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

(51) International Patent Classification[7]: A61L 9/03

(21) International Application Number:
PCT/US2003/025243

(22) International Filing Date: 13 August 2003 (13.08.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
10/222,070   16 August 2002 (16.08.2002)   US

(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). TRIPLETT, Carl [US/US]; 9202 East Pershing Avenue, Scottsdale, AZ 84260 (US). CONWAY, Mary, J. [US/US]; 824 East Country Gables, Phoenix, AZ 85022 (US). RINALDIS, David [US/US]; 7041 Fairways Drive, Longmont, CO 80503 (US). STRASSER, Michael [US/US]; 290 Hawthorn Avenue, Boulder, CO 80304 (US). MILLS, Francis, Joseph, IV [US/US]; 5925 Harper Road, Holt, MI 48842 (US).

(74) Agent: BOYD, Damon, L.; Snell & Wilmer L.L.P., One Arizona Center, 400 East Van Buren, Phoenix, AZ 85004 (US).

(81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— with international search report
— before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

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: VAPOR DISPENSING DEVICE HAVING IMPROVED TRANSVERSE LOADING STABILITY
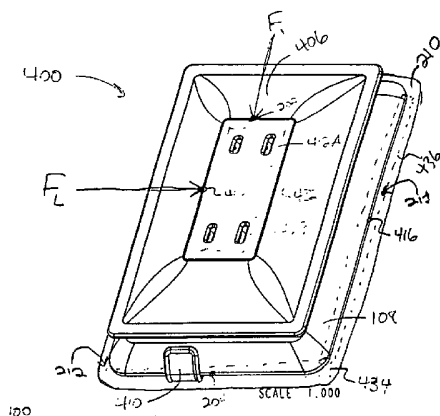
(57) Abstract: A vapor dispensing device having a high transverse loading stability includes a relatively low profile with respect to the supporting wall or electrical receptacle such that the frequency and impact of accidental physical contact with the device are appropriately reduced. To achieve a low profile, the housing of a vapor dispensing device is designed such that the distance from the outlet face of the wall receptacle to a worst-case transverse loading point (d_L) is less than the distance from the plug to a worst-case support point (d_S).

VAPOR DISPENSING DEVICE HAVING IMPROVED TRANSVERSE LOADING STABILITY

Field of Invention

This invention generally relates to vapor dispensing devices such as air fresheners.
More particularly, the invention relates to electrically-powered vapor dispensing devices.

Background of the Invention

Electrically-operated vapor dispensing devices have been used for several years and
have become common household products. These devices are typically inserted into a
conventional electrical receptacle to obtain electricity for heating a perfumed fluid, wax,
paraffin, or other fuel to produce a pleasing aroma that is dispersed within a room or other
confined space. Examples of electric vapor dispensers include the RENUZIT products
available from The Dial Corporation of Scottsdale, Arizona. One such product is shown in
U.S. Design Patent Serial No. D449,101 which issued on October 9, 2001 to Wolpert et al.

Many conventional vapor dispensing devices exhibit a marked disadvantage,
however, in that the size of the dispenser housing frequently extends outwardly from the
wall receptacle for a significant distance. Because of this distance, an outcropping from the
wall is produced that can become bumped, jostled or otherwise accidentally placed into
contact with people or objects. Such contact may have the effect of pushing the dispenser
out of the wall receptacle, and may potentially break or deform the device. Accordingly, it
is desirable to produce an electric vapor dispenser that is resilient to accidental contact that
may produce breakage or displacement of the dispenser.

Summary of the Invention

A vapor dispensing device having a high transverse loading stability is provided in
accordance with various embodiments of the invention. Such a device includes a relatively
low profile with respect to the supporting wall or electrical receptacle such that the
frequency and impact of accidental physical contact with the device are appropriately
reduced. According to an exemplary embodiment, the housing of a vapor dispensing device
is designed such that the perpendicular distance from the outlet face of the wall receptacle to
a worst-case transverse loading point (d_L) is less than the distance from the plug to a worst-
case support point (d_S) such that a transverse loading coefficient $\eta = d_S/d_L$ is greater than

one. These and other aspects of the invention shall become more apparent when read in conjunction with the accompanying drawing figures and the attached detailed description of exemplary embodiments.

5

Brief Description of the Drawing Figures

The features and advantages of the present invention are hereinafter described in the following detailed description of exemplary embodiments to be read in conjunction with the accompanying drawing figures, wherein like reference numerals are used to identify the same or similar parts in the similar views, and:

10   Figure 1 is a side view of a conventional vapor dispensing device;

Figure 2 is a side view of an exemplary vapor dispensing device with a high transverse loading stability;

Figure 3 is a side view of an exemplary vapor dispensing device having two plugs and a high transverse loading stability;

15   Figures 4A-D are top, front, side and perspective views, respectively, of an exemplary vapor dispensing device having a high transverse loading stability; and

Figures 5A-5C depict various refill configurations in accordance with the present invention.

20

Detailed Description of Exemplary Embodiments

With reference to Figure 1, a conventional vapor dispensing device 100 typically includes a housing 108 coupled to a plug 106 that is capable of being inserted into a conventional electrical receptacle in a wall or other structure 110. Housing 108 typically retains a vapor-producing material such as a perfumed fluid, wax, paraffin or the like that

25   can be combusted, electrolyzed or otherwise processed by a resistance heater or other appropriate device to produce a vapor that can be dispersed through a room, vehicle or other confined space.

Due to the relatively large profile of vapor dispensing device 100 with respect to wall 110, however, forces impacting on the vapor dispensing device 100 suitably produce

30   rotational moments about a support point along the wall. For example, force F applied at point 102 on housing 108 suitably produces a rotational moment about point 104 that is equal to the magnitude of force F multiplied by the distance d_L from the effective point of

force **F** to the front face of the outlet. This loading distance d_L is defined as the distance from the effective point of force **F** from an axis that is perpendicular to the front face of the outlet and that runs through a support point **104**. In the vapor-dispensing device **100** shown in Figure 1, support point **104** is the point on device **100** that bears the greatest impact of

5   force **F**.

Application of force **F** produces a reactive force **R** between plug **106** and wall **110**. Reactive force **R** appropriately maintains vapor-producing device **100** in contact with the outlet receptacle, and produces a counter-balancing rotational moment upon support point **104**. The moment produced by the stabilizing force **R** about support point **104** is equal to

10 the magnitude of reactive force **R** multiplied by the distance from force **R** to support point **104**. This distance is referred to herein as support distance d_S and is typically measured along an axis parallel to the outlet face. Because vapor dispensing device **100** remains rigidly fixed in position and does not move in response to the application of force **F**, the sum of the moments about point **104** suitably equates to zero. The sum of the moments about

15 point **104** may therefore be expressed as:

$$R\, d_S - F\, d_L = 0 \qquad \text{(Equation 1)}$$

Manipulating these terms algebraically shows that the resulting force **R** produced into the wall by force **F** is as follows:

$$R = F \frac{d_L}{d_S} = \eta \qquad \text{(Equation 2)}$$

20 wherein η is a transverse loading coefficient defined as the ratio of the support distance d_S to the load distance d_L. In vapor dispensing device **100** shown in Figure 1, it is clear that lateral distance d_L is relatively large compared to d_S, thereby indicating that the transverse loading coefficient η is less than 1. Accordingly, it can be readily shown from

25 Equation 2 that a load force **F** upon point **102** effectively produces a resultant force **R** that has a greater magnitude than that of force **F** when the transverse loading coefficient η is less than one.

Figure 2 is a side view of a vapor dispensing device having an improved transverse loading stability. With reference now to Figure 2, a vapor dispensing device **200** suitably

30 includes a housing **108** coupled to a plug **106** that is capable of being inserted into the outlet face **212** of a conventional electrical receptacle **210** housed in a wall or other surface **110**. Housing **108** may also include a conventional device outlet **206** electrically coupled to the

plug that provides electrical power from plug **106** to a light or other electrically-powered device such as a hairdryer, curling iron, electric razor, kitchen appliance, or the like.

     Figure 2 depicts a force **F** impinging upon a worst-case transverse loading point **202** along housing **108**. Worst-case loading point **202** is any point along the edge of device **200**

5   that is furthest from the outer face **212** of the electrical receptacle. Worst-case loading point **202** corresponds to locations on housing **108** where the impinging force produces a maximum rotational moment about a worst-case support point **204**, which is defined as the points on housing **108** wherein the moment produced by reactive force **R** is maximized. Worst-case support points **204** typically reside on an edge of housing **108** that is in physical

10   contact with the front face of the receptacle and that is on a side of housing **108** opposite plug **106** from the impinging point of the force **F**. Accordingly, device **200** may exhibit multiple worst-case support points along an edge of housing **108** that provide equal reactive moments to external forces. Similarly, forces impinging upon each point along certain edges of housing **108** may produce identical moments in the various support points.

15   Accordingly, the precise locations of worst-case loading and support points on device **400** vary widely depending upon the particular embodiment and forces applied.

     In the device shown in Figure 2, worst-case support point **204** is defined near the bottom of vapor dispensing device **200** at the point on housing **108** that bears the greatest loads from applied external forces. Worst-case transverse loading point **202** corresponds to

20   the point on vapor dispensing device **200** whereupon application of a force **F** produces the greatest resultant force **R** between plug **106** and the surrounding receptacle **210**. Using Equation 2 above, the resultant force **R** is:

$$R = F\ d_L/d_S = \frac{F}{\eta}$$

25   In this case, however, the transverse loading coefficient η is greater than one because support distance d_S from plug 106 to support point 204 along outlet face **212** is designed to be greater than the lateral distance d_L from outlet face **212** to loading point **202**. Correspondingly, then, force **F** applied at worst-case transverse loading point **202** produces a resulting force **R** with a magnitude that is less than the magnitude of force **F**, thereby

30   reducing the impact of force **F** on plug **106** and improving the overall transverse loading stability of vapor dispensing device **200**.

Figure 3 is a side view of a vapor dispensing device having more than one plug which can be inserted into an electrical receptacle. With reference now to Figure 3, a vapor dispensing device 300 suitably includes housing 108 coupled to two plugs 106a and 106b. Either or both of the plugs 106a-b may be an electrical communication with one or more

5   device outlets 206 to provide electrical power from receptacle 210 (Figure 2) to external devices such as lamps, hair dryers or the like.

In the embodiment shown, the worst-case transverse loading point remains at point 202, which is the greatest perpendicular distance d_L from the face of the outlet. Similarly, worst-case support point 204 remains at the edge of housing 108 at a distance furthest from

10   plugs 106A-B and opposite worst-case transverse loading point 202. Because two plugs 106A-B are provided, two resultant forces R_1 and R_2 are produced. Accordingly, the rotational moments about point 204 are appropriately expressed as:

$$R_1 \, d_{S2} + R_2 \, d_{S1} - F \, d_L = 0. \qquad \text{(Equation 3)}$$

Algebraically manipulating Equation 3 results in:

15   $$F = R_1 \, d_{S1}/d_L + R_2 \, d_{S2}/d_L = R_1 \, \eta_1 + R_2 \, \eta_2 \qquad \text{(Equation 4)}$$

wherein $\eta_1 = d_{S1}/d_L$ and $\eta_2 = d_{S2}/d_L$. Evaluating Equation 4 shows that force F applied at point 202 is appropriately counterbalanced by two resultant forces R_1 and R_2. In each case, the transverse loading coefficients η_1 and η_2 are designed to be greater than one such that the support distance d_S is greater than the loading distance d_L for each plug 106A-

20   B. Because R_1 and R_2 are inversely proportional to η_1 and η_2, respectively, it may be readily shown that relatively large values for η_1 and η_2 result in correspondingly smaller reactive forces R_1 and R_2 for a constant value of F. Further, because unusually high values of R_1 and R_2 can cause breakage or movement of device 300, higher values for η_1 and η_2 thereby allow device 300 to produce lower reactive forces and to thereby withstand greater

25   forces F without breakage or movement. Accordingly, the transverse loading stability of device 300 is improved.

Figures 4A-D are top, front, side and perspective views, respectively, of another exemplary embodiment of a vapor-dispensing device. With reference to Figures 4A-D, vapor dispensing device 400 suitably includes a housing 108 connecting to one or more

30   plugs 106A-B. Housing 108 and plugs 106A-B are appropriately configured to correspond with the front face 212 of a wall-mounted outlet receptacle 210 (Figure 4D) to provide device stability and electrical power.

In the exemplary embodiment shown in the drawings, housing 108 suitably includes two optional device outlets 412A-B that allow the user to connect other appliances to plugs 106A-B to obtain electrical power while device 400 remains in use. Each of the plugs 106A-B has two prongs 404A-B as best seen in Figure 4A. To simplify the discussion

5   below, however, the reactive forces produced by each prong 404A-B are analyzed as a combined reactive force R for the entire plug 106. Plug 106 may conform to any electrical convention such as the 60 Hertz, 110 Volt alternating-current standard commonly used in North America. Alternatively, plug 106 may be configured to operate using direct current (e.g. current supplied by a battery) or any other electrical convention.

10 Fragrance is produced in device 400 by any conventional technique and structure. In an exemplary embodiment, device 400 suitably uses electrical resistance to heat a fragrance-producing fuel such as a perfumed fluid, wax or other substance maintained in a reservoir within or coupled to housing 108. In a further exemplary embodiment, device 400 suitably interfaces to an optional replaceable fragrance cartridge (or "refill component") 406 to

15 replenish the supply of fuel as needed. The cartridge may be discarded and replaced when the fuel is spent, when the user desires an alternate fragrance or as otherwise appropriate. An optional flat lamp, night light or other lighting feature may also be provided within fragrance-producing device 400. The term "housing" as used herein is intended to broadly include features such as removable cartridges, lamps and the like that may be coupled or

20 otherwise attached to device 400.

Housing 108 may also include or interface with an optional fragrance intensity slider 410. Slider 410 allows users to adjust the intensity of fragrance produced by device 400 by moving slider 410 to a desired linear position corresponding to the rate by which fragrance is allowed to diffuse or move into the surrounding space. Alternate embodiments may use a

25 rotary dial, switch or other control in place of slider 410 to adjust the fragrance intensity, or may eliminate fragrance intensity adjustment altogether.

Figures 4A-D depict two separate forces F_1 and F_L impinging upon worst-case transverse loading points 202 and 414, respectively. Worst-case loading points 202 and 414 correspond to locations on housing 108 where the impinging forces F_1 and F_L produce

30 maximum rotational moments upon device 400. Accordingly, the worst case loading points on device 400 are the points furthest from the outlet face along outer ridge 432 of device 400 as shown in Figure 4D.

Worst case support points 204 and 416 lie along the outer edge of housing 108 facing

the electrical receptacle and opposite plugs 106A-B, since the rotational moments produced

by reactive forces R_1 and R_2 are maximized along edges 434 and 436 (Figure 4D),

respectively. To simplify discussion, points 204 and 416 are considered as worst case

5   support points for forces F_1 and F_L, respectively, although other points along edges 434 or

436 would produce similar results.

With continued to Figures 4A-D, force F_1 is shown applied to worst-case loading

point 202, which is located along the upper edge of housing 108 at a point furthest outward

from the outlet face. Force F_1 is therefore applied a distance of d_L (Figs. 4A and 4C) from

10   the outlet face to produce a moment of magnitude $F \times d_L$ about worst case support point 204.

Plugs 106A and 106B effectively produce reactive forces R_1 and R_2 at distances d_{S1} and d_{S2}

from support point 204, respectively, to generate rotational moments about point 204 equal

to $R_1 \times d_{S1}$ and $R_2 \times d_{S2}$, respectively. Applying the analysis of equation 4 set forth above, the

transverse loading stability of device 400 is suitably improved by designing distances d_{S1}

15   and d_{S2} to be relatively long compared to distance d_L. Stated another way, stability is

improved by designing the maximum thickness of device 400 to be less than the shortest

distance from either plug 106A-B to any loading edge (e.g. edges 434 and 436) of housing

108 that is in contact with outlet face 212.

Similarly, force F_L is shown applied to worst-case loading point 414, which (like

20   point 202) is located along the upper edge of housing 108 at a point furthest outward from

the outlet face. Force F_L is therefore applied a distance of d_L (Figs. 4A and 4C) from the

outlet face to produce a moment of magnitude $F_L \times d_L$ about worst case support point 204,

which lies along edge 436 as described above. Plugs 106A and 106B effectively produce

reactive forces R_1 and R_2 at a distance d_{SL} from support point 204. In this case, R_1 and R_2

25   are produced at an equal distance from support point 204 along an axis parallel to the outlet

face as best seen in Figure 4C. Accordingly, R_1 and R_2 generate rotational moments about

point 204 with magnitudes equal to $R_1 \times d_{SL}$ and $R_2 \times d_{SL}$, respectively. Again applying the

analysis of equation 4 set forth above, the transverse loading stability of device 400 is

suitably improved by designing distance d_{SL} to be relatively long compared to distance d_L.

30   Regardless of the type of volatizable material used, the material delivery system may

employ any form of controller to modulate the delivery of vapor into the environment. To

the extent that the rate at which the vapor is introduced into the environment is a function of

both the temperature of the volatizable material and the environmental convection
conditions in the vicinity of the volatizable material, any suitable control mechanism may be
employed to modulate these two factors. For example, the convection conditions may be
controlled through the use of adjustable convection inhibitors (e.g., one or more vents) one

5   or more convection enhancers (e.g., fans, chimney structures, etc.), or other structures that
modify the vapor pressure in and around the material delivery system. Similarly, the
temperature of the volatizable material and/or the temperature of the environment in the
vicinity of the material delivery system may be controlled through any convenient method,
including resistive heating (described above), or through proximity of the device to a

10   preexisting heat source.

           Notwithstanding the nature of receptacle 210 -- i.e., whether and to what extent the
receptacle is configured to supply electrical current -- the device may be passive, active, or
selectably switched between active and passive modes. The term "passive" in this context, as
applied to delivery devices, refers to those devices which substantially depend upon ambient

15   conditions to deliver a fragrance or otherwise give rise to a modification of the environment.
Such ambient conditions include, for example, ambient thermal conditions (e.g., wall
surface temperature and air temperature) and ambient air flow, (e.g., air flow resulting from
free convection as well as the movement (if any) of fans, individuals, and other entities
within the environment).The term "active" in this context refers to devices that are not

20   passive, e.g., devices which employ integrated fans, heating elements, and other such
devices.

           In the event that the vapor dispensing device is an active device, any power source
required by the device may be intrinsic to receptacle 210, e.g., the 120 V source of a
standard wall outlet, or extrinsic to receptacle 210, e.g., supplied by a battery, solar cell, or

25   other such device incorporated into or otherwise associated with delivery device 100.
Alternatively, power may be supplied by a combination of intrinsic and extrinsic sources
and/or may be incorporated into a refill component.

           Delivery device 100 suitably includes one or more removeably attached refill
components as briefly mentioned above. That is, referring to Figs. 5A-5C, it may be

30   advantageous for the delivery device to include components that are integral to housing 108
of the delivery system itself as well as one or more refill components 406 (or simply
"refills") that can be replaced by the user. In the event delivery system 100 is an air

freshener device, for example, a depleted refill component 406 may removed from system
100 and replaced by a new refill containing fragrant oil, wax, gel, or the like. The refill
suitably includes a refill body and a volatizable material provided therein.

In accordance with one aspect of the present invention, a refill component is
5   provided which allows a vapor-dispensing device to mimic an electrical receptacle. For
example, a refill component comprising a refill body having a volatizable material provided
therein may be configured to be inserted behind the front surface of the device such that it is
substantially concealed by the front surface. In accordance with one aspect of the present
invention, the refill has a perimeter that is encompassed by the perimeter of the housing.

10   In accordance with another aspect of the present invention, refill 406 is configured
such that it does not significantly obstruct the receptacle's outlet pattern (comprising, for
example, two outlets 412A and 412B). In one embodiment, for example, this is
accomplished by providing a refill component 406 that at least partially surrounds one or
more outlets on the receptacle (variously shown in Figs. 5A-5C). In the event that the
15   delivery device is used in connection with a standard electrical receptacle, it is desirable for
refill 406 to encompass two or more sides of the outlet pattern (Fig. 5A). To the extent that it
is advantageous to supply the greatest possible volume of volatizable material, the refill may
be configured as a rectangular ring that completely surrounds the outlet pattern (Fig. 5B).
Alternatively, the refill may be configured in a 'U' shape to allow refill 406 to be slideably
20   removed from the device (Fig. 5C).

For the sake of brevity, conventional electrical and mechanical design techniques
used in developing various vapor-dispensing devices (and the various components thereof)
are not described in detail herein. Accordingly, devices disclosed herein may be readily
modified to create equivalent embodiments through application of general electrical and
25   mechanical principles. Although the embodiments described herein show vapor dispensing
devices that are generally quadrilateral in shape, for example, other design styles could be
formulated. Vapor dispensing devices could be readily formulated with angular, round, oval
or other shapes, for example, as well as with combinations of multiple shapes and structures.
In a further embodiment, the vapor dispensing device may be adorned with an ornamental
30   design such as a floral design, an outdoor scene, a cartoon or movie character, or the like.
Moreover, the general concepts of improving transverse loading stability described herein

may be applied to other electrical devices such as air filters, nightlights, audio speakers, wireless control devices, timers and the like.

    The particular implementations shown and described herein are examples of the invention and are not intended to otherwise limit the scope of the invention in any way. The

5   connecting lines shown in the various figures contained herein are intended to represent exemplary functional relationships and/or physical couplings between the various elements. It should be noted that many alternative or additional functional relationships, physical connections or logical connections may be present in a practical vapor-dispensing device. The corresponding structures, materials, acts and equivalents of all elements in the claims

10   below are intended to include any structure, material or acts for performing the functions in combination with other claimed elements as specifically claimed. The scope of the invention should be determined by the appended claims and their legal equivalents, rather than by the examples given above. No item or component is essential to the practice of the invention unless the element is specifically described herein as "critical", "essential" or

15   "required".

<u>Claims</u>

1.   A vapor-dispensing device having a high transverse loading stability when
connected to an electrical receptacle having an outlet face, said vapor-dispensing device
comprising:

5   a housing;

              a device outlet provided within said housing;

              a plug electrically coupled to said device outlet and configured to be inserted
into said outlet face;

              said housing having a worst-case transverse loading point a distance d_L from

10   said outlet face along an axis through said worst-case transverse loading point and
substantially perpendicular to said outlet face;

              said housing having a worst-case support point a distance d_S from said plug
along an axis through said worst-case support point and substantially parallel to said
outlet face;

15   said transverse loading stability of said vapor dispensing device characterized
by a transverse loading coefficient η, defined as:

              $\eta \equiv d_S/d_L$

              wherein said vapor dispensing device has a transverse loading coefficient η >
1.0.

20

2.   A vapor dispensing device configured to be connected to an electrical
receptacle having an outlet face, said vapor dispensing device comprising a housing and a
plug configured to be inserted into the outlet face, wherein the housing comprises a worst-
case transverse loading point a perpendicular distance d_L from the outlet face and a worst-

25   case support point a distance d_S from the plug, and wherein the distance d_S is greater than
the distance d_L.

3.   The vapor dispensing device of claim 2 further comprising a first device
outlet electrically coupled to the plug.

30

11

4.   The vapor dispensing device of claim 3 further comprising a second plug electrically coupled to the plug.

5.   The vapor dispensing device of claim 2 wherein the worst case transverse loading point is defined as a point on the housing having a maximum distance from the outlet face.

6.   The vapor dispensing device of claim 5 wherein the worst case support point is defined as a point along a loading edge of the housing adjacent the front face and opposite the plug from the worst case transverse loading point.

7.   The vapor dispensing device of claim 6 wherein the thickness of the housing is less than the shortest distance from the plug to the loading edge of the housing.

8.   The vapor dispensing device of claim 1, further including a refill component removeably attached to said housing.

9.   The apparatus of claim 8, wherein said refill component at least partially surrounds the outlet.

10.   The apparatus of claim 8, wherein said refill is generally "U"-shaped.

11.   The apparatus of claim 10, wherein said refill is configured to slideably attach to the environment-altering apparatus.

12.   The apparatus of claim 8, wherein said refill component is a rectangular ring.

13.   The apparatus of claim 1, wherein the vapor-delivery device is passive.

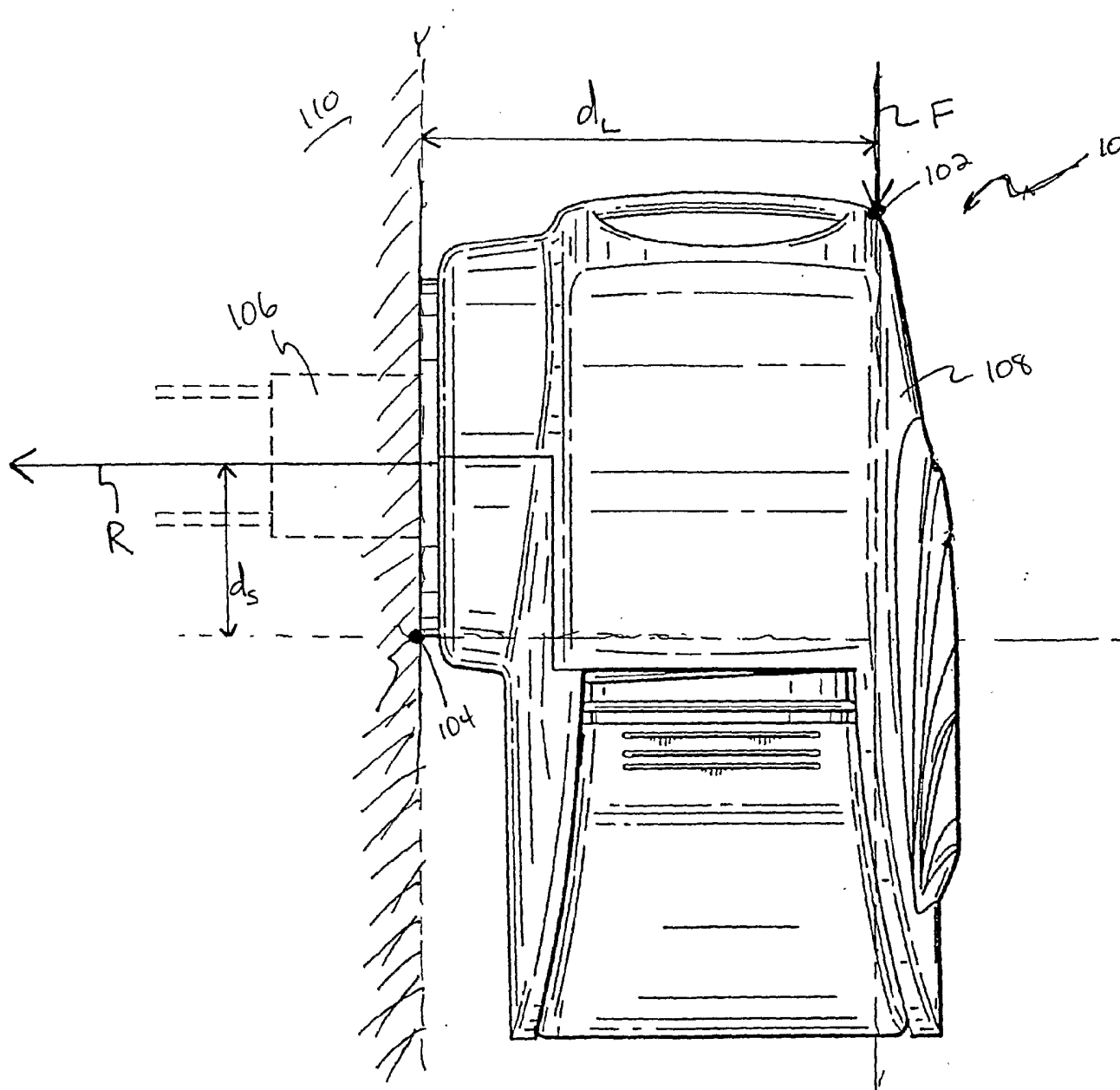14.   The apparatus of claim 1, wherein the vapor-delivery device is active.
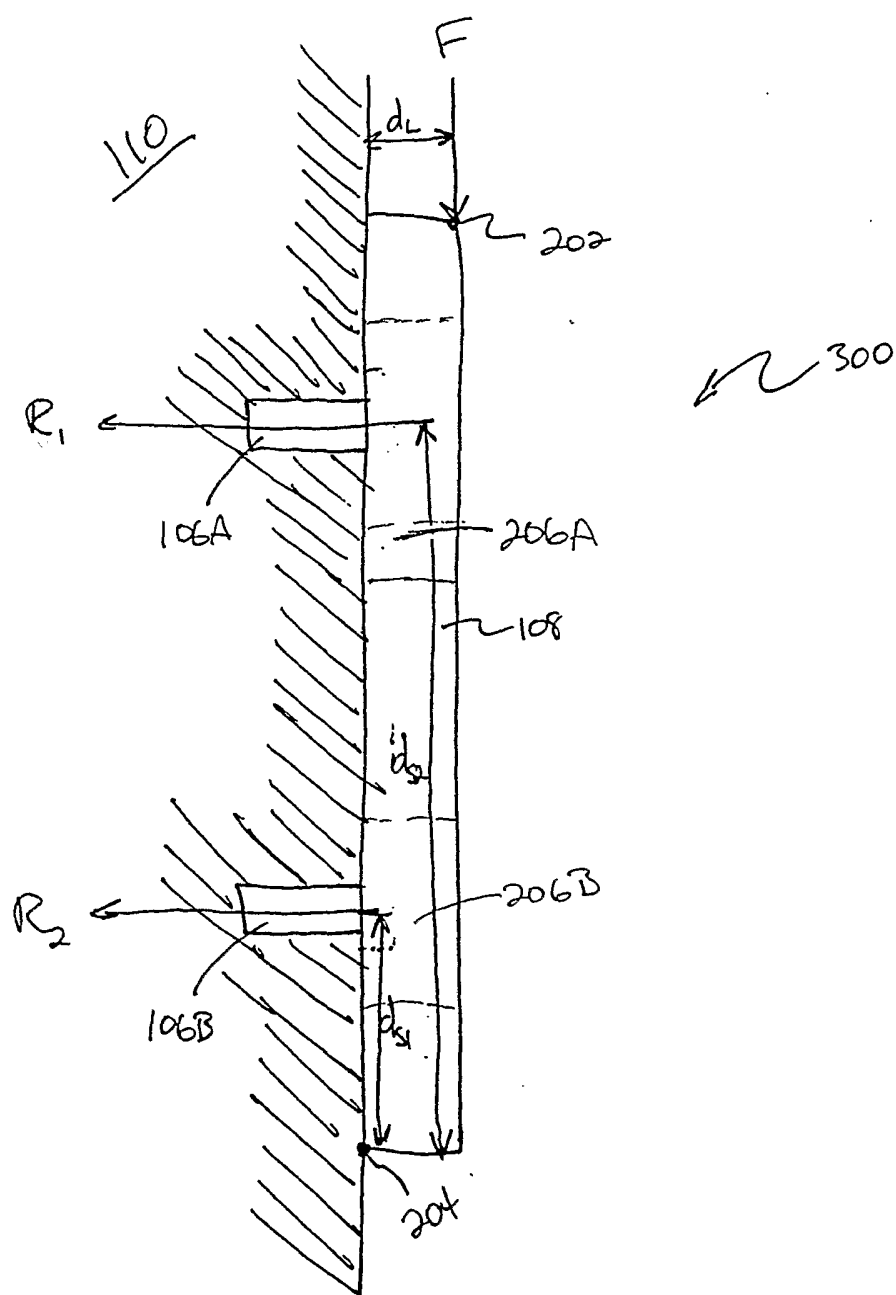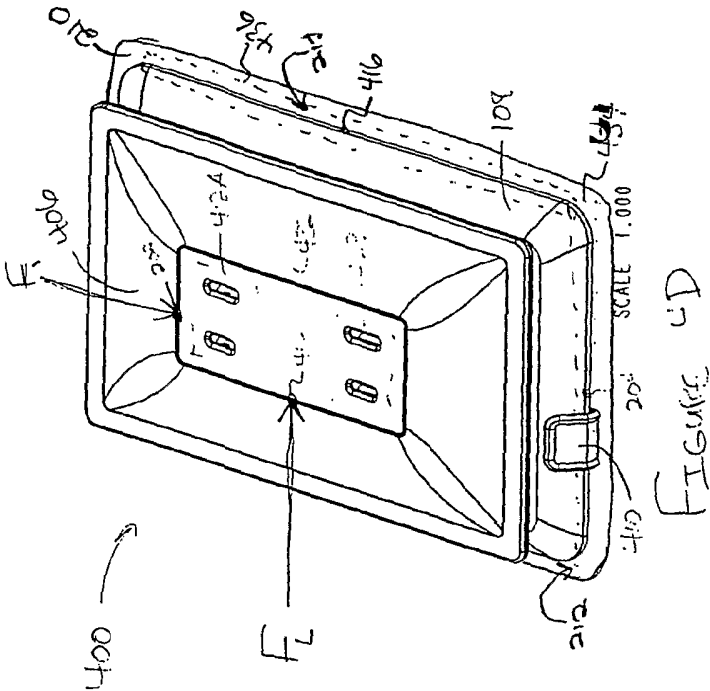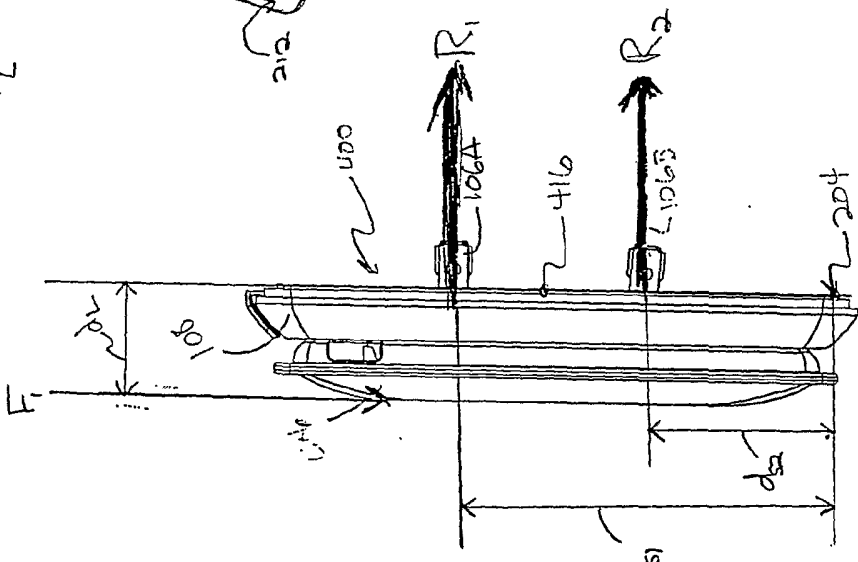
FIG. 1

(Prior Art)

FIGURE 2
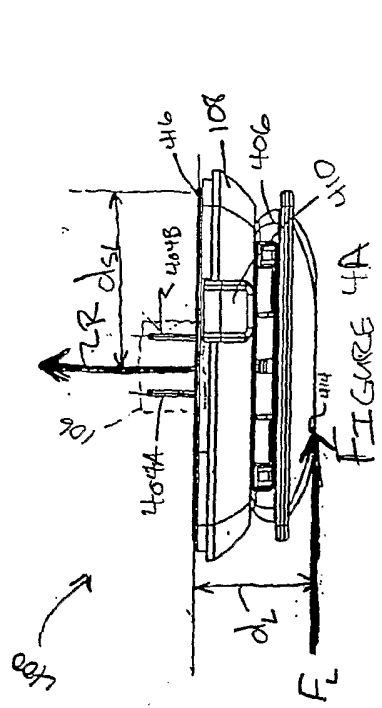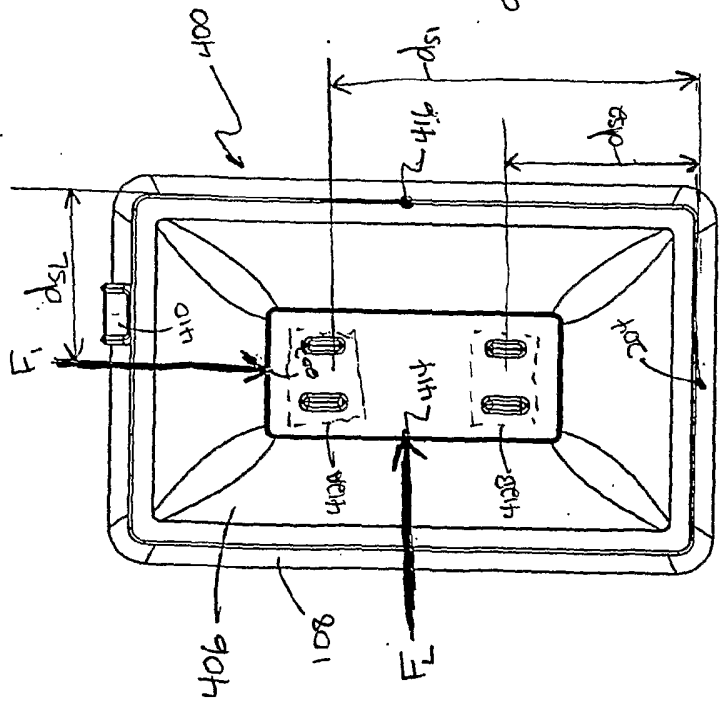
FIGURE 3

FIGURE 4A

FIGURE 4B

FIGURE 4C

FIGURE 4D

Fig. 5C

Fig. 5B

Fig. 5A
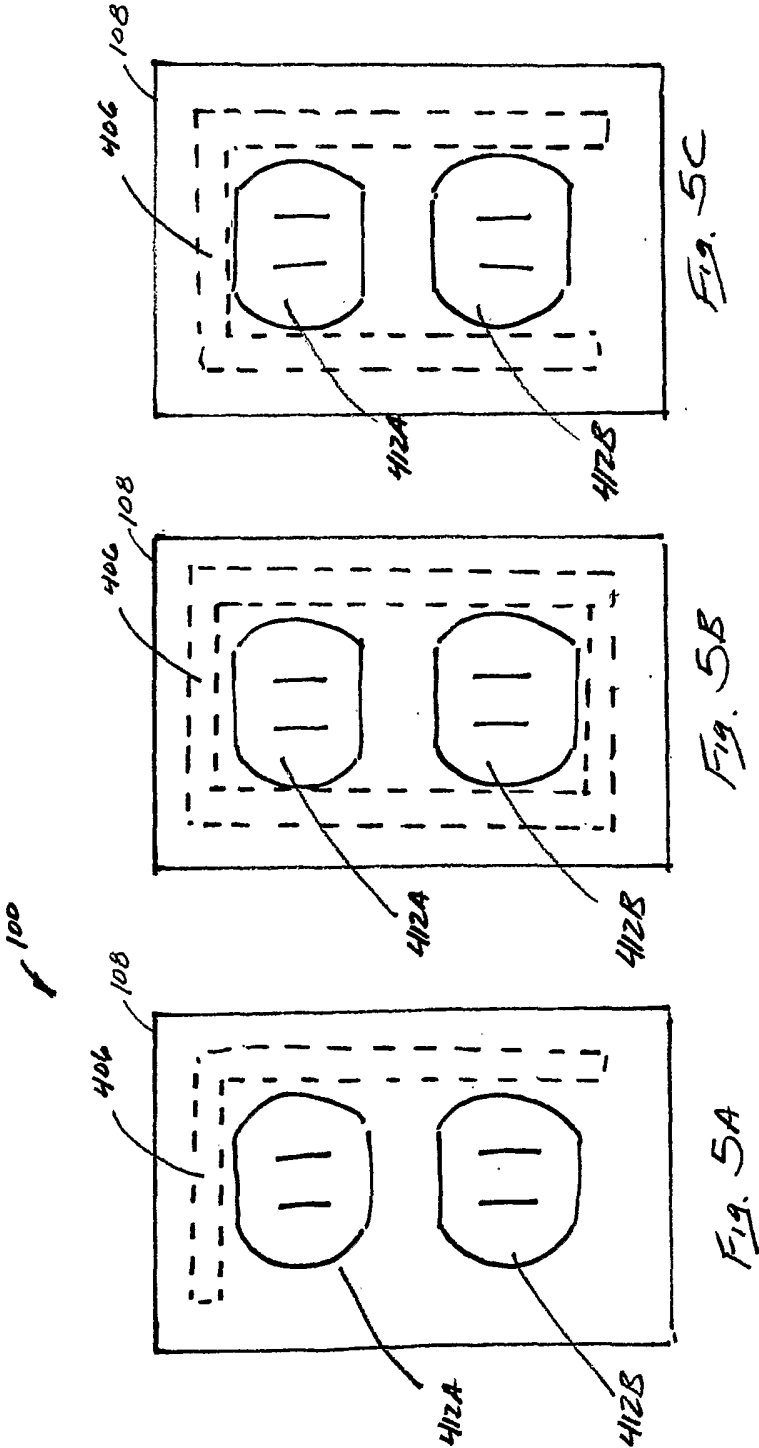
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A61L9/03

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)
IPC 7 A61L A01M

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 804 821 A (GLUCKSMAN DOV Z) 14 February 1989 (1989-02-14) column 6, line 11 -column 7, line 60; figures 7,9	1-3,5-8, 14
X	DE 41 31 613 A (GLOBOL GMBH) 25 March 1993 (1993-03-25)	2,5-7
A	column 1, line 20 - line 58; figures 1,13,16 column 2, line 64 -column 3, line 30 column 8, line 13 - line 39	8,10,11, 14
X	US 6 085 026 A (HAMMONS RANDALL LEE ET AL) 4 July 2000 (2000-07-04) figures 1,3	2,5-7

-/--

| X | Further documents are listed in the continuation of box C. | X | 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	Date of mailing of the international search report
10 December 2003	19/12/2003

Name and mailing address of the ISA	Authorized officer
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	Katsoulas, K

Form PCT/ISA/210 (second sheet) (July 1992)

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
A	WO 00 76292 A (LEVINE LAWRENCE T ;WOLPERT CHRISTOPHER J (US); DIAL CORP (US); PAR) 21 December 2000 (2000-12-21) cited in the application figure 1 -----	1-8,14

Form PCT/ISA/210 (continuation of second sheet) (July 1992)

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
US 4804821	A	14-02-1989	US	4731520 A	15-03-1988
			AU	1770488 A	20-04-1989
			EP	0296807 A2	28-12-1988
			JP	1131665 A	24-05-1989
			AT	63223 T	15-05-1991
			AU	4272089 A	15-02-1990
			AU	592201 B2	04-01-1990
			AU	7466287 A	07-01-1988
			DE	3769871 D1	13-06-1991
			EP	0252642 A1	13-01-1988
			JP	63051864 A	04-03-1988
			ZA	8704522 A	29-12-1987
DE 4131613	A	25-03-1993	DE	4131613 A1	25-03-1993
US 6085026	A	04-07-2000	AU	6336396 A	22-01-1997
			EP	0844892 A1	03-06-1998
			GB	2302507 A ,B	22-01-1997
			SG	55207 A1	21-12-1998
			WO	9700700 A1	09-01-1997
			ZA	9605285 A	14-04-1997
WO 0076292	A	21-12-2000	US	6104867 A	15-08-2000
			CA	2377319 A1	21-12-2000
			WO	0076292 A2	21-12-2000
			US	2002172512 A1	21-11-2002