



## (51) International Patent Classification:

A61L 9/04 (2006.01) A61L 9/12 (2006.01)  
A01M 1/20 (2006.01)

## (21) International Application Number:

PCT/US2014/044578

## (22) International Filing Date:

27 June 2014 (27.06.2014)

## (25) Filing Language:

English

## (26) Publication Language:

English

## (30) Priority Data:

|            |                               |    |
|------------|-------------------------------|----|
| 61/840,561 | 28 June 2013 (28.06.2013)     | US |
| 61/944,307 | 25 February 2014 (25.02.2014) | US |
| 14/309,549 | 19 June 2014 (19.06.2014)     | US |

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

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

## Published:

- with international search report (Art. 21(3))
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))

## (54) Title: EMANATION SYSTEM AND METHOD FOR USE

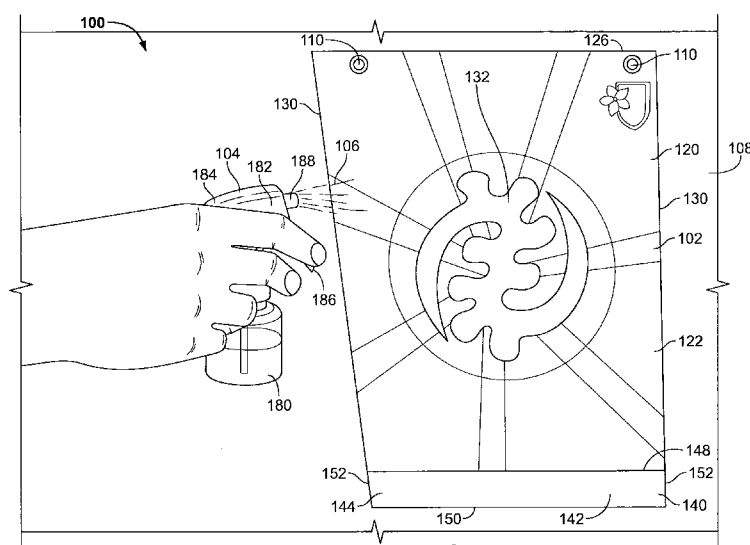


FIG. 7

(57) Abstract: [0075] An emanation system (100) is disclosed that include a substrate (102), a secondary substrate (140), and an air treatment material (106). The secondary substrate (140) is adapted to be wetted with runoff from the air treatment material applied to the substrate (102). When applied, the air treatment material emanates from the substrate (102) at a first release rate and from the secondary substrate (140) at a second release rate.

## EMANATION SYSTEM AND METHOD FOR USE

## CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to U.S. Provisional Application Serial No. 61/840,561, filed June 28, 2013, and to U.S. Provisional Application Serial No. 61/944,307, filed February 25, 2014. Each of the preceding applications is incorporated by reference.

## REFERENCE REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

[0002] Not applicable.

## SEQUENCE LISTING

[0003] Not applicable.

## BACKGROUND OF THE DISCLOSURE

1. Field of the Disclosure

[0004] The present disclosure relates to emanation systems with one or more substrates attached to a surface, and in particular, to a substrate with a visual guide disposed thereon and having one or more active release profiles.

2. Description of the Background of the Disclosure

[0005] Various emanation systems are known in the prior art that generally include a reservoir that holds a volatile material and optionally includes a housing or support structure to retain the reservoir. The prior art emanation systems typically either allow passive diffusion of the volatile material to occur without the aid of a dispensing mechanism or enhance and/or facilitate the release of the volatile material using a dispensing mechanism. Typical dispensing mechanisms used in emanation systems include a heating device and/or a fan that either heats and/or supplies air, respectively.

[0006] Many passive emanation systems of the prior art utilize a solid or semi-solid block of material or a volatile material laden gel disposed within a housing. In particular, one prior art emanation system includes a container having a candle therein. When lit, the candle emits a volatile material. Another prior art emanation system uses a conical gel surface impregnated with a volatile material. The conical gel surface is disposed within a housing having an adjustable cap. The cap may be adjusted upwardly or downwardly to expose the surface area of the conical gel surface to varying degrees. In a different prior art emanation system, a reservoir having a semi-permeable film disposed thereon is used and has a volatile material disposed within the reservoir. The volatile material diffuses out of the reservoir through the semi-permeable membrane. Another prior art emanation system includes a substantially flat substrate having a volatile material thereon. The volatile material is slowly released into the surrounding atmosphere.

[0007] One drawback of some of the aforementioned prior art emanation systems is that the substrate may be wetted with a volatile material that is released over a shortened time period. The release profile of the volatile material is generally constant in that the release rate of the volatile slowly decreases until the volatile is evaporated. In these systems, the emanation system only provides efficacy for a short period of time after application of the volatile to the substrate.

[0008] Further, some prior art emanation systems are designed to emit an insecticide. Historically, the smell of the insecticide has been unpleasant, which sometimes discourages use of the emanation system. Some attempts have been made to mask the unpleasant odor associated with the use of insecticides through the incorporation of citronella oil into the emanation system.

[0009] Further, in some instances, it is undesirable to keep air treatment materials within the home. Therefore, it is desirable to have an emanation system in the home that can be refilled by a third party such that the air treatment materials do not need to be kept in the home. In some instances, it may also be desirable to have the third party re-apply the air treatment materials to the emanation system so that individuals do not have to touch the material-laden surface of the substrate after use.

[0010] Therefore, it would be desirable to have an inexpensive passive emanation system in the form of a wettable substrate that allows a user to apply an air treatment material thereto. It is

further desirable to provide a system that allows the air treatment material to emanate at a high rate after the initial application of the air treatment material to the substrate, and further allows for continued efficacy by having a secondary substrate that releases the air treatment material at a slower rate than that of the substrate. Finally, it would be desirable to have a fragrance incorporated into the air treatment material, which acts to incentivize the user to use the emanation system, and also acts as a use-up cue that allows the user to determine when the air treatment material is no longer effective.

### **SUMMARY OF THE INVENTION**

[0011] According to a first aspect, an emanation system includes a substrate, a secondary substrate, and an air treatment material. The secondary substrate is adapted to be wetted with runoff from the air treatment material applied to the substrate. When applied, the air treatment material emanates from the substrate at a first release rate and from the secondary substrate at a second release rate.

[0012] The following attributes may be combined individually or in any combination with the first aspect to form different embodiments of the first aspect: the substrate may include a substantially rectangular body and the secondary substrate may be disposed adjacent a lower edge of the body; the secondary substrate may be in communication with the substrate such that a rear surface of the secondary substrate is substantially flush with a front surface of the substrate; the substrate may include a polymer and the secondary substrate may include a cellulosic material; the substrate and the secondary substrate may define a substantially smooth surface; and the substrate may include a visual guide.

[0013] According to a second aspect, an air treatment material includes a fragrance having a first efficacy time period and an active ingredient having a second efficacy time period. The air treatment material is provided as a microemulsion, and the first and the second efficacy time periods are substantially the same.

[0014] The following attributes may be combined individually or in any combination with the second aspect to form different embodiments of the second aspect: the air treatment material may be applied to a polymer substrate and the active ingredient may be released therefrom at a

rate of at least about 0.2 mg/hr; the fragrance may act as a use-up indicator to provide an olfactory cue that the second efficacy time period has ended; the active ingredient may be a pyrethroid; the air treatment material may further include a surfactant blend; the air treatment material may include about 4% fragrance and about 0.4% active ingredient; and the air treatment material may include about 90% of deionized water, about 3 to about 6% of the surfactant blend, about 2 to about 6% of the fragrance, and about 0.2 to about 1% of the active ingredient.

[0015] According to a third aspect, a method of operating an emanation system includes the steps of providing a dispensing device containing an air treatment material and a substrate, aligning a nozzle of the dispensing device with the substrate, and actuating the dispensing device to spray an amount of the air treatment material onto at least a portion of the substrate.

[0016] The following attributes may be combined individually or in any combination with the third aspect to form different embodiments of the third aspect: a secondary substrate may be designed to catch an amount of run off from the amount of air treatment material sprayed onto the substrate; the air treatment material may emanate from the substrate at a first release rate, and may emanate from the secondary substrate at a second release rate; the method of the third aspect may further include the step of filling the dispensing device; the nozzle may be aligned with a visual guide on the substrate; the amount of air treatment material sprayed may be about 3 grams; and the amount of the air treatment material sprayed onto the substrate may provide mosquito repellency and a pleasant fragrance to the room for a time period of about three days.

### **BRIEF DESCRIPTION OF THE DRAWINGS**

[0017] FIG. 1 is a perspective view of a first embodiment of an emanation system having a substrate and a dispensing device associated therewith;

[0018] FIG. 2 is a perspective view of a substrate similar to that of FIG. 1, wherein the substrate is attached to a surface via an attachment mechanism;

[0019] FIG. 3A is a schematic of one embodiment of a substrate with a visual guide;

[0020] FIG. 3B is a schematic of another embodiment of a substrate with a visual guide;

[0021] FIG. 3C is a schematic of a different embodiment of a substrate with a visual guide;

- [0022] FIG. 3D is a schematic of another embodiment of a substrate with a visual guide;
- [0023] FIG. 3E is a schematic of one embodiment of a substrate with a visual guide;
- [0024] FIG. 3F is a schematic of another embodiment of a substrate with a visual guide;
- [0025] FIG. 3G is a schematic of a different embodiment of a substrate with a visual guide;
- [0026] FIG. 3H is a schematic of another embodiment of a substrate with a visual guide;
- [0027] FIG. 4 is a front, right, top isometric view of a substrate similar to that of FIG. 1;
- [0028] FIG. 5 is side elevational view of the substrate of FIG. 4;
- [0029] FIG. 6 is a front, right, top isometric view of a different embodiment of a substrate;  
and
- [0030] FIG. 7 is a perspective view of the emanation system of FIG. 1 in use.

#### **DETAILED DESCRIPTION OF THE INVENTION**

[0031] As generally depicted in FIGS. 1-7, an emanation system 100 generally includes a substrate 102 and a dispensing device 104 designed to coat the substrate 102 with an air treatment material 106. The emanation system 100 may be used in an enclosed area, such as an office, a living room, a bedroom, a kitchen, a screened in porch, a basement, or other suitable location. Prior to use, the substrate 102 may be attached to a surface 108 via an attachment mechanism 110. During use, the dispensing device 104 is positioned adjacent the substrate 102, and the air treatment material 106 is dispensed onto the substrate 102. The emanation system 100 is adapted to passively dispense the air treatment material 106 from the substrate 102 when air flows around the substrate.

[0032] The substrate 102 may have a rectangular body 120 with a front surface 122, a rear surface 124, upper 126 and lower 128 edges, and opposing side edges 130. In one embodiment, the substrate 102 has a flat, smooth appearance. The substrate 102 may have various textures and/or surface patterns, such as a rough surface, a smooth surface, a channeled surface, and combinations thereof that may increase surface area and/or the rate of emanation of the air

treatment material 106. Moreover, the substrate 102 may be any shape such as square, triangular, circular, oval, and other shapes.

[0033] As seen more clearly in FIGS. 2-3H, the substrate 102 may further include a spray pattern or visual guide 132 disposed thereon. The visual guide 132 may be positioned on either the front 122 or rear surface 124 of the substrate 102, and may be visible through the substrate. In one instance, the visual guide 132 includes a dark circular boundary 134 with a contrasting pattern 136 therein, as compared to the color of the substrate 102. A secondary pattern 138 is optionally provided in conjunction with the visual guide 132 and may provide an aesthetic quality to the substrate 102.

[0034] The visual guide 132 may act as a target or non-verbal cue for an individual coating the substrate 102 with the air treatment material 106, as described in more detail hereinbelow. The visual guide 132 may be only a region of visual contrast from the surrounding substrate 102, though any pattern or visual device may be used. For example, numerous representative examples of exemplary visual guides 132 are depicted in FIGS. 3A-3H.

[0035] In some embodiments, the visual guide 132 directs an individual coating the substrate 102 where to spray the air treatment material 106 and provides a secondary meaning. For example, the visual guide 132 depicted in FIG. 3A may indicate that the substrate 102 and associated air treatment material 106 are non-toxic and/or environmentally friendly. In other embodiments seen in FIGS. 3B, 3G, or 3H, the visual guides 132 may depict images suggesting a time of day (e.g., day or night) to indicate when the substrate 102 and associated air treatment material 106 should be used.

[0036] In other embodiments, the pattern or appearance of the visual guide 132 may be correlated either with a dispensing pattern of the dispensing device 104 or may otherwise indicate a pairing with the dispensing device. With respect to the first concept, the dispensing device 104 may dispense the air treatment material 106 in the same shape as the visual guide 132 disposed on the substrate 102, such as a circular pattern (FIG. 3C), a rectangular pattern (FIG. 3D), or a triangular pattern (FIG. 3E). Regarding the second concept, the pattern of the visual guide 132 may be indicative of which air treatment material 106 should be used for the particular substrate 102. For example, a particular substrate 102 may have a characteristic that favors one

type of air treatment material 106 compared to another, such as an ideal emanation rate for the air treatment material in question due to the material from which the particular substrate is made. In other words, the visual guide 132 serves to instruct the user which air treatment material 106 should be used with the substrate 102, and the user matches the pattern of the visual guide to that disposed (not shown) on the dispensing device 104.

[0037] In further embodiments, contact between the air treatment material 106 and the substrate 102 changes the appearance of the visual guide 132. For example, in one instance, the visual guide 132 disappears or fades or changes color after contact with the air treatment material 106. In a different embodiment, the visual guide 132 becomes visible only after contact with the air treatment material 106 and fades over time. In this embodiment, the visual guide 132 may fade as the efficacy of the air treatment material lessens to serve as a visual use up cue.

[0038] As seen in FIGS. 1, 4, 5, and 7, the substrate 102 may further include a secondary substrate 140 associated therewith. The secondary substrate 140 may be provided in the form of a rectangular sheet 142 having a front surface 144 and an opposing rear surface 146. The sheet 142 has an upper edge 148, a lower edge 150, and opposing side edges 152. The secondary substrate 140 is attached to, or is otherwise in communication with the substrate 102. In particular, the secondary substrate 140 may be positioned such that the rear surface 146 of the secondary substrate 140 is flush with the front surface 122 of the substrate 102. Further, the lower edge 128 and side edges 130 of the substrate 102 may be aligned with the corresponding lower edge 150 and side edges 152 of the secondary substrate 140. In other embodiments, the secondary substrate 140 may be larger, smaller, and/or wrap around one or more edges 126, 128, 130 of the substrate 102.

[0039] The secondary substrate 140 may be attached to the substrate 102 by an adhesive, a staple, a hook and loop fastener, combinations thereof, and other mechanisms. In one embodiment, the secondary substrate 140 is designed to be adjacent the front surface 122 of the substrate 102 such that there are no gaps between the substrate 102 and the secondary substrate 140. In another embodiment, the secondary substrate 140 is disposed on the substrate 102 to serve as the visual guide 132.

[0040] Referring to FIGS. 4 and 5, the substrate 102 may have a length dimension  $L$  of between about 10 mm to about 800 mm. In some embodiments, the length dimension  $L$  of the substrate 102 is between about 100 mm to about 500 mm. In one specific embodiment, the length dimension  $L$  of the substrate 102 is about 300 mm. The substrate 102 further may have a width dimension  $W$  of between about 10 mm to about 600 mm. In some embodiments, the width dimension  $W$  of the substrate 102 is between about 100 mm to about 400 mm. In one specific embodiment, the width dimension  $W$  of the substrate 102 is about 210 mm.

[0041] As depicted in FIG. 5, the secondary substrate 140 may have a thickness dimension  $T_S$  of between about 0.1 mm to about 2 mm. In some embodiments, the thickness dimension  $T_S$  of the secondary substrate 140 is between about 0.3 mm to about 1 mm. In one specific embodiment, the thickness dimension  $T_S$  of the secondary substrate 140 is about 0.6 mm. In another embodiment, the thickness dimension  $T_S$  of the secondary substrate 140 is at least about 0.4 mm. The secondary substrate 140 further may have a length dimension  $L_S$  of between about 1 mm to about 100 mm. In some embodiments, the length dimension  $L_S$  of the secondary substrate 140 is between about 5 mm to about 100 mm. In one specific embodiment, the length dimension  $L_S$  of the secondary substrate 140 is about 25 mm. In another embodiment, the length dimension  $L_S$  of the secondary substrate 140 is at least about 20 mm.

[0042] The secondary substrate 140 further may have a width dimension  $W_S$  (see FIG. 4) of between about 10 mm to about 600 mm. In some embodiments, the width dimension  $W_S$  of the secondary substrate 140 is between about 100 mm to about 400 mm. In one specific embodiment, the width dimension  $W_S$  of the secondary substrate 140 is about 210 mm. In one embodiment, the width dimension  $W$  of the substrate 102 is substantially the same as the width dimension  $W_S$  of the secondary substrate 140. In one embodiment, the ratio of the length dimension  $L$  of the substrate 102 to the length dimension  $L_S$  of the secondary substrate 140 is about 14 to about 1. In another embodiment, the ratio of the length dimension  $L$  of the substrate 102 to the length dimension  $L_S$  of the secondary substrate 140 is about 10 to about 1. In a further embodiment, the ratio of the length dimension  $L$  of the substrate 102 to the length dimension  $L_S$  of the secondary substrate 140 is about 8 to about 1.

[0043] As seen in FIG. 6, the substrate 102 may include a first emanation surface 160 and a second emanation surface 162. In this embodiment, the first emanation surface 160 and the second emanation surface 162 are integral, or otherwise in fixed communication with each other to form the substrate 102. The first and second emanation surfaces 160, 162 may be integral, in that, the substrate 102 is provided as a single sheet with a portion of the sheet having a different volatile material release profile from other portions of the sheet. In this embodiment, the substrate 102 includes a substantially uninterrupted front surface 164. Although the second emanation surface 162 is depicted as an elongate rectangular structure, the second emanation surface 162 may include other shapes and/or sizes and/or may be oriented or positioned in other portions of the substrate 102.

[0044] A demarcation between the substrate 102 and the secondary substrate 140, or the first and second emanation surfaces 160, 162, may not be readily apparent unless another mechanism (*e.g.*, visual cue) is used to alert the user. For example, the second emanation surface 162 may be imparted with a pattern 166 or design, while the first emanation surface 160 may not include the pattern or design. In other embodiments, the first and second emanation surfaces 160, 162 may be contrasted using patterns, colors, and/or other visual markers. In a further embodiment, the first and second emanation surfaces 160, 162 are not visually distinct with respect to each other. Likewise, the substrate 102 and/or secondary substrate 140 may be provided with one or more visual cues distinguishing one from the other.

[0045] The substrate 102 may be chosen based on the rate of release from the substrate of a composition impregnated therein. For example, the substrate 102 may be chosen to have a release rate such that an effective amount of a pest control agent, such as an insecticide or insect repellent, is released for a specific length of time, such as for about 1 day, or about 2, or about 3, or about 7, or about 14 days. Further, the substrate 102 may also be chosen based on its ability to maximally release a composition held therein, such that at the end of life, a minimal amount of composition is still contained therein.

[0046] The materials and properties used for the substrate 102 and/or the secondary substrate 140 impact the volatile material release rates of each substrate. Therefore, the substrate 102 may include a first volatile material release profile, and the secondary substrate 140 may include a

second, different, volatile material release profile. In one embodiment, an active contained within the air treatment material 106 may be designed to be released from the substrate 102 at a rate of about 0.1 mg/hr to about 1 mg/hr. In other embodiments, the active may be released from the substrate 102 at a rate of about 0.1 mg/hr to about 0.3 mg/hr. In a further embodiment, the active may be released from the substrate 102 at a rate of about 0.25 mg/hr. In another embodiment, the active may be released from the substrate 102 at a rate of at least about 0.2 mg/hr. Contemplated effective release rates of the active from the secondary substrate 140 may be from about 0.01 mg/hr to about 1 mg/hr. In other embodiments, the active may be released from the secondary substrate 140 at a rate of about 0.05 mg/hr to about 0.1 mg/hr, or from about 0.05 to about 0.2 mg/hr, or from about 0.1 to about 0.3 mg/hr. In another embodiment, the active may be released from the secondary substrate 140 at a rate of less than about 0.1 mg/hr. In one embodiment, the active may be released from the secondary substrate 140 at a slower rate than the release rate of the active from the substrate 102. It should be noted that the substrate 102 may be defined by the second volatile material release profile, and the secondary substrate 140 may be defined by the first volatile material release profile.

[0047] Any suitable materials may be used for the substrate 102 and secondary substrate 104. For example, the substrate 102 may be made of paper, cardboard, paperboard, plastic, and the like, or other materials consistent with the properties described herein. In one embodiment, the substrate 102 may include a natural or synthetic plastic material. For example, in one embodiment, the substrate 102 includes a polymer such as polypropylene, polyethylene, and/or polyethylene terephthalate. In one particular embodiment, the substrate 102 is a polyethylene terephthalate film.

[0048] The secondary substrate 140 may include a material that is rigid enough to minimize any gaps between the secondary substrate and the substrate 102, while at the same time, porous enough to absorb a quantity of air treatment material 106. For example, the secondary substrate 140 may be paper, cardboard, paperboard, foam, or the like. The secondary substrate 140 may include cellulosic materials including crepe paper, printer paper, A4 paper, and materials disclosed in WO 2005/046332. Additionally, the substrate 102 and/or the secondary substrate 140 may include combinations of manufactured, natural, and recycled or reclaimed materials. In

one specific embodiment, the substrate 102 includes a polymer and the secondary substrate 140 includes cardboard.

[0049] Further, one or more portions of or the entirety of the substrate 102 may be transparent. In addition, one or more portions of or the entirety of the substrate 102 and/or the secondary substrate 140 may be translucent and/or opaque. Further, any combination of transparency, translucency, or opacity may be chosen for the substrate 102 and the secondary substrate 140. For example, in one embodiment, the substrate 102 is translucent, and the secondary substrate 140 is opaque. In another embodiment, both the substrate 102 and the secondary substrate 140 are transparent. In a further embodiment, the substrate 102 is opaque, and the secondary substrate 140 is translucent.

[0050] The air treatment material 106 may be a fragrance or insecticide disposed within a carrier liquid, a solvent, a deodorizing liquid, and the like. The air treatment material 106 may also include other actives, such as sanitizers, air fresheners, odor eliminators, mold or mildew inhibitors, insect repellents, and the like, or actives that have aromatherapeutic properties. The air treatment material 106 alternatively includes any volatile material known to those skilled in the art.

[0051] The air treatment material 106 may be provided in any dispensable form. In one embodiment, the air treatment material 106 is provided as an emulsion. For example, the air treatment material 106 may be provided as a microemulsion. In one embodiment, the air treatment material 106 may include water, one or more surfactants, an active ingredient, and a fragrance.

[0052] In one embodiment, the air treatment material 106 may include between about 80% to about 98% deionized water, or about 85% to about 94% deionized water, or about 90% deionized water, or an amount of deionized water of at least about 80% of the total of the air treatment material.

[0053] The air treatment material 106 may further include a surfactant and/or a surfactant blend provided in an amount between about 0.1% to about 8%. In one embodiment, the surfactant blend is provided in an amount between about 3% to about 6%. In a different embodiment, the surfactant blend is present in an amount of at least about 4%. In one specific

embodiment, a first surfactant is provided in an amount between about 0.1% to about 0.5%, a second surfactant is provided in an amount between about 1.75% to about 2.5%, and a third surfactant is provided in an amount between about 1.75% to about 2.5%. Suitable surfactants include, for example, nonionic, anionic, zwitterionic, and/or cationic surfactants. For example, the first surfactant may be provided by Stepan, Co. under the trade name and number Stepanquat® 1010, and the second surfactant may be provided by Dow Chemical, Co. under the name and number Tergitol™ 15-S-7. The third surfactant may be an ethoxylated castor oil provided by Evonik Industries and sold under the name and number Tagat® CH 60.

[0054] The air treatment material 106 may also include at least one fragrance. The fragrance may be present in an amount of between about 0.5% to about 10%, or about 2% to about 6%, or in an amount at least about 4%. Any fragrance may be used herein including, for example, a floral scent, a fresh scent, a lavender scent, a eucalyptus scent, a pine scent, a spice scent, and combinations thereof.

[0055] An active ingredient may be present in the air treatment material 106 in an amount of between about 0.1% to about 2%, or about 0.2% to about 1%, or in an amount of about 0.4%, or at least about 0.3%. Candidate actives include esbiothrin, tefluthrin, prallethrin, transfluthrin, VAPORTHRIN®, metofluthrin, dimefluthrin, D-teflumethrin, and/or other volatile pyrethroids (with high vapor pressure). An active release rate of at least 0.05 milligrams per hour (mg/hr) or higher is preferred.

[0056] In one specific embodiment, the air treatment material 106 includes about 90.7% (2.7 g) of deionized water, about 0.4% (0.01 g) of the first surfactant, about 2.25% (0.068 g) of the second surfactant, about 2.25% (0.068 g) of the third surfactant, about 4% (0.12 g) of the fragrance, and about 0.4% (0.012 g) of the active ingredient.

[0057] It is contemplated that fragrances may be used as “use up” cues or indicators, such that when a user can no longer smell the fragrance, the strength of the active ingredient is no longer effective for its intended purpose, and the substrate 102 must be “recharged” with another dose of the air treatment material 106. In one embodiment, the amount of fragrance included in the air treatment material 106 is correlated to the active ingredient included therein. In this way, the fragrance further provides an olfactory cue to the user of the continuing efficacy of the air

treatment material 106. One or more additional use-up cues may be used, such as, for example, appearing and disappearing inks and the like for the visual guide 132 or secondary substrate 140.

[0058] A methodology for selecting a fragrance and an active to be incorporated into the air treatment material 106 is provided. For example, a fragrance may be selected to be efficacious for a first specified time period, and an active ingredient may be selected to be efficacious for a second specified time period. In one embodiment, the first and second time periods may be substantially equivalent. Numerous factors may be considered when selecting the fragrance and the active ingredient including, for example, the climate, the strength of the sense of smell of the user, the size of the room where the emanation system may be used, the size of the substrate 102, the amount of air treatment material 106 applied to the substrate, and the like. It should be appreciated that the fragrance can be “keyed” to the active ingredient, or vice versa, to provide the “use-up” cue function.

[0059] In one embodiment, the air treatment material includes about 4% of a fragrance and about 0.4% of the active ingredient (e.g., transfluthrin). Using this formulation, about 3 g of air treatment material 106 may be sprayed onto the substrate 102 to provide both mosquito repellency and a pleasantly fragranced room for a time period of about three days. The air treatment material 106 may be reapplied after the third day to repeat the process.

[0060] The air treatment material 106 may solely include an active, or for ease of handling, the active may be carried in a hydrocarbon, an alcohol, or a lipophilic or a hydrophilic solvent, mixtures thereof, or other solvent. Alternatively, or in addition, the substrate 102 and/or secondary substrate 140 may also hold a fragrance, a deodorizer, or other air treatment material to which the active is applied to create the air treatment material 106 on the substrate. In one embodiment, the substrate 102 and/or secondary substrate 140 may include the fragrance which only becomes noticeable once adequately saturated with an applied air treatment material 106 and thus serves as a saturation cue to indicate an adequate amount of air treatment material has been applied. It is envisioned that such an arrangement may teach the user to apply a specific amount (the same amount when first used to trigger the saturation cue) each subsequent time when the substrate 102 is recharged.

[0061] As shown in FIGS. 1, 2, and 7, the substrate 102 is designed to be attached to the surface 108 via the attachment mechanism 110. The attachment mechanism 110 may include pins or tacks that extend through the substrate 102 in opposing upper corners thereof. In some embodiments, other attachment mechanisms 110 may include electrostatic forces, a hook and loop fastener, a magnet, adhesives, strings, hooks, or the like. In other embodiments, the substrate 102 may be positioned adjacent the surface 108 (e.g., such as a flat surface) without the use of the attachment mechanism 110. The attachment mechanism 110 preferably allows the substrate 102 to be mounted or hung from a vertical or horizontal surface 108, such as, for example, a wall.

[0062] As seen in FIGS. 1 and 7, a dispensing device 104 may be used to apply the air treatment material 106 to the substrate 102. One suitable dispensing device 104 includes a container 180 with a sprayer head 182 mounted thereon. The air treatment material 106 is disposed within the container 180, and the sprayer head 182 acts to seal the air treatment material therein and to provide a dispensing mechanism able to controllably release the air treatment material 106. The sprayer head 182 generally includes a body 184 with a manually actuated trigger 186 and a nozzle 188 with an outlet orifice (not shown). Although a specific dispensing device 104 is shown in FIGS. 1 and 7, other manually or electrically actuated dispensing devices may be used.

[0063] In one embodiment, the nozzle 188 of the sprayer head 182 is designed to emit a desirable spray pattern that is correlated to the visible guide 132 on the substrate 102. In some embodiments, the sprayer head 182 may be curved or provided with other structure (not shown) having attributes to facilitate spraying. Further, it is anticipated that a conventional trigger sprayer mechanism may be used or a pre-compression pump type spray mechanism. The nozzle 188 of the sprayer head 182 may further include a swirl chamber (not shown) and/or other mechanism that acts to break up and dispense the air treatment material 106 in a desired pattern.

[0064] The sprayer head 182 emits enough air treatment material 106 to contact at least a portion of the substrate 102. In particular, in some embodiments, the sprayer head 182 emits between about 0.1 cc to about 0.5 cc per pump, and in one specific embodiment emits about 0.3 cc per pump. One suitable sprayer head 182 for use in the emanation system 100 is the Mini-

Trigger™ Curve Fine Mist Sprayer manufactured by MeadWestvaco Corporation (Richmond, VA).

[0065] By coating the substrate 102 with an appropriate air treatment material 106, air contacting the substrate will acquire a portion of the volatile material (*e.g.*, the active), and release it from the emanation system 100. The air treatment material 106 may be applied to one or more portions of the substrate 102 and/or the secondary substrate 140 (or the first emanation surface 160 and/or the second emanation surface 162 shown in FIG. 6).

[0066] In one instance, the user may dispense the air treatment material 106 onto the substrate 102. In this instance, the air treatment material 106 may run, or otherwise flow down the front surface 122 thereof, until it contacts the secondary substrate 140. After contacting the secondary substrate 140, the air treatment material 106 may be absorbed by the secondary substrate for the continuing release of the air treatment material into the atmosphere. In this way, the air treatment material 106 is not wasted due to loss from the air treatment material flowing off the substrate 102 after application thereto.

[0067] Application of the air treatment material 106 to the substrate 102 may provide an additional advantage of staged release of the air treatment material. More particularly, a quantity of air treatment material 106 may be released from the substrate 102 in the time period initially following application. Such release provides for faster efficacy of the air treatment material 106. Additionally, runoff from the air treatment material 106 is absorbed into the secondary substrate 140. The runoff quantity of air treatment material 106 is initially absorbed, but continues to be released from the secondary substrate 140 over an extended time period. In some embodiments, the positioning of the secondary substrate 140 allows for runoff to be retained and to be continually released over a longer time period, providing for both initial and continuing efficacy.

[0068] Prior to use, the substrate 102 is preferably provided to a user either by itself or via a sealed container or package (not shown). The user may attach the substrate 102 to the surface 108 using the attachment mechanism 110. At this point, the substrate 102 may not include the air treatment material 106 or may include a portion of it, as described herein elsewhere. As depicted in FIG. 7, when the emanation system 100 is to be used, a user grasps the dispensing device 104 and orients the nozzle 188 of the sprayer 162 in substantial alignment with the

substrate 102 and/or visual guide 132, if provided. Once properly oriented, the individual applies inward force to the trigger 186 to manually dispense the air treatment material 106 therefrom. The air treatment material 106 contacts the substrate 102 and coats at least a portion thereof. After the air treatment material 106 is applied to the substrate 102, at least a portion of the air treatment material may travel downwardly over the front surface 122 of the substrate until contacting the secondary substrate 140.

[0069] In one particular embodiment, the dispensing device 104 is positioned a distance of not greater than about 60 cm away from the substrate 102. Once properly oriented, the individual manually dispenses the air treatment material 106 therefrom by pressing the manually actuated trigger 186. In one specific embodiment, the user applies the air treatment material 106 onto the substrate 102 by pressing the trigger 186 about ten times to impart at least about 5 mg to about 6 mg of active ingredient onto the substrate 102.

[0070] In one embodiment, the air treatment material 106 is designed to be applied to the substrate 102 over a pre-defined time period. In particular, the air treatment material 106 is designed to be applied to the substrate 102 about every three days. In one embodiment, the time period is about one day. In another embodiment, the time period is between about 1 day and about 7 days. In other embodiments, the air treatment material 106 may be applied by the user as desired.

[0071] In another embodiment, the substrate 102 is provided to an individual's home for use by another individual. The second individual arrives at the home of the user with the dispensing device 104 and dispenses the air treatment material 106 onto the substrate 102. The second individual then leaves with the dispensing device 104. The user may then have the substrate 102 recharged, as needed, using a subscription service to have their substrates coated with the air treatment material 106 by the second individual. For example, the second individual may re-coat the substrate 102 every three days, weekly, bi-weekly, bi-monthly, monthly, or over other set time periods. In a further instance, the second individual may deliver supplies or other items in conjunction with the application of the air treatment material 106. In a different embodiment, individuals may take their substrates 102 to a central location (e.g., a church, a community center, etc.) to have the substrate coated with the air treatment material 106.

[0072] Any of the embodiments described herein may be modified to include any of the structures or methodologies disclosed in connection with different embodiments. Further, the present disclosure is not limited to the substrate, the attachment mechanism, and/or the dispensing device of the type specifically shown. Still further, the support for any component of any of the embodiments disclosed herein may be chosen or modified to work with various types of substrates consistent with the disclosure herein.

#### INDUSTRIAL APPLICABILITY

[0073] The system described herein advantageously includes a substrate having a first active release rate and a secondary substrate to catch runoff air treatment material applied to the substrate. The secondary substrate provides continuing efficacy by emitting the active at a second active release rate.

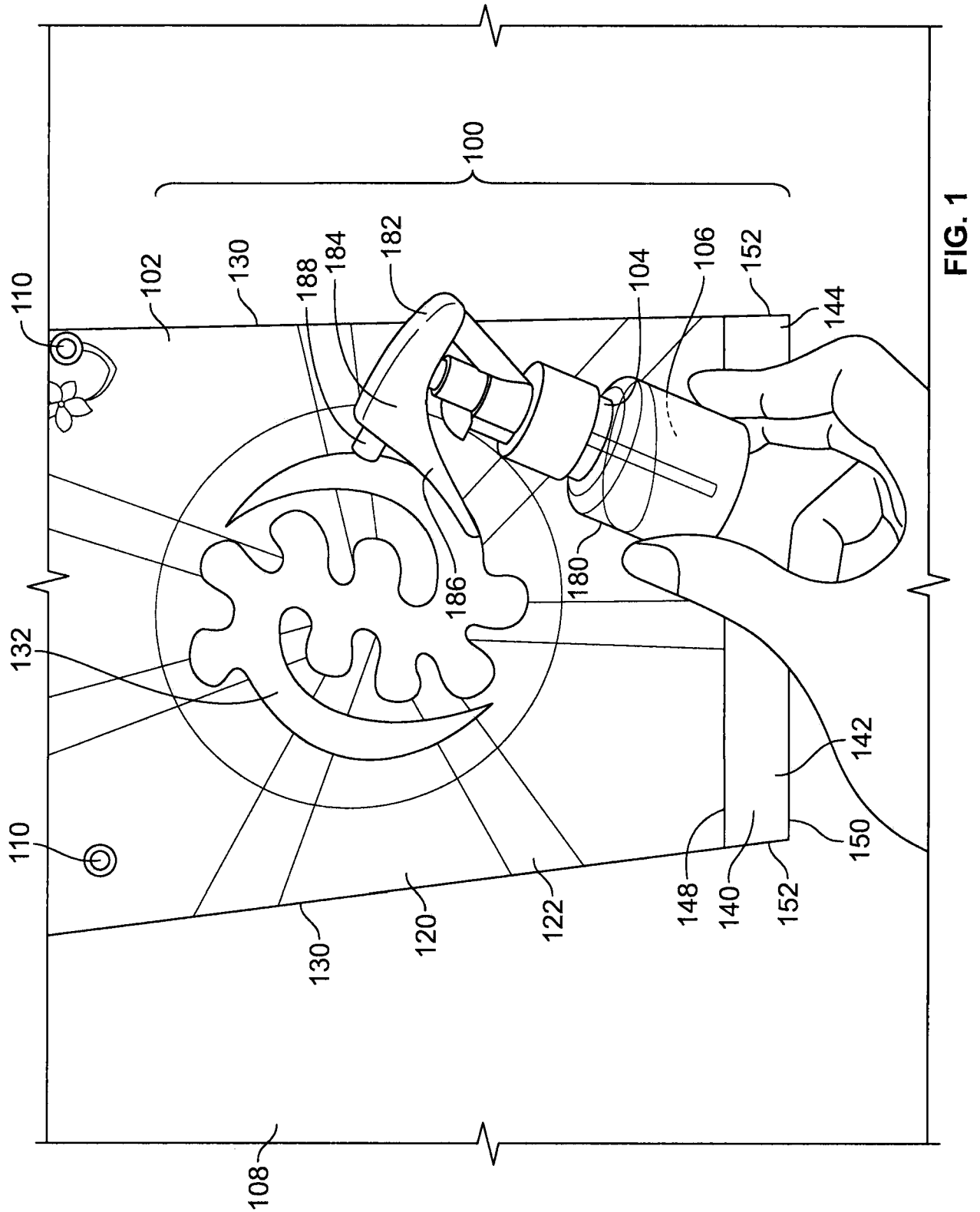
[0074] Numerous modifications to the present invention will be apparent to those skilled in the art in view of the foregoing description. Accordingly, this description is to be construed as illustrative only and is presented for the purpose of enabling those skilled in the art to make and use the invention and to teach the best mode of carrying out same. The exclusive rights to all modifications which come within the scope of the appended claims are reserved.

We claim:

1. An emanation system, comprising:  
a substrate;  
a secondary substrate; and  
an air treatment material,  
wherein the secondary substrate is adapted to be wetted with runoff from the air treatment material applied to the substrate, and  
wherein when applied, the air treatment material emanates from the substrate at a first release rate and from the secondary substrate at a second release rate.
2. The emanation system of claim 1, wherein the substrate comprises a substantially rectangular body and the secondary substrate is disposed adjacent a lower edge of the body.
3. The emanation system of claims 1 or 2, wherein the secondary substrate is in communication with the substrate such that a rear surface of the secondary substrate is substantially flush with a front surface of the substrate.
4. The emanation system according to any of the preceding claims, wherein the substrate comprises a polymer and the secondary substrate comprises a cellulosic material.
5. The emanation system according to any of the preceding claims, wherein the substrate and the secondary substrate define a substantially smooth surface.
6. The emanation system according to any of the preceding claims, wherein the substrate comprises a visual guide.

7. An air treatment material, comprising:  
a fragrance having a first efficacy time period; and  
an active ingredient having a second efficacy time period,  
wherein the air treatment material is provided as a microemulsion, and wherein the first and the second efficacy time periods are substantially the same.
8. The air treatment material of claim 7, wherein the air treatment material is applied to a polymer substrate and the active ingredient is released therefrom at a rate of at least about 0.2 mg/hr.
9. The air treatment material of claims 7 or 8, wherein the fragrance acts as a use-up indicator to provide an olfactory cue that the second efficacy time period has ended.
10. The air treatment material of claims 7, 8 or 9, wherein the active ingredient is a pyrethroid.
11. The air treatment material according to any of claims 7 to 10 further comprising a surfactant blend.
12. The air treatment material according to any of claims 7 to 11, wherein the air treatment material comprises about 4% fragrance and about 0.4% active ingredient.
13. The air treatment material according to claim 11, wherein the air treatment material comprises about 90% of deionized water, about 3 to about 6% of the surfactant blend, about 2 to about 6% of the fragrance, and about 0.2 to about 1% of the active ingredient.

14. A method of operating an emanation system, comprising the steps of:  
providing a dispensing device containing an air treatment material and a substrate;  
aligning a nozzle of the dispensing device with the substrate; and  
actuating the dispensing device to spray an amount of the air treatment material onto at least a portion of the substrate.
15. The method of claim 14, wherein a secondary substrate is designed to catch an amount of run off from the amount of air treatment material sprayed onto the substrate.
16. The method of claim 14 or 15, wherein the air treatment material emanates from the substrate at a first release rate, and emanates from the secondary substrate at a second release rate.
17. The method according to any of claims 14 to 16 further including the step of filling the dispensing device.
18. The method according to any of claims 14 to 17, wherein the nozzle is aligned with a visual guide on the substrate.
19. The method according to any of claims 14 to 18, wherein the amount of air treatment material sprayed is about 3 grams.
20. The method according to any of claims 14 to 19, wherein the amount of the air treatment material sprayed onto the substrate provides mosquito repellency and a pleasant fragrance to the room for a time period of about three days.



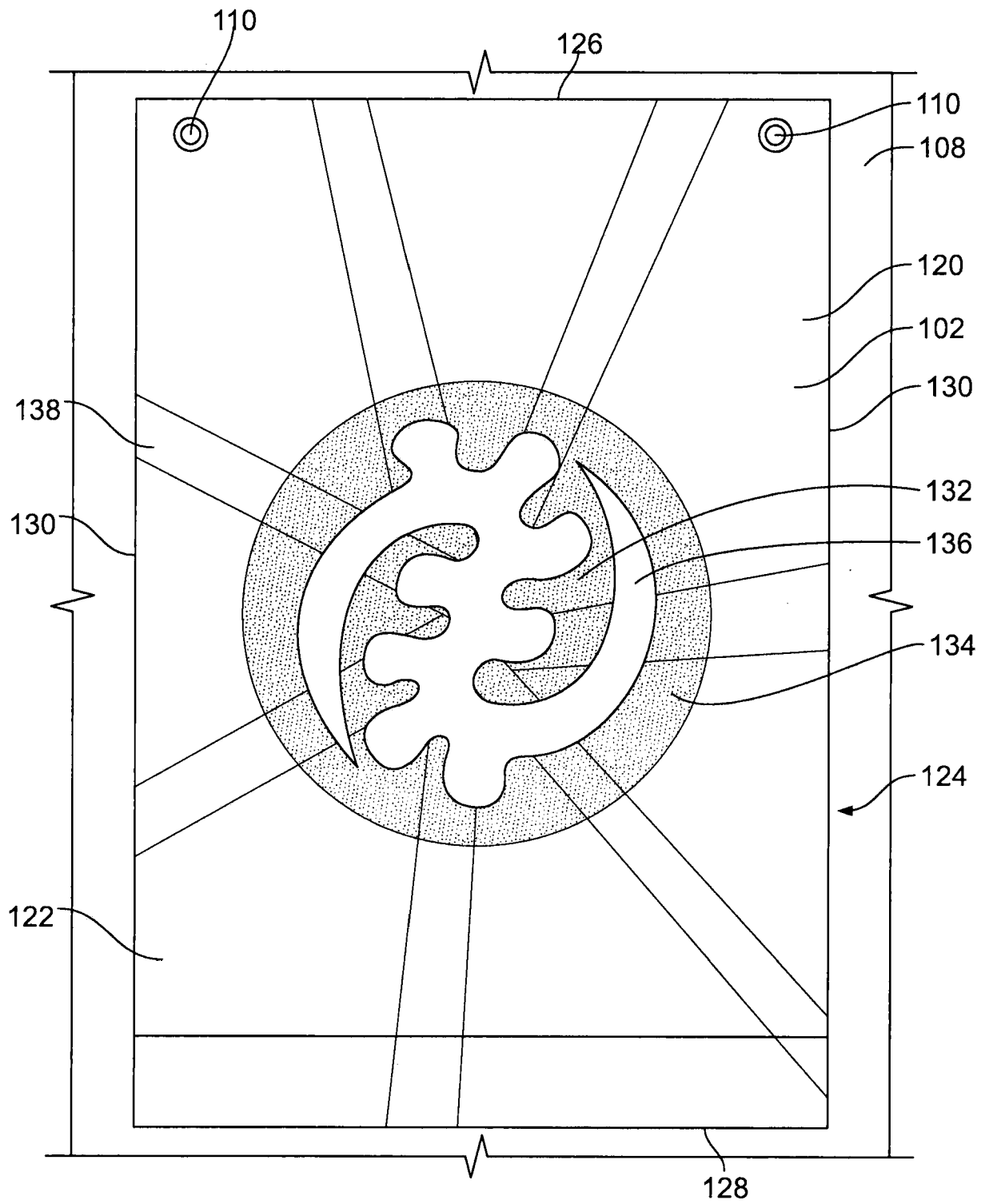
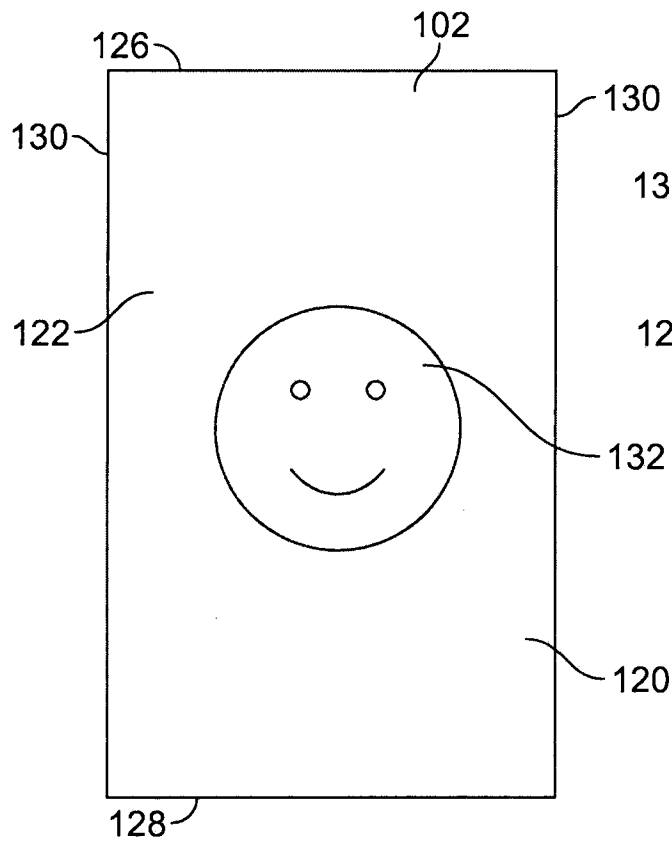
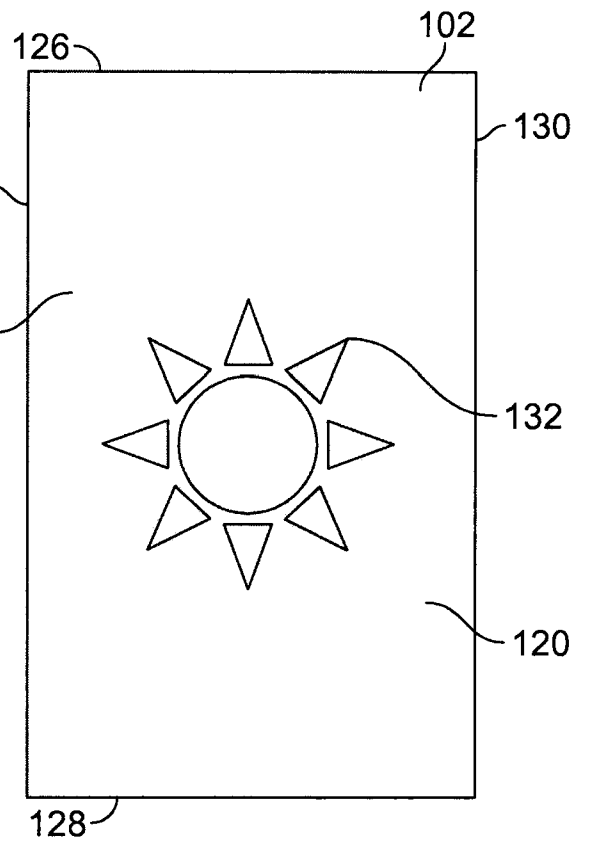


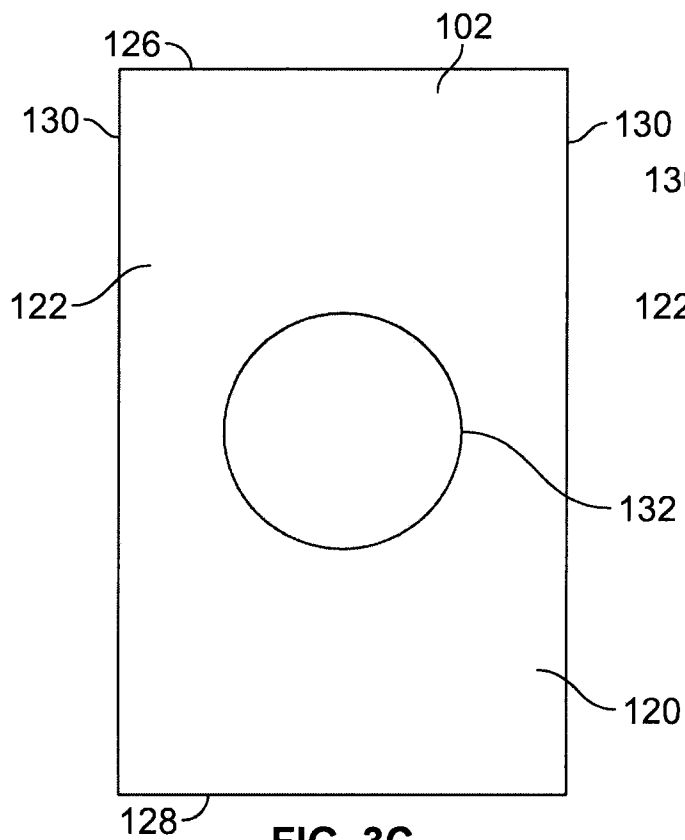
FIG. 2



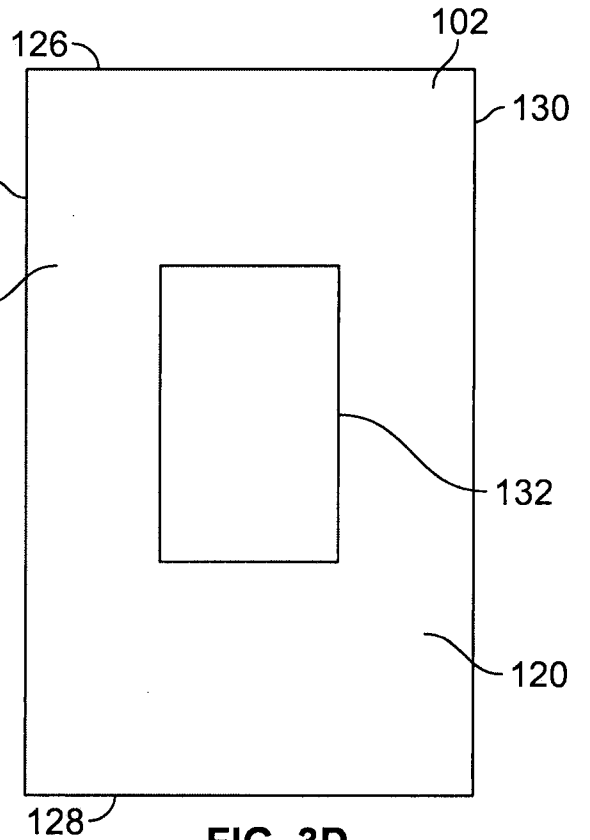
**FIG. 3A**



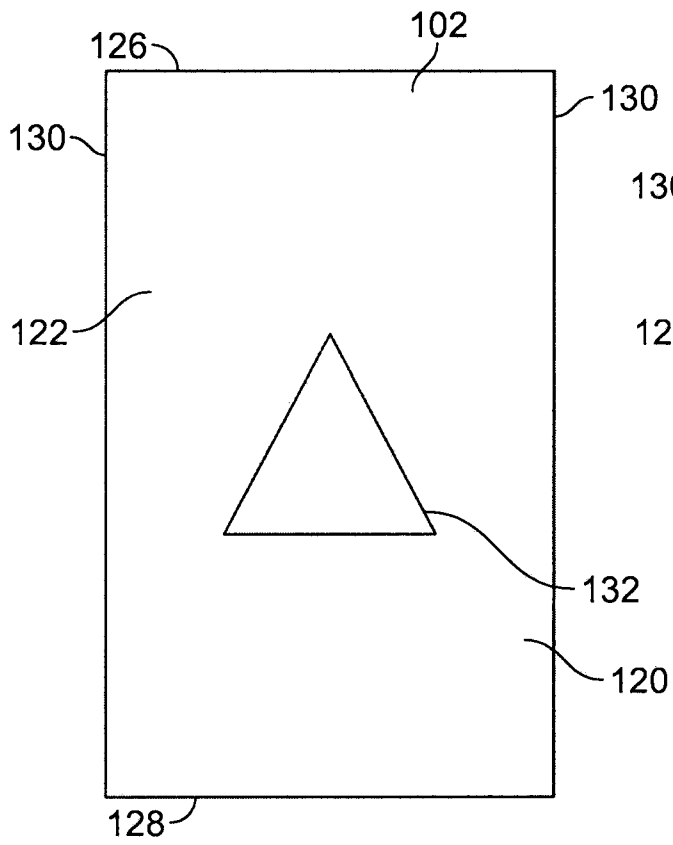
**FIG. 3B**



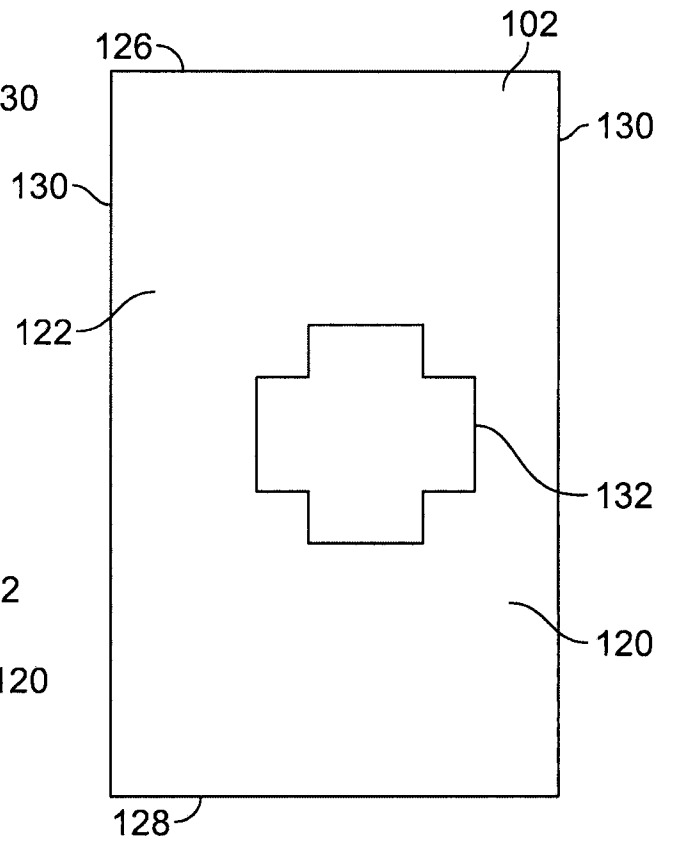
**FIG. 3C**



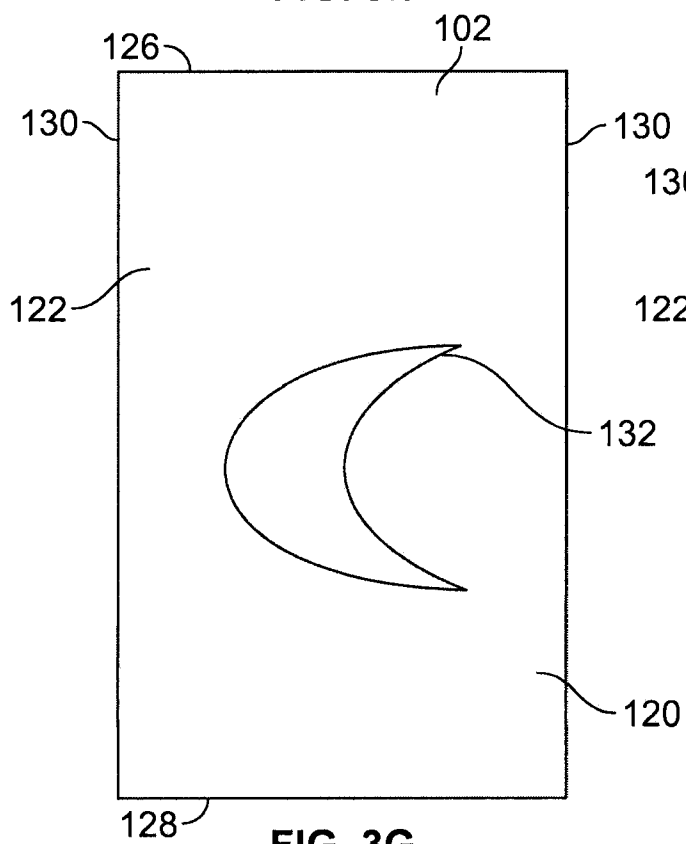
**FIG. 3D**



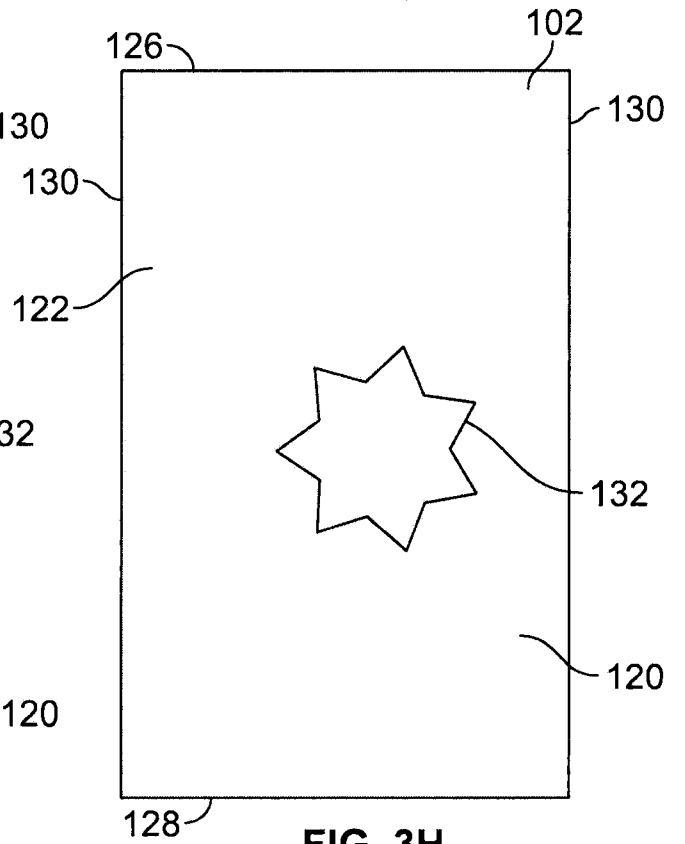
**FIG. 3E**



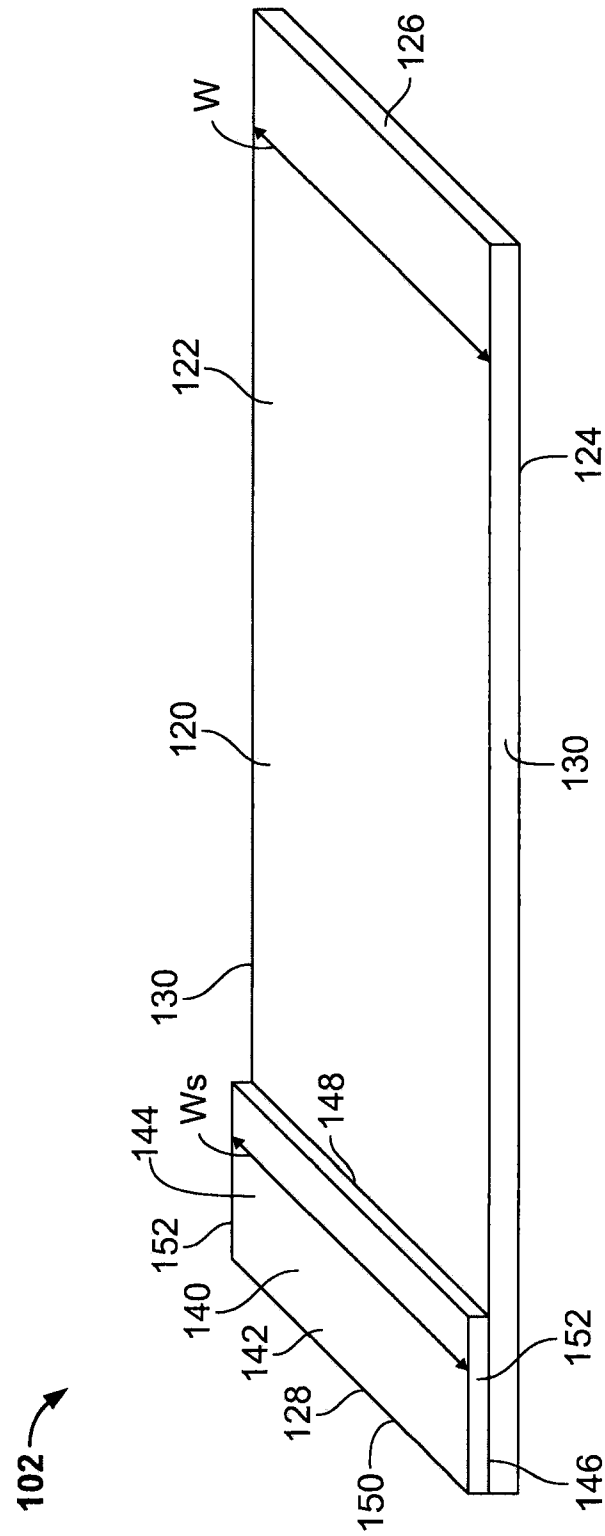
**FIG. 3F**



**FIG. 3G**



**FIG. 3H**



**FIG. 4**

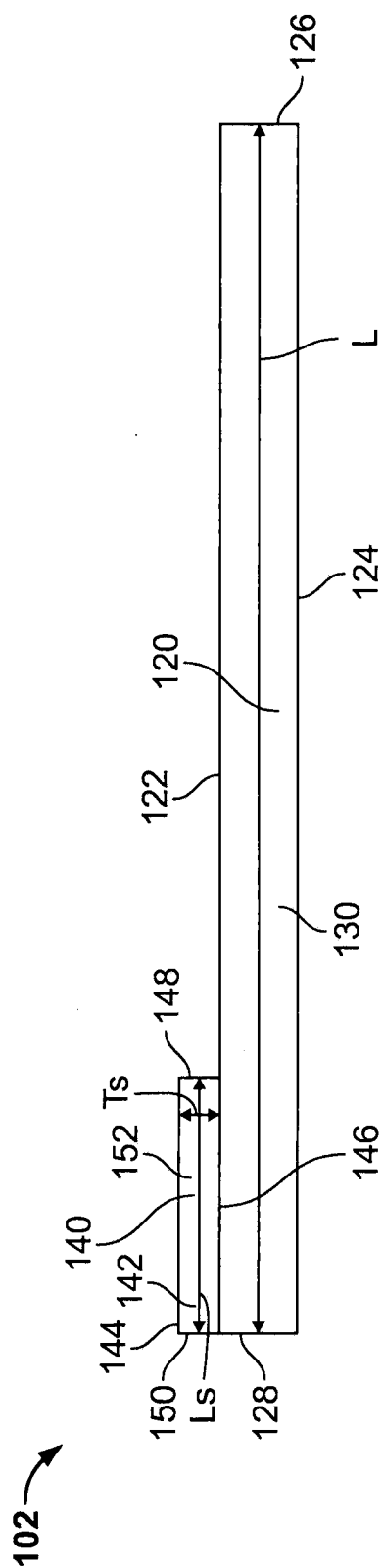


FIG. 5

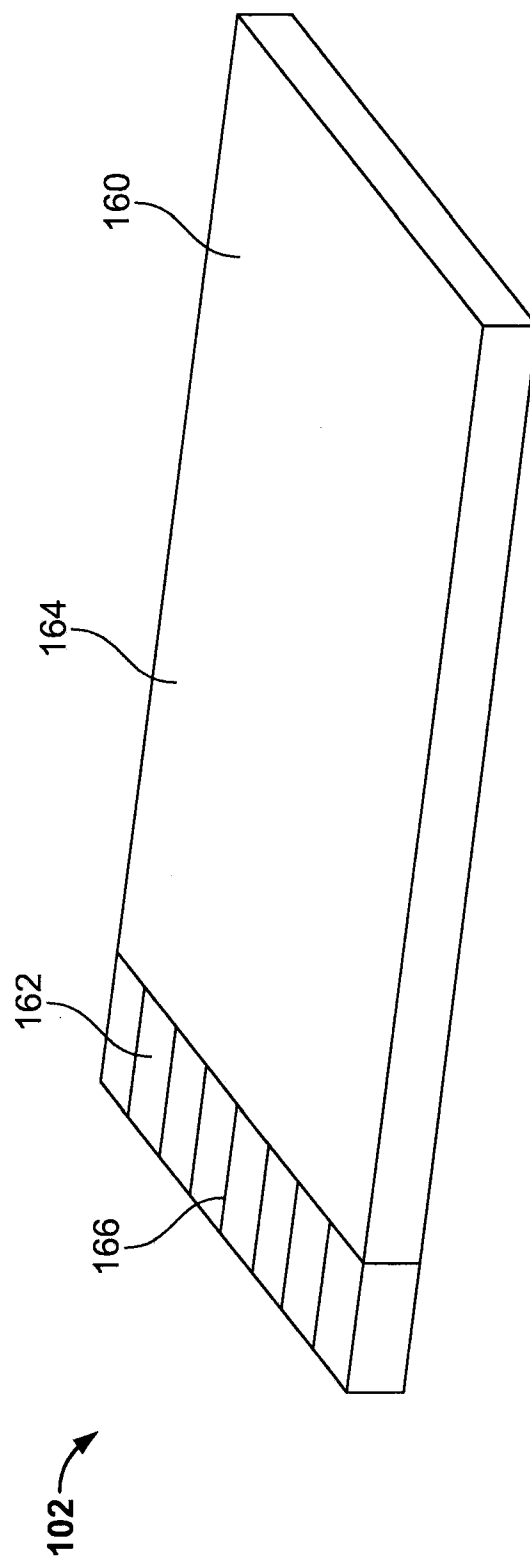


FIG. 6

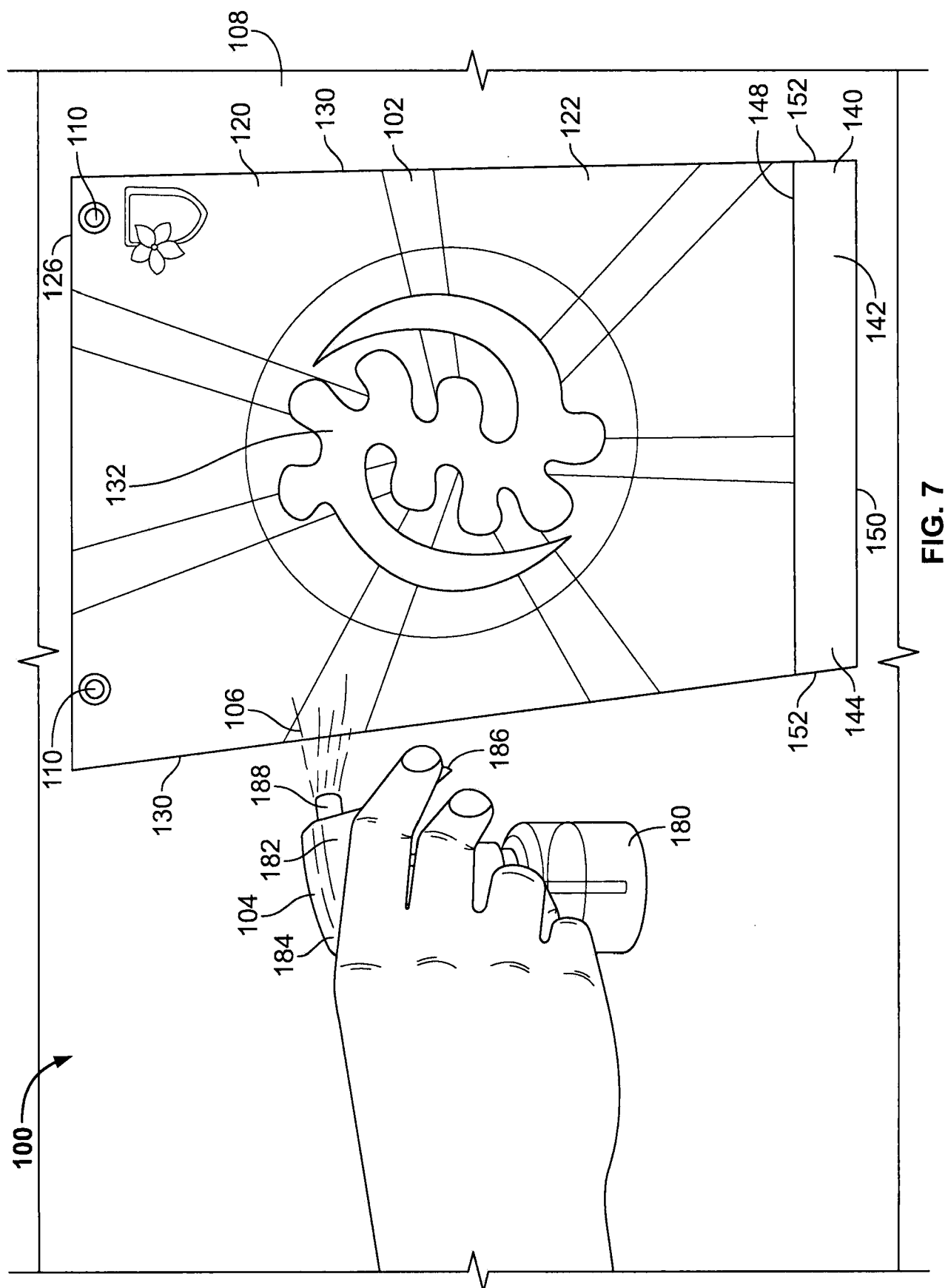


FIG. 7

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

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

1. ☐ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
  
2. ☐ Claims Nos.:  
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
  
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

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

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

see additional sheet

1. ☒ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
  
2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
  
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
  
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

**Remark on Protest**

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☒ No protest accompanied the payment of additional search fees.

## INTERNATIONAL SEARCH REPORT

International application No  
PCT/US2014/044578

A. CLASSIFICATION OF SUBJECT MATTER  
INV. A61L9/04 A01M1/20 A61L9/12  
ADD.

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 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 practicable, search terms used)

EPO-Internal, WPI Data

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Further documents are listed in the continuation of Box C.



See patent family annex.

\* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

10 November 2014

Date of mailing of the international search report

25/11/2014

Name and mailing address of the ISA/

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Authorized officer

Maremonti, Michele

## INTERNATIONAL SEARCH REPORT

International application No  
PCT/US2014/044578

| C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT |                                                                                                                                                                                        |                       |
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Information on patent family members

International application No

PCT/US2014/044578

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Information on patent family members

International application No

PCT/US2014/044578

| Patent document<br>cited in search report | Publication<br>date | Patent family<br>member(s) | Publication<br>date |
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**FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210**

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-6

Emanation system comprising a substrate and a secondary substrate

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2. claims: 7-13

Air treatment material comprising a fragrance and an active ingredient

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3. claims: 14-20

Method of operating an emanation system

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