifier of claim 1, said housing comprising an axis of rotation normal to a plane of the electrical outlet.
12. The air purifier of claim 11, wherein said housing is configured to rotate within a range of rotational angles.
- 20 13. The air purifier of claim 12, wherein said range is about 270 degrees.
14. The air purifier of claim 11, wherein said axis of rotation passes through substantially a center of the first electrical receptacle.
15. The air purifier of claim 14, the first electrical pattern further comprising a third electrical receptacle; and said housing further comprising an edge profile comprising a
25 radius of curvature, wherein said housing is configured such that a first distance from said substantial center of the first electrical receptacle to said edge profile is less than a distance from said substantial center of the first electrical receptacle to a point of said third electrical receptacle closest to said substantial center of the first electrical receptacle.
16. The air purifier of claim 15, said edge profile comprising a radius of curvature in the
30 range of about 3 centimeters (cm) to about 7 cm.

17. An air purifier, comprising:
a housing comprising an anterior surface, said anterior surface comprising an electrical plug receptacle, said electrical plug receptacle coupled to electrical plugs extending from a posterior surface of said air purifier; and
- 5 an air sanitizer module housed substantially within said housing, wherein said air sanitizer module is configured to at least partially purify air, and said housing is configured to rotate about said electrical receptacle and electrical plugs when said electrical plugs are attached to an electrical outlet.
18. The air purifier of claim 17, further comprising:
- 10 an airflow module housed substantially within said housing, wherein said airflow module is configured to facilitate at least one of movement of said air into said air purifier, movement of said air within said air purifier, and movement of said air out of said air purifier.
19. The air purifier of claim 18, further comprising:
- 15 a vapor dispensing module in communication with said airflow module, wherein said vapor-dispensing module is configured to add a fragrance to said air.
20. The air purifier of claim 17, wherein said electrical receptacle and electrical plugs are each configured to be static.

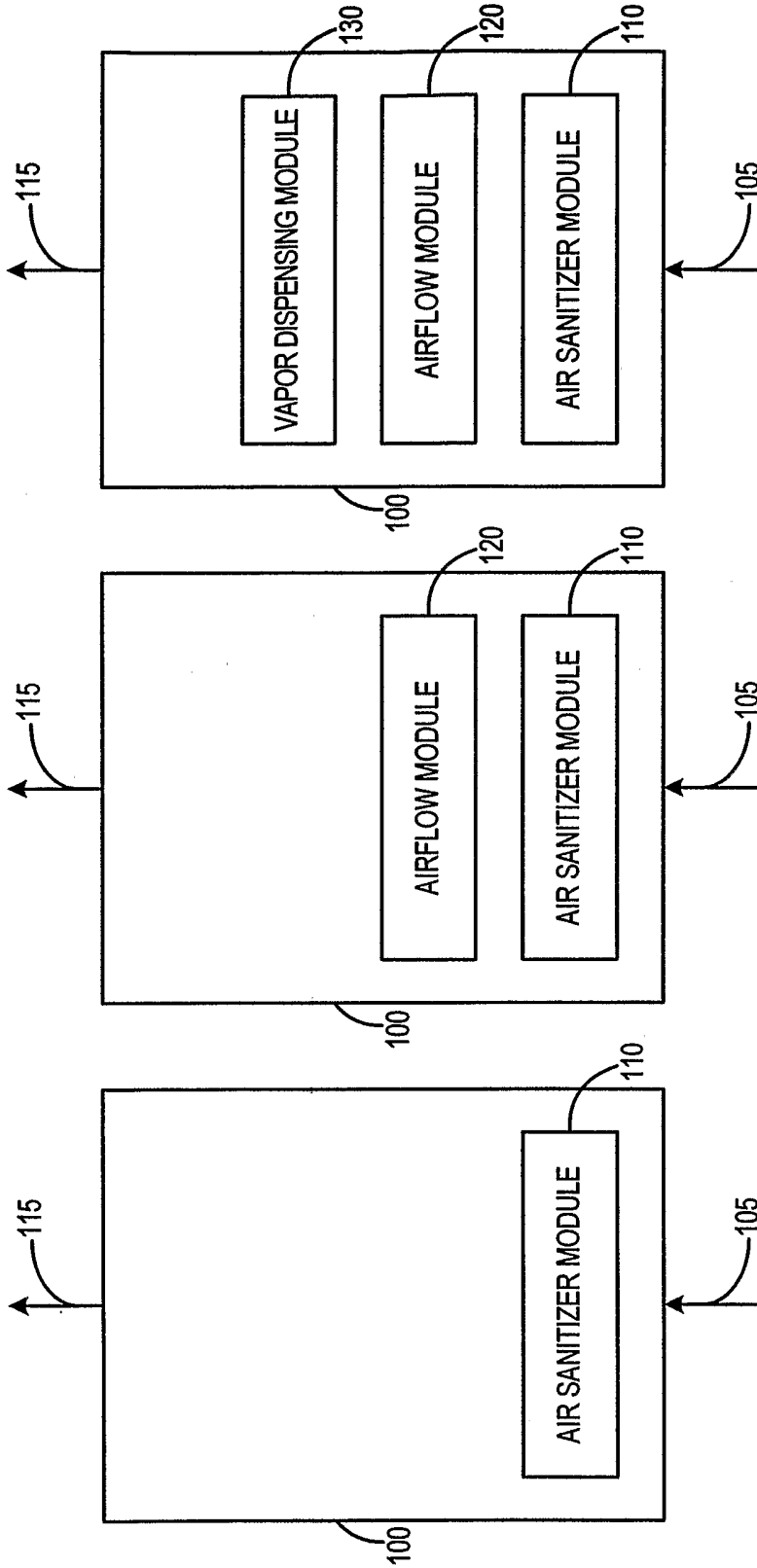


FIG. 1A

FIG. 1B

FIG. 1C

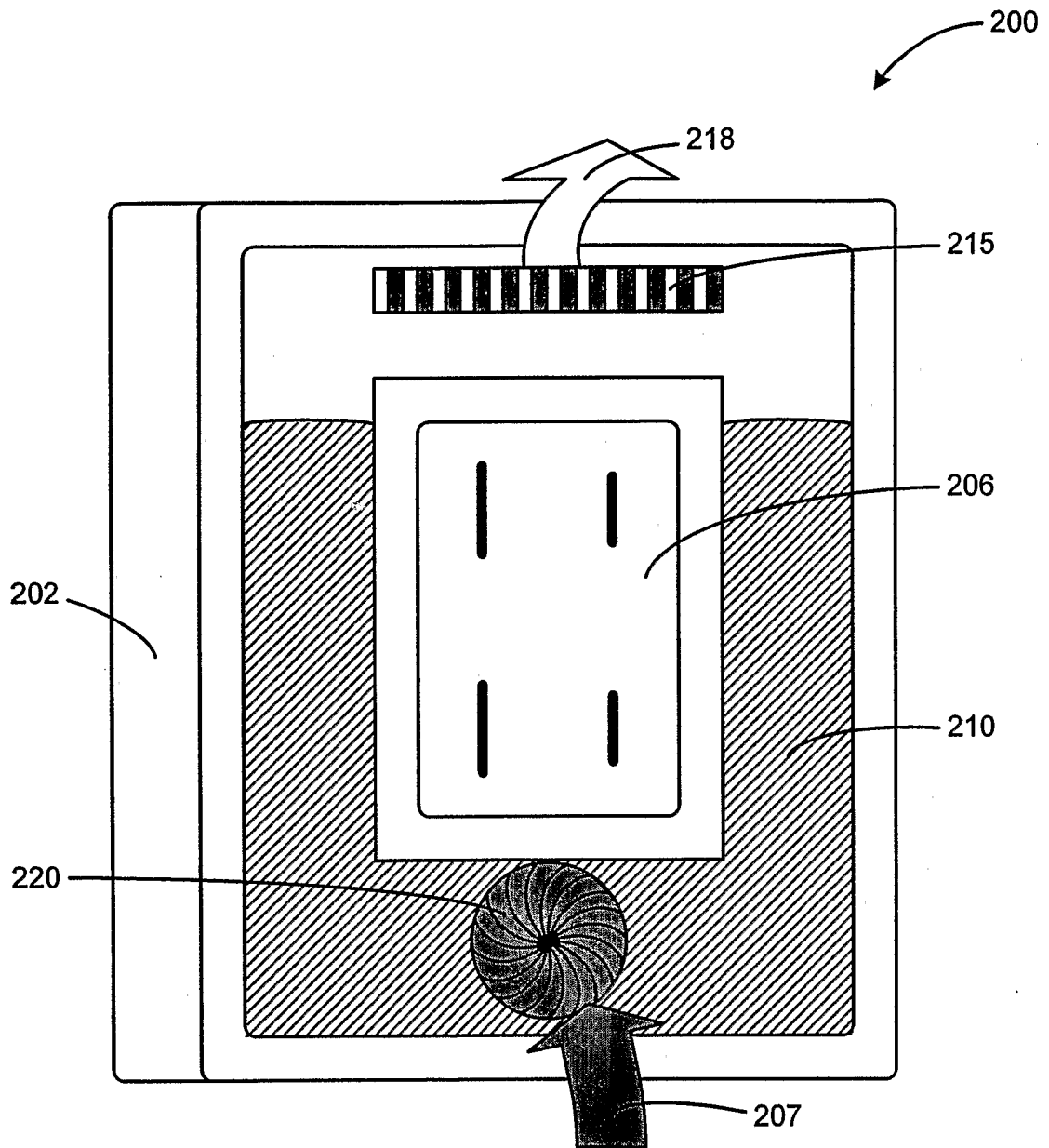


FIG. 2

3/18

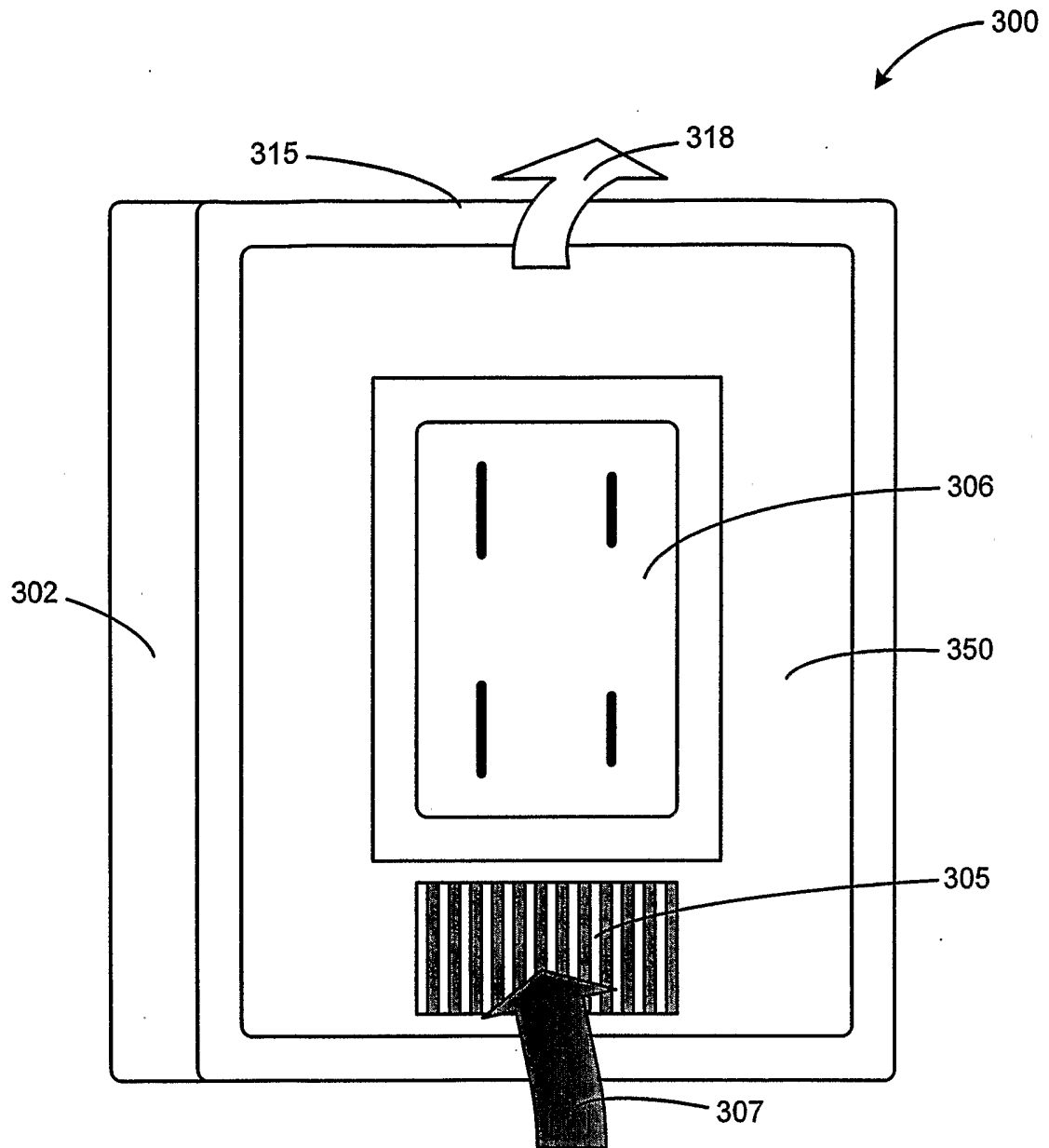


FIG. 3

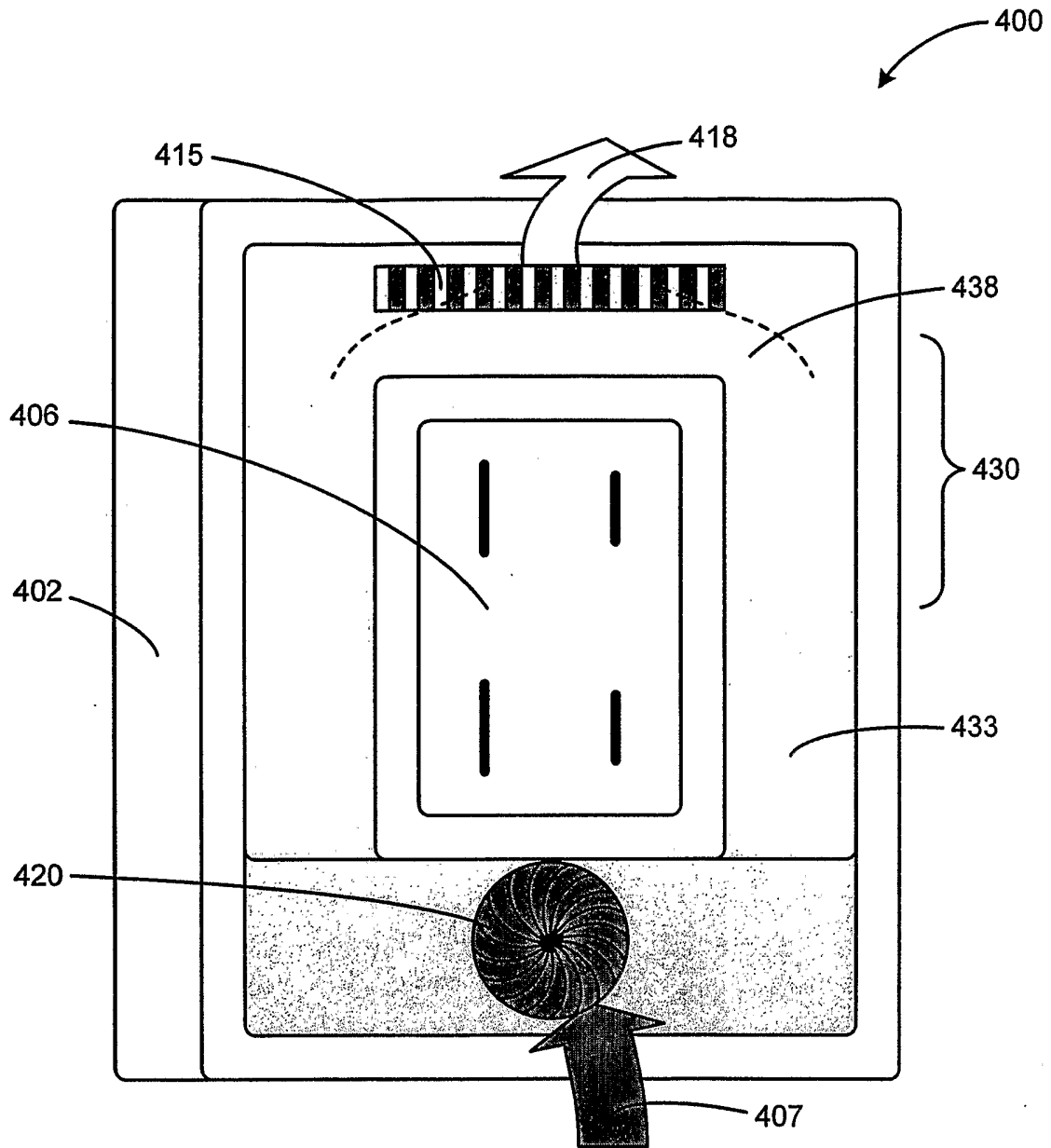


FIG. 4

5/18

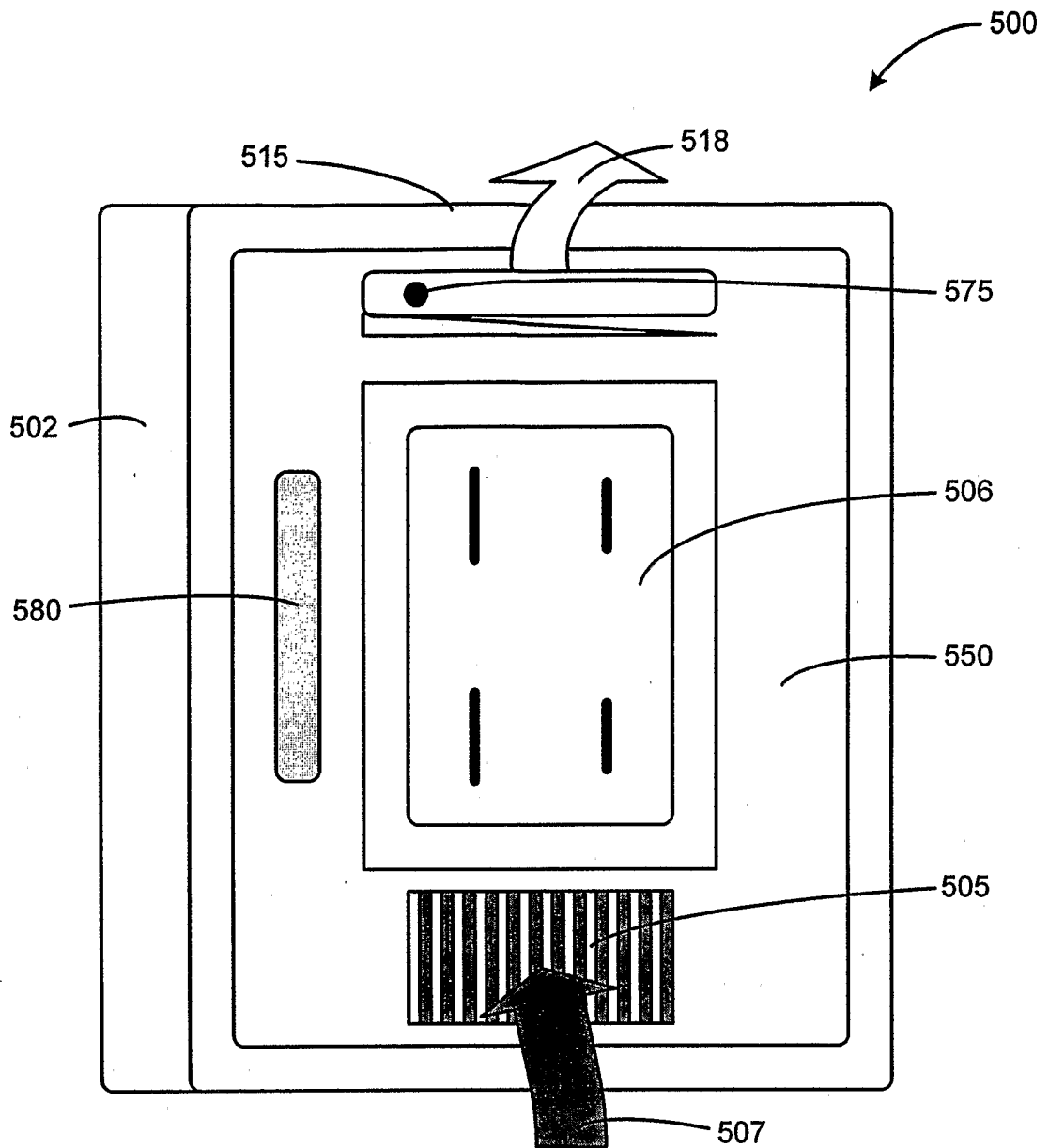


FIG. 5

6/18

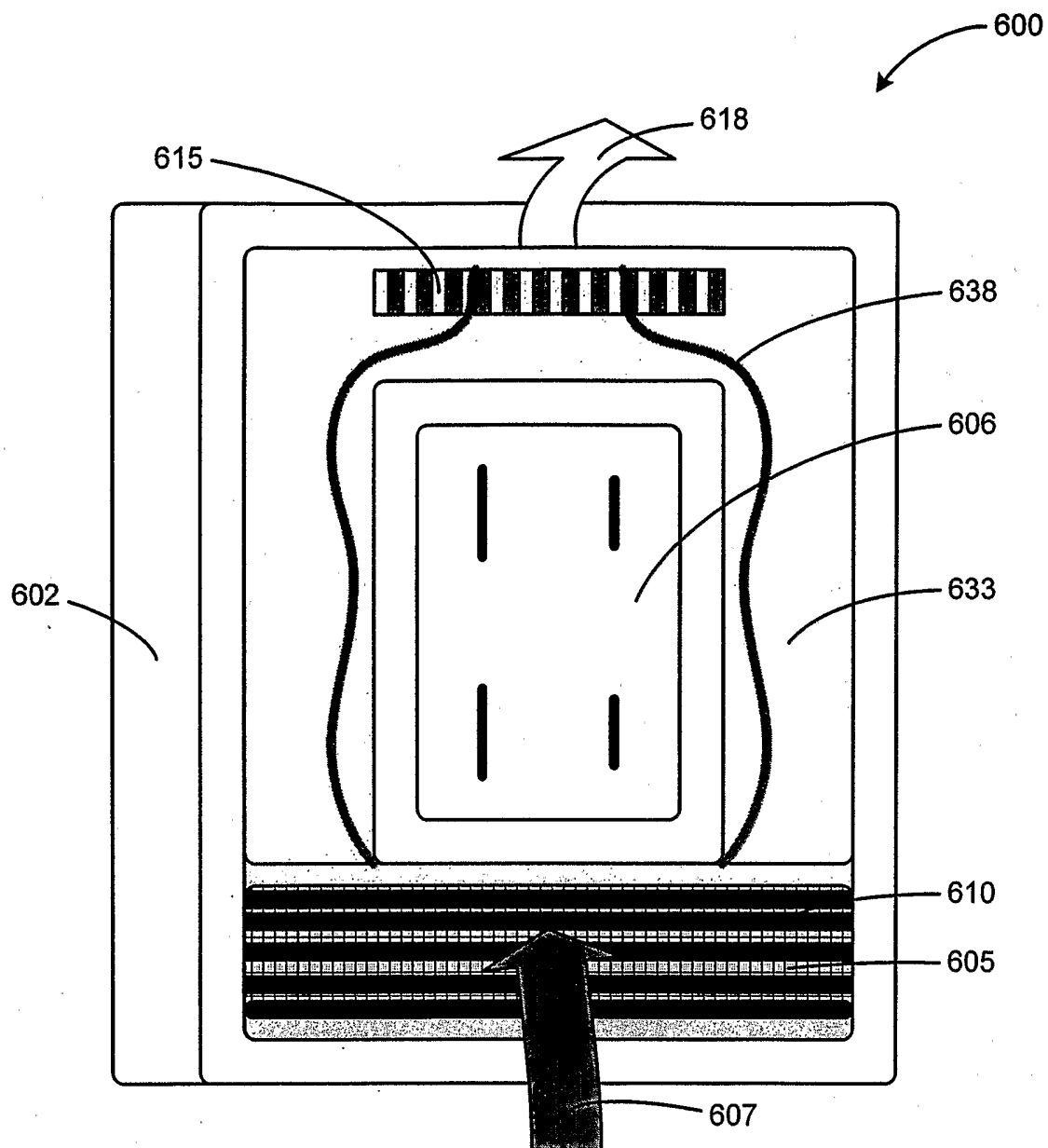


FIG. 6

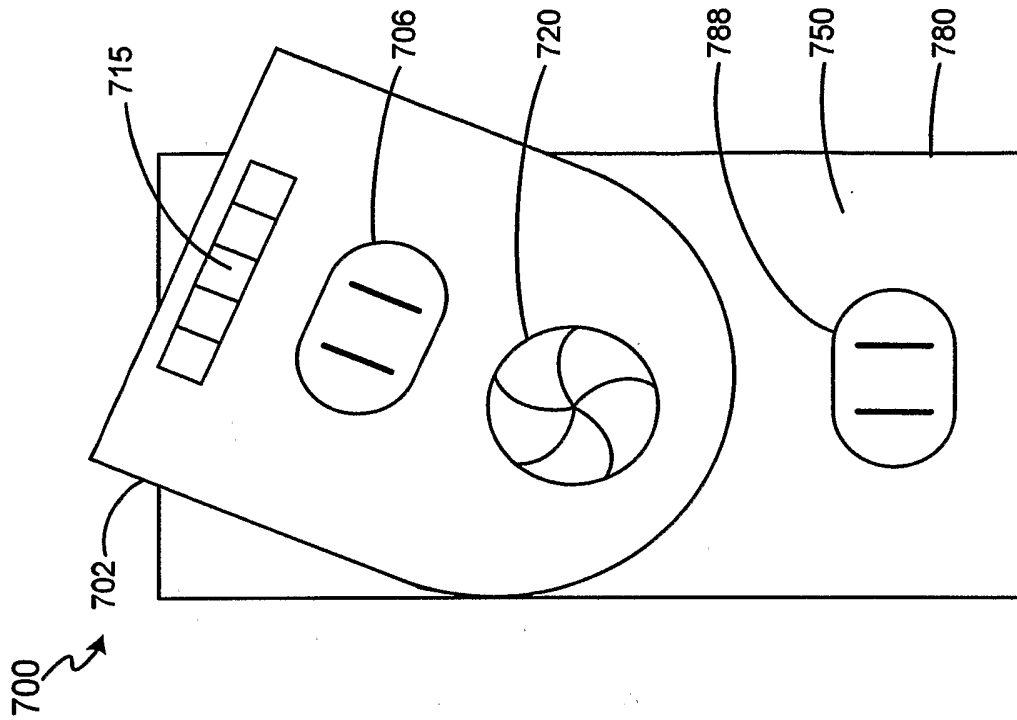


FIG. 7B

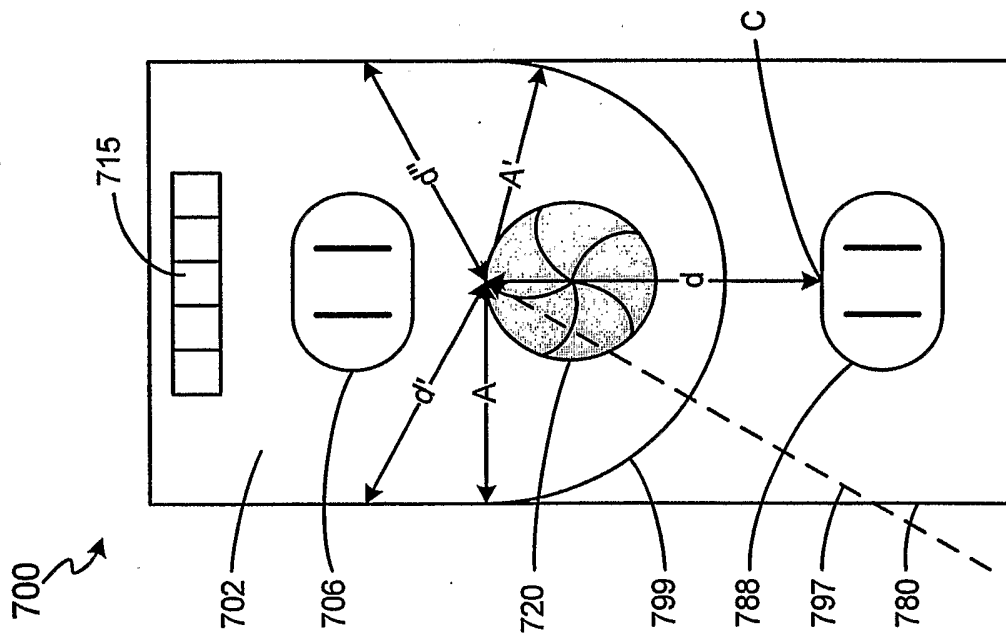


FIG. 7A

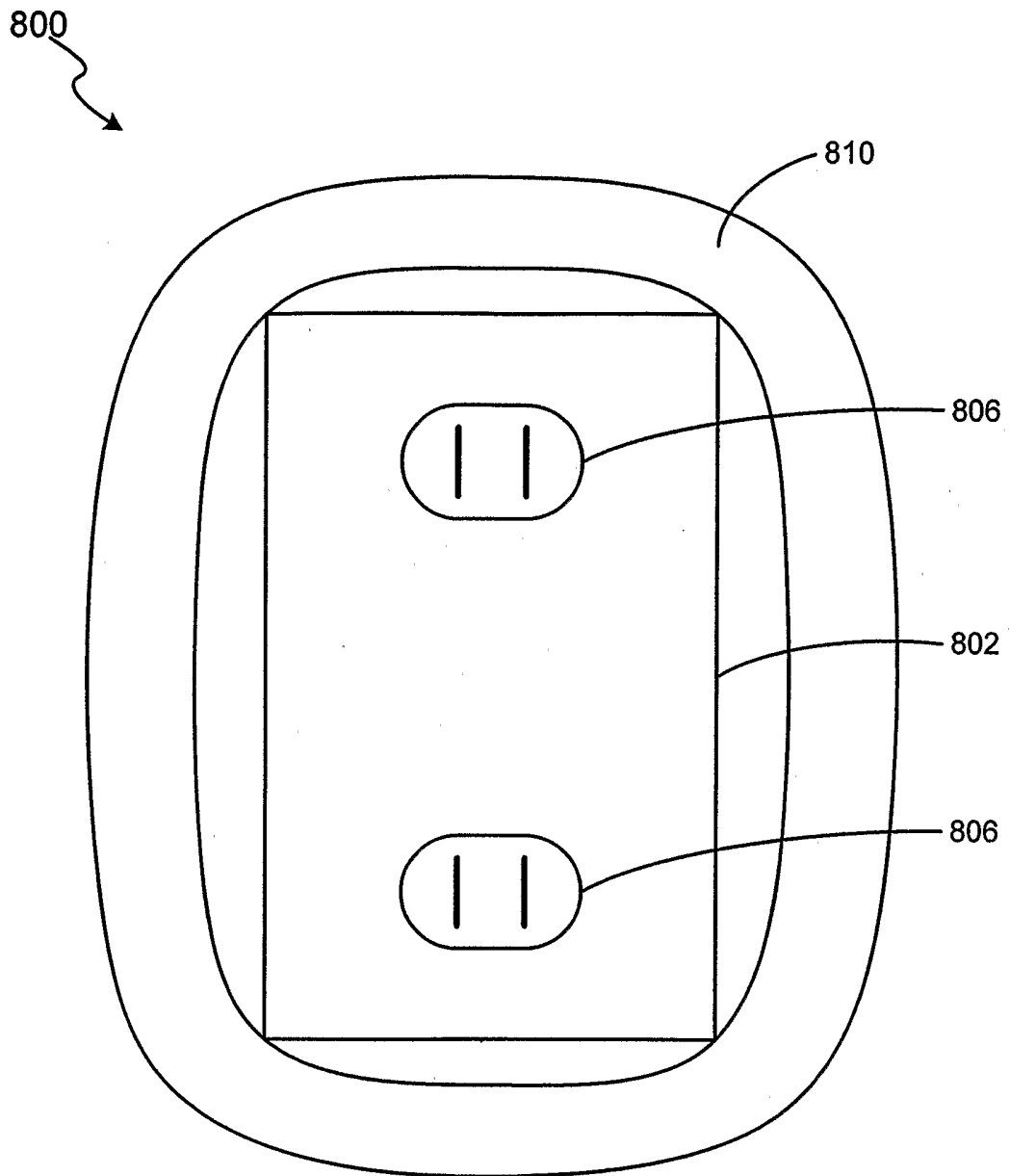


FIG. 8

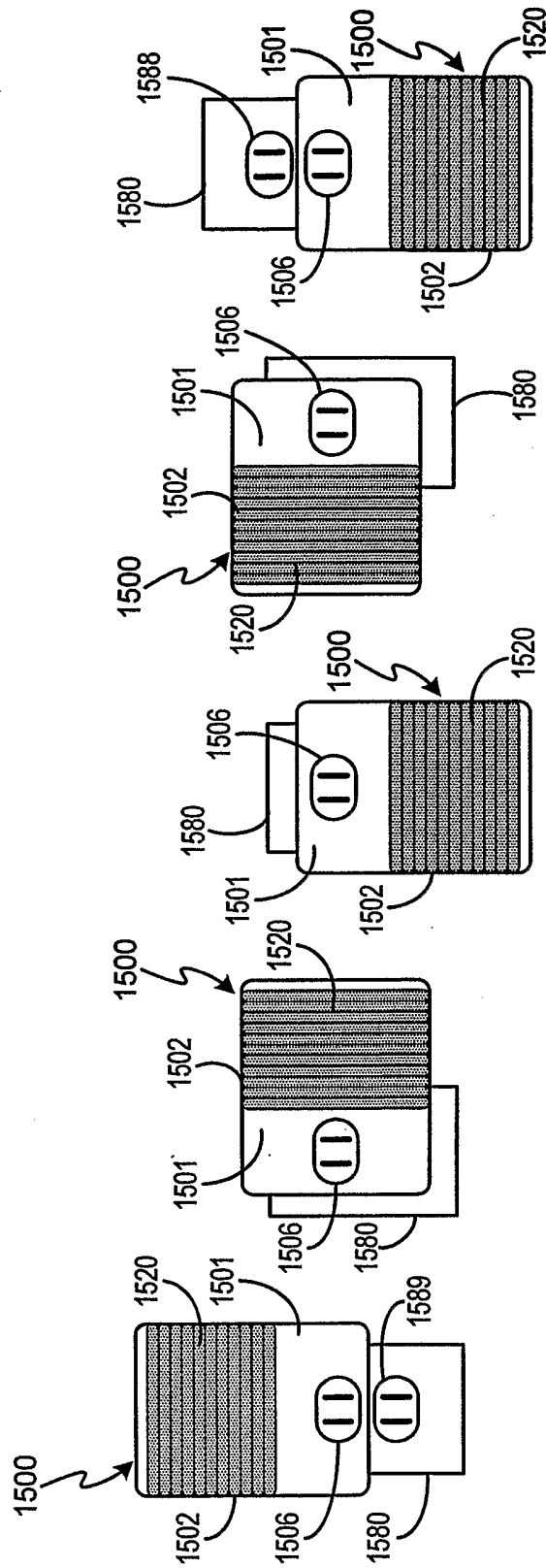


FIG. 9A FIG. 9B FIG. 9C FIG. 9D FIG. 9E

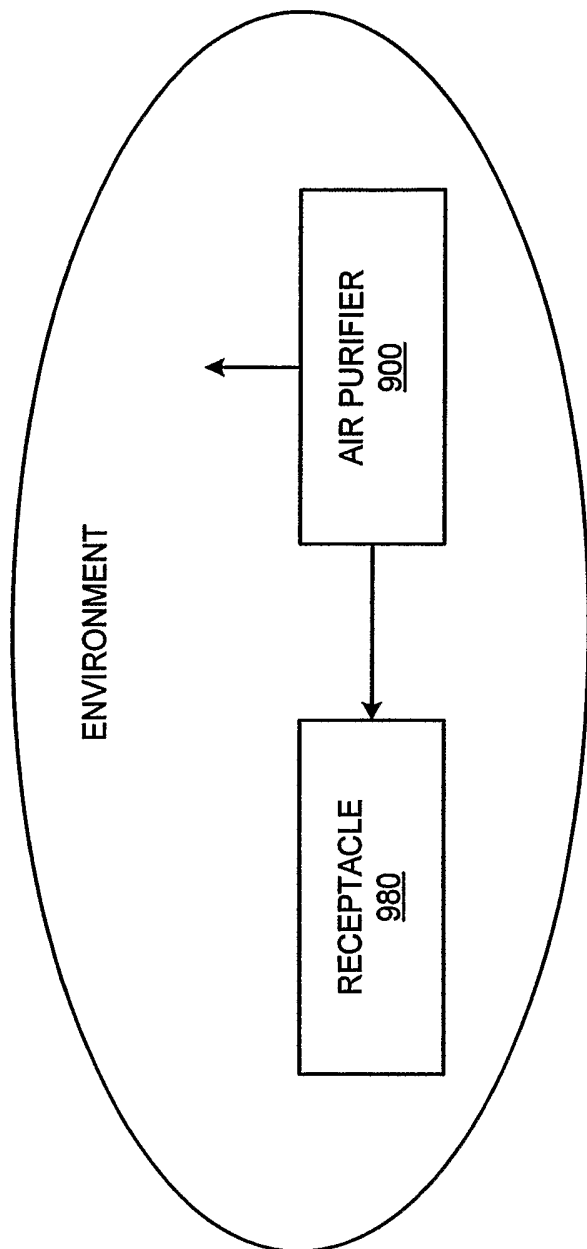


FIG. 10

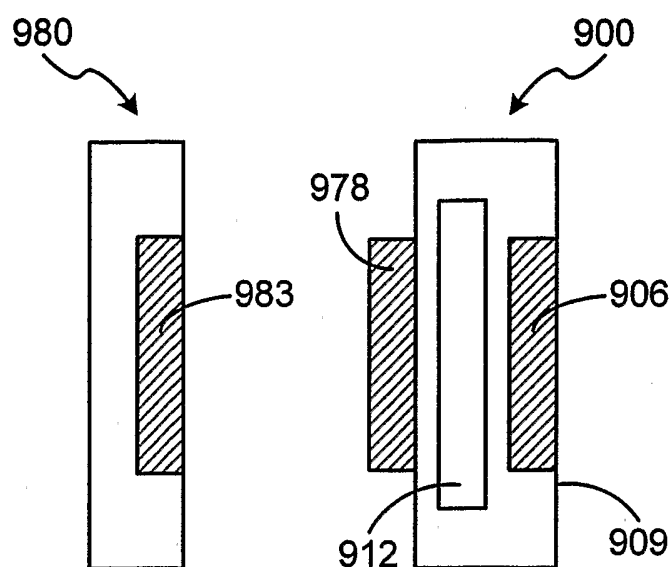


FIG. 11

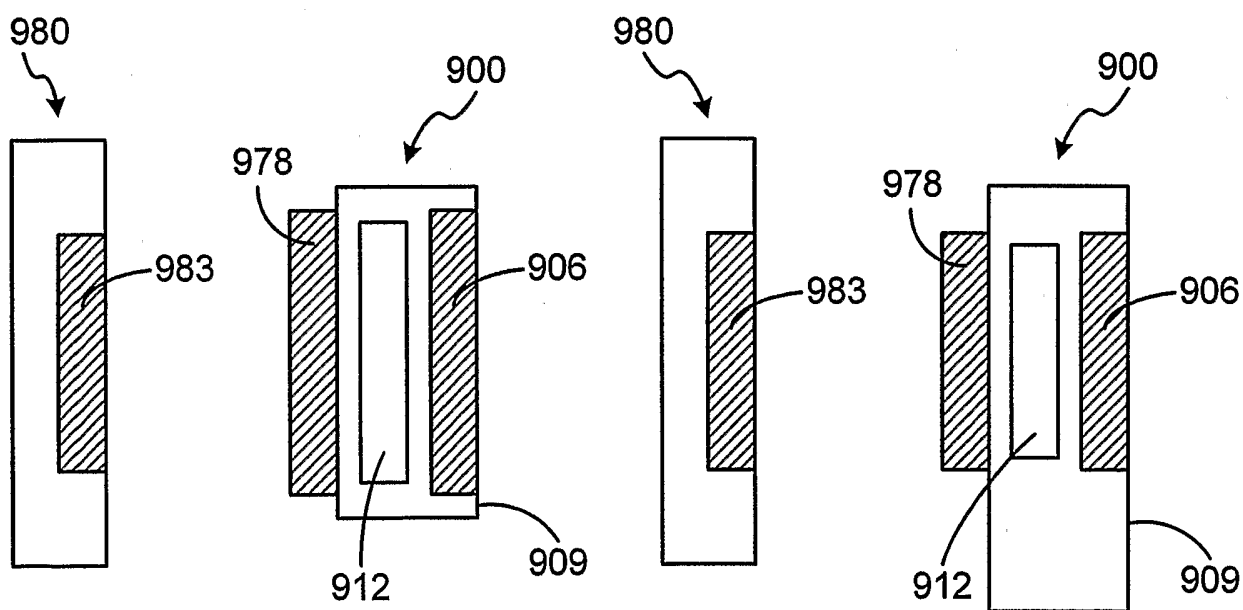


FIG. 12

FIG. 13

12/18

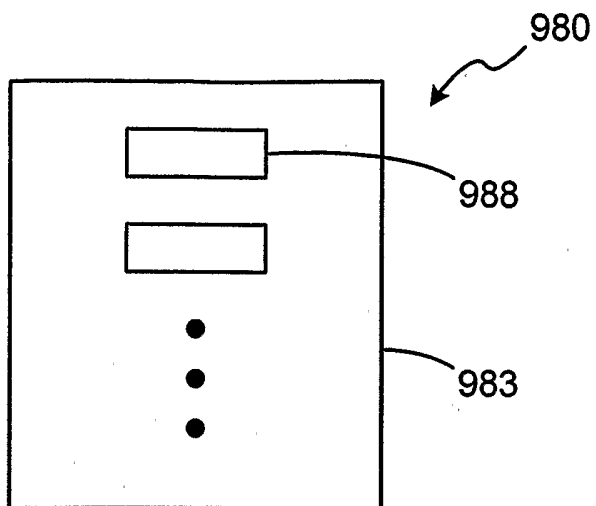


FIG. 14

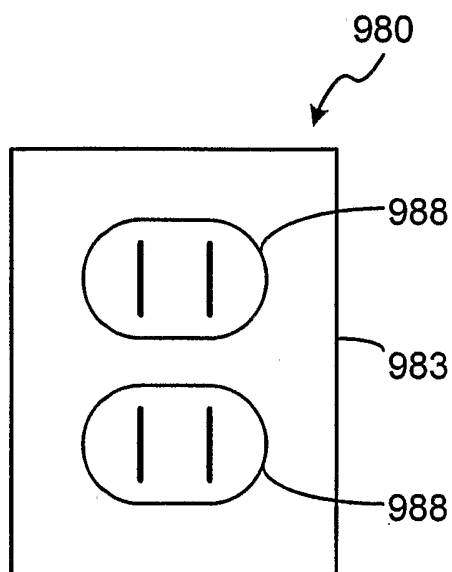


FIG. 15

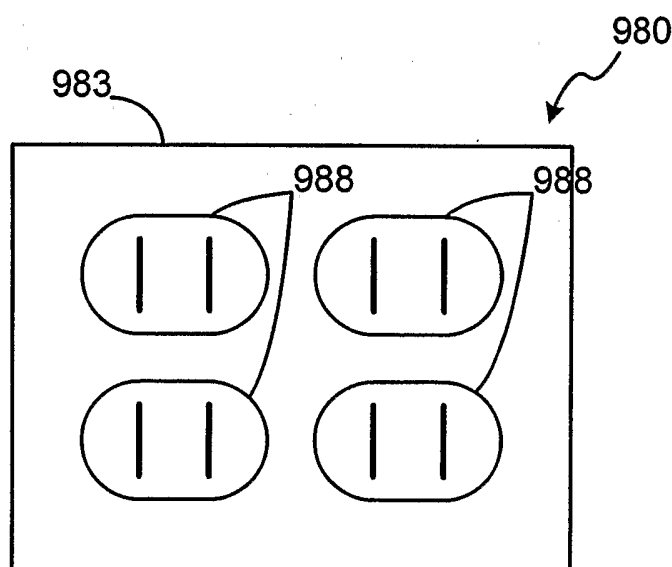


FIG. 16

		15A	20A	30A	50A	60A
2 POLE 2 WIRE	125V					
	250V					
2 POLE 3 WIRE GROUNDING	125V					
	250V					
	277V					
3 POLE 3 WIRE	125/ 250V					
	30A 250V					
3 POLE 4 WIRE GROUNDING	125/ 250V					
	30A 250V					
4 POLE 4 WIRE	30Y 120/ 208V					

FIG. 17

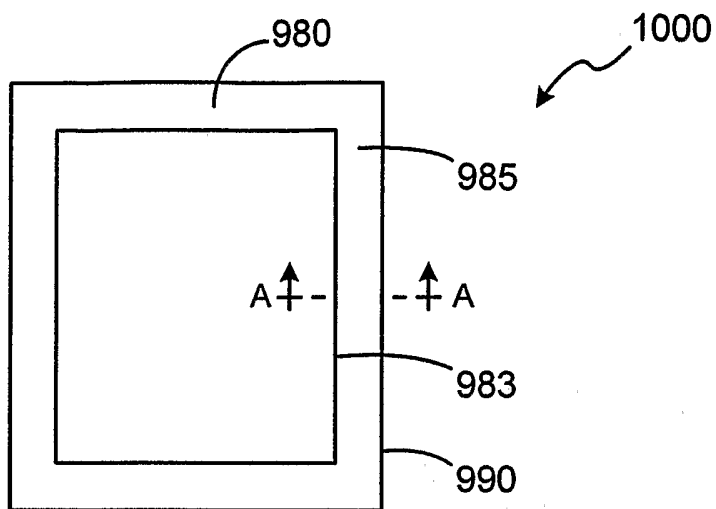


FIG. 18

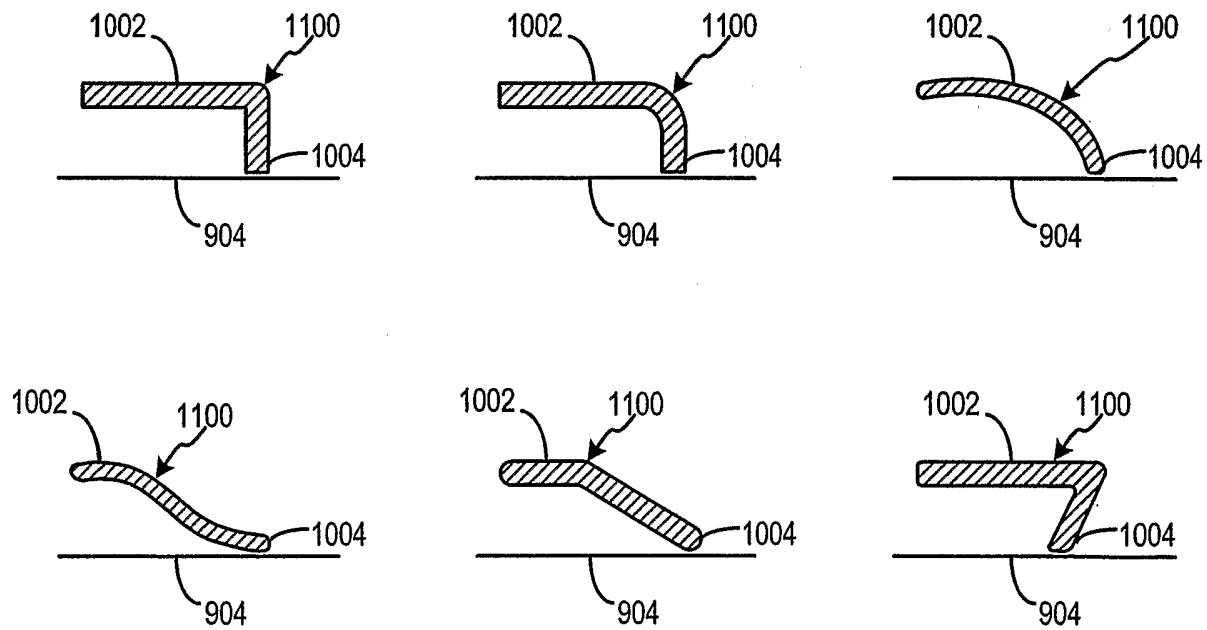


FIG. 19

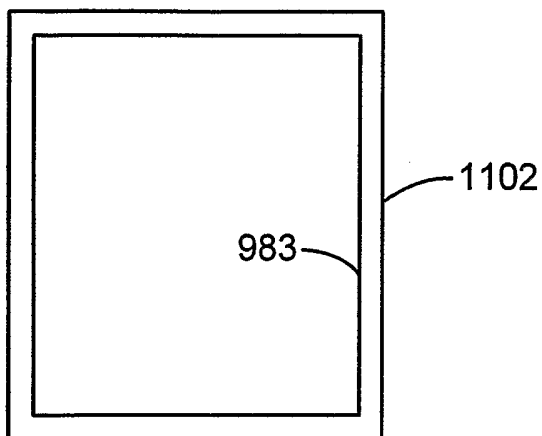


FIG. 20A

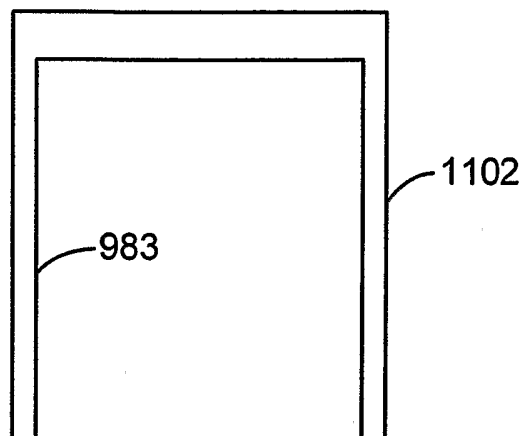


FIG. 20B

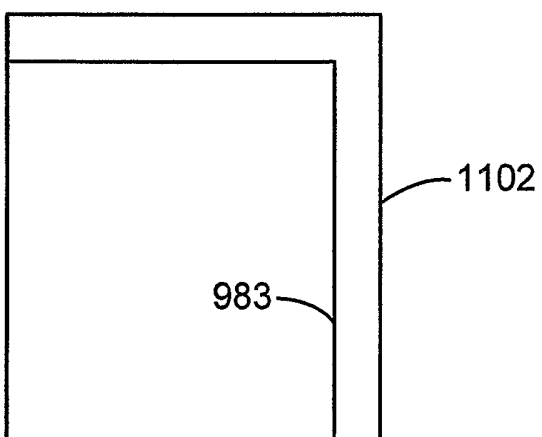


FIG. 20C

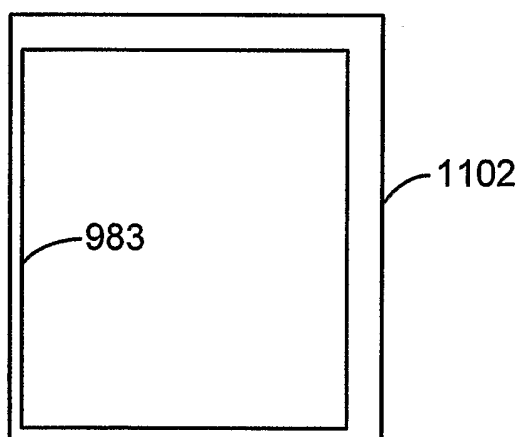


FIG. 20D

16/18

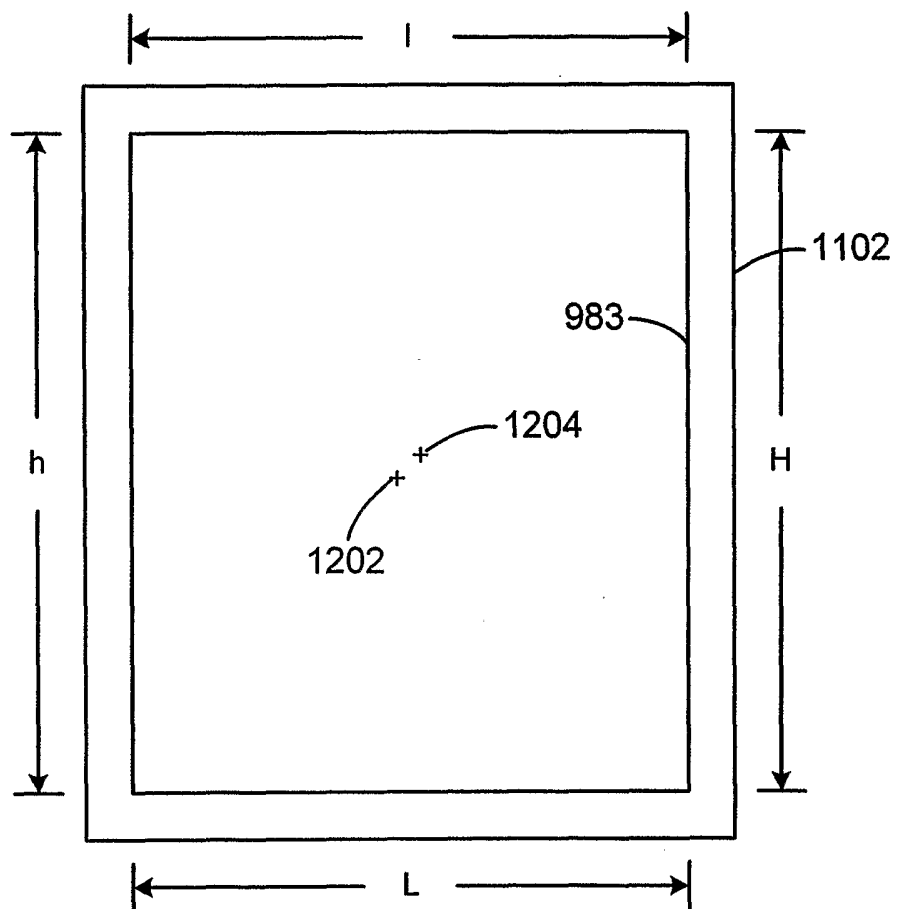


FIG. 21

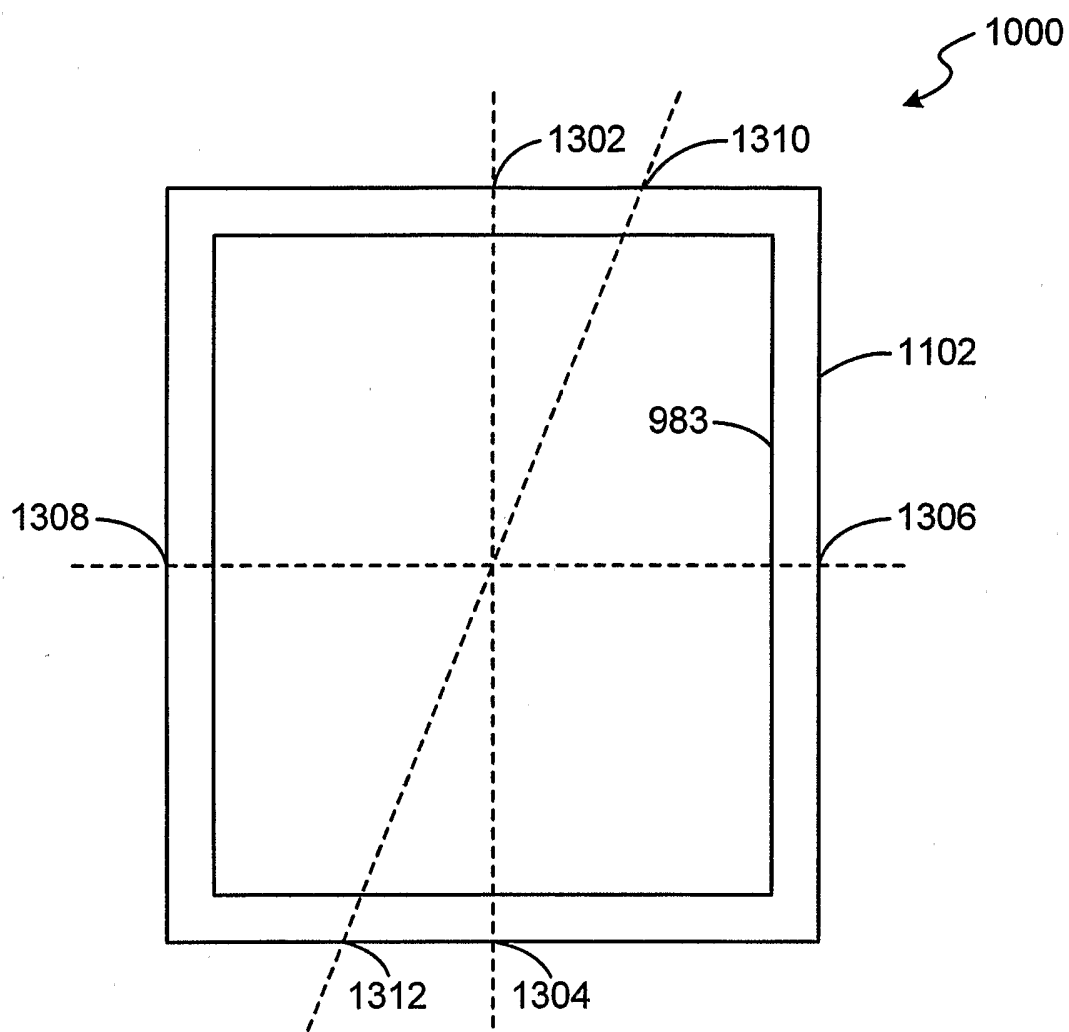


FIG. 22

18/18

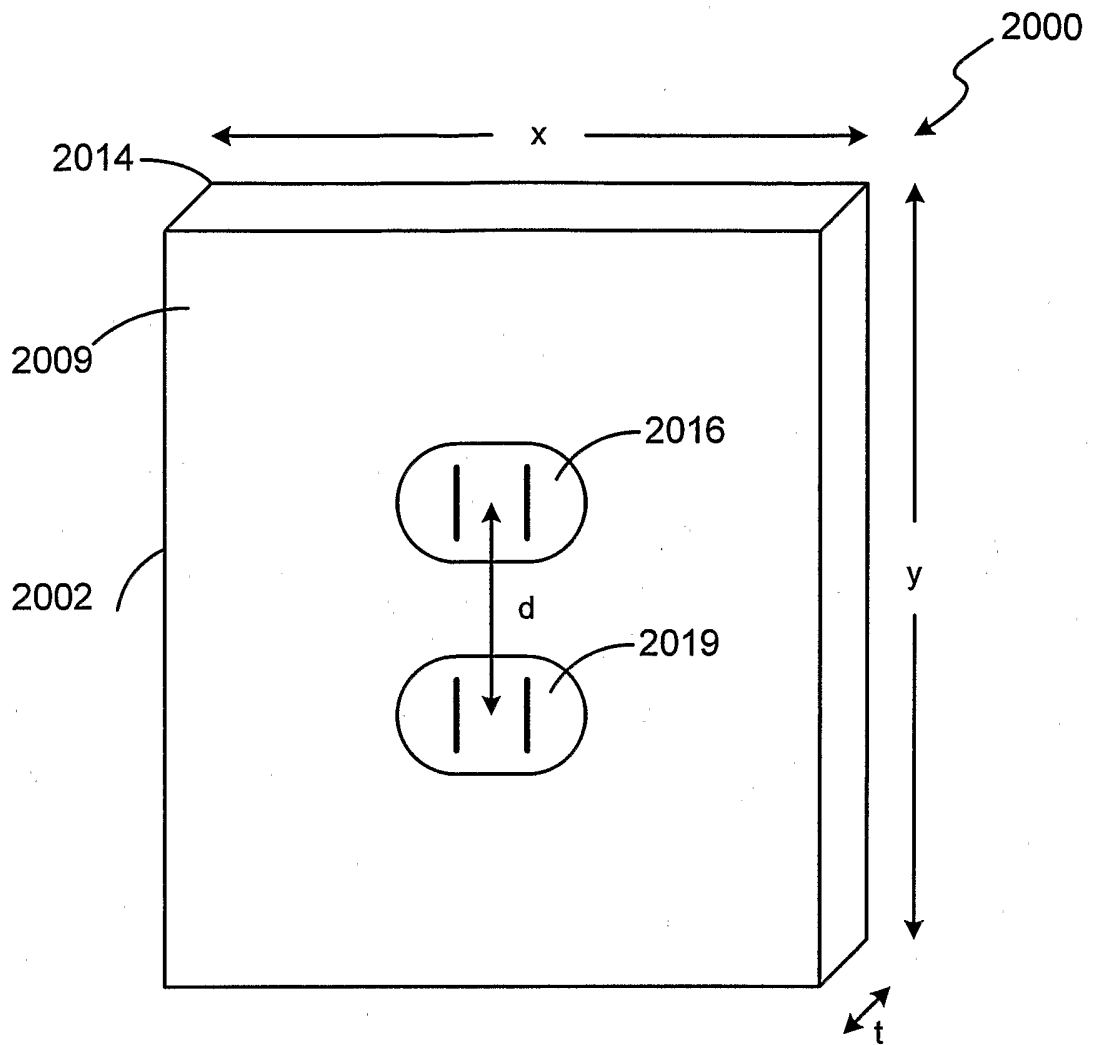


FIG. 23

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US2005/029664

A. CLASSIFICATION OF SUBJECT MATTER
A61L9/03 F24F3/12

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)
A61L F24F H01R

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

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 478 440 B1 (JAWORSKI THOMAS ET AL) 12 November 2002 (2002-11-12)	1,2,5,8, 9
Y	column 5, line 9 - column 10, line 31; figures 1,2,7	6,7
Y	US 2003/005668 A1 (HUANG PING) 9 January 2003 (2003-01-09) paragraphs '0013! - '0016!; figure 1	6,7
X	WO 03/088430 A (S.C. JOHNSON & SON, INC) 23 October 2003 (2003-10-23) paragraphs '0023! - '0034!; figures 1-3	1-5, 8-14, 17-19
X	EP 1 283 062 A (S.C. JOHNSON & SON, INC) 12 February 2003 (2003-02-12) paragraphs '0011! - '0017!; claims 1,8,10; figures 1-4	1-5, 8-14, 17-19

Further documents are listed in the continuation of box C. Patent family members are listed in 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 document 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 21 November 2005	Date of mailing of the international search report 05/12/2005
--	---

Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Authorized officer Lienhard, D
--	--

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No PCT/US2005/029664
--

Patent document cited in search report	Publication date	Patent family member(s)	Publication date	
US 6478440	B1	12-11-2002	AU 4355201 A	24-09-2001
			CA 2402868 A1	20-09-2001
			CN 1426313 A	25-06-2003
			JP 2003526475 T	09-09-2003
			MX PA02008844 A	10-02-2003
			NZ 521319 A	27-02-2004
			TW 512065 B	01-12-2002
			WO 0168154 A1	20-09-2001
US 2003005668	A1	09-01-2003	NONE	
WO 03088430	A	23-10-2003	AU 2003215013 A1	27-10-2003
			BR 0309155 A	25-01-2005
			CA 2481608 A1	23-10-2003
			CN 1656657 A	17-08-2005
			EP 1493210 A1	05-01-2005
EP 1283062	A	12-02-2003	TW 568747 B	01-01-2004
			WO 03013618 A1	20-02-2003
			US 2003063902 A1	03-04-2003