

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
2 April 2009 (02.04.2009)

PCT

(10) International Publication Number
WO 2009/042017 A1

- (51) International Patent Classification:
B65D 81/28 (2006.01) *B65D 81/24* (2006.01)
- (21) International Application Number:
PCT/US2008/009552
- (22) International Filing Date: 8 August 2008 (08.08.2008)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
60/955,299 10 August 2007 (10.08.2007) US
- (71) Applicant (for all designated States except US): **THE BOARD OF TRUSTEES OPERATING** [US/US]; Michigan State University, East Lansing, MI 48824 (US).

East Grand River Avenue, Apt. No. 27, East Lansing, MI 48823 (US).

- (74) Agents: **SMIRMAN, Preston, H.** et al.; Howard & Howard Attorneys, P.C., 39400 Woodward Avenue, Suite 101, Bloomfield Hills, MI 48304-5151 (US).
- (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, BR, BW, BY, BZ, CA, CH, 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, IS, JP, KE, KG, KM, 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, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

- (72) Inventors; and
- (75) Inventors/Applicants (for US only): **RUBINO, Maria** [—/US]; 140 Packaging Building, East Lansing, MI 48824-1223 (US). **SIDDIQ, Muhammad** [—/US]; 111 G. M. Trout Food Science Building, East Lansing, MI 48824 (US). **AURAS, Rafael** [AR/US]; 142 Packaging Building, East Lansing, MI 48824-1223 (US). **ANNOUS, Bassam, A.** [—/US]; 600 East Mermaid Lane, Wyndmoor, PA 19038 (US). **NETRAMAI, Siriyupa** [TH/US]; 1390

- (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, HR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, NO, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

[Continued on next page]

(54) Title: PACKAGE SYSTEM WITH DISTRIBUTION GAS INSERT

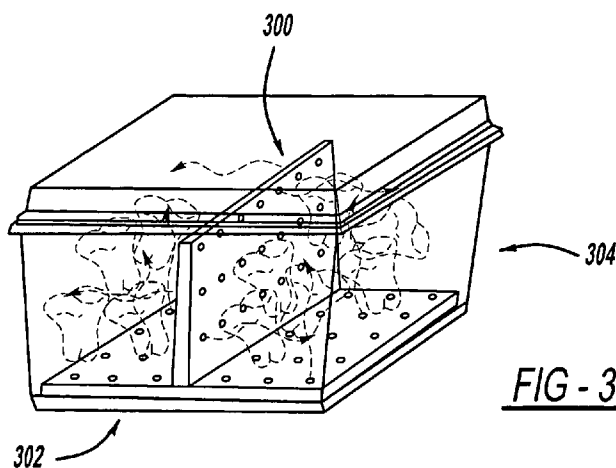


FIG - 3

(57) Abstract: Packaging systems (304) are provided for preventing post harvest microbial, including but not limited to fungal, diseases of food systems, such as but not limited to fresh produce, such as but not limited to berries (e.g., strawberries, blueberries, and/or the like). For example, various anti-microbial (e.g., anti-fungal) compounds (including multi-component compositions that can be selectively activated) can be incorporated into a container or sachet (26, 1 12) that in turn can be incorporated into a package insert (10, 100, 202, 300). The package insert (10, 100, 202, 300) can include various surfaces that are provided with a plurality of holes (22, 108, 204) formed therein for allowing the anti-microbial (e.g., anti-fungal) compounds to diffuse through the package insert (10, 110, 202, 300) and out through the plurality of holes (22, 108, 204). The package insert (10, 110, 202, 300) can be placed into a produce container (304), wherein the produce can then be introduced into the produce container (304) such that the produce is in proximity to the plurality of holes (22, 108, 204).

WO 2009/042017 A1



Published:

— *with international search report*

PACKAGE SYSTEM WITH DISTRIBUTION GAS INSERT

CROSS-REFERENCE TO RELATED APPLICATION

[0001] The instant application claims priority to U.S. Provisional Patent Application Serial Number 60/955,299, filed August 10, 2007, the entire specification of which is expressly incorporated herein by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0002] The present invention generally relates to systems for preventing post harvest diseases of produce and more specifically to packaging systems incorporating anti-microbial (e.g., anti-fungal) compounds for preventing post harvest microbial (e.g., fungal) diseases of fresh produce, such as but not limited to berries (e.g., strawberries, blueberries and/or the like).

2. Description of the Related Art

[0003] Fresh produce, such as but not limited to berries (e.g., strawberries, blueberries, and/or the like), are perishable items with a relatively short lifespan. High levels of sugars and other nutrients, along with an ideal water activity and low pH, provide a growth medium for various microorganisms, including various fungi. Post harvest losses during fresh produce storage and marketing, including but not limited to berry storage and marketing, are mainly caused by fungi such as *Colletotrichum acutatum*, *Alternaria alternata* and *Botrytis cinerea*. Other species of fungi that produce various post harvest diseases in fresh produce include

Gliocephalotrichum microchlamydosporum, *Colletotrichum gloeosporioides*, *Botryodiplodia theobromae*, and *Rhizopus stolonifer*.

[0004] Additionally, *Penicillium roqueforti*, *Penicillium expansum*, and *Aspergillus niger* are also common contaminants of various food systems, including fresh produce. These fungi typically grow at moisture content of 15 to 20% in equilibrium with a relative humidity of 65 to 90% and temperatures up to 55 °C. They are harsher when temperatures surpass 25°C and relative humidity goes above 85%.

[0005] Control of these organisms is very difficult, even with preharvest anti-microbial application. Therefore, it would be advantageous to provide new and improved systems for reducing or preventing microbial growth, such as but not limited to fungal growth, in food systems, such as but not limited to fresh produce, such as but not limited to berries (e.g., strawberries, blueberries and/or the like), which overcome at least one of the aforementioned problems.

SUMMARY OF THE INVENTION

[0006] In accordance with the general teachings of the present invention, a packaging system is provided for the controlled release of various anti-microbial compounds, including but not limited to anti-fungal compounds, by incorporating them into a package insert. The anti-fungal compounds can include various compositions and/or mixtures of compositions. By way of a non-limiting example, the anti-fungal compounds can include two or more components that can be selectively mixed or combined to produce a gas or vapor that has anti-fungal properties. The anti-fungal compounds can be incorporated into a container or sachet (e.g., porous or discontinuous (e.g., with holes, slits, and/or the like)) that is in turn

incorporated into a portion of the package insert (e.g., on or in a bottom surface thereof). The package insert can include various surfaces (e.g., chimneys, spikes, pillars, walls, corrugations, and/or the like) that include a plurality of holes formed therein. The package insert can be placed in the produce package, with the fresh produce introduced therein such that at least some of the fresh produce is in proximity to the plurality of holes. As the anti-fungal compounds begin, or continue, to diffuse or otherwise be emitted from the plurality of holes, they protect the packaged fresh produce from attack by fungal organisms.

[0007] In accordance with one embodiment of the present invention, a produce packaging system is provided, comprising: (1) a package defining an internal space; (2) an insert operable to be received within the internal space of the package, wherein the insert includes an outer surface and an inner surface, wherein the insert is provided with a plurality of apertures formed thereon; and (3) at least one anti-microbial compound disposed within or on the inner surface of the insert, wherein the at least one anti-microbial compound is operable to diffuse through the plurality of apertures into the internal space of the package.

[0008] In accordance with another embodiment of the present invention, a produce packaging system is provided, comprising: (1) a package defining an internal space, the internal space being operable to receive an amount of produce; (2) an insert operable to be received within the internal space of the package, wherein the insert includes an outer surface and an inner surface, wherein the produce is operable to be placed onto the outer surface of the insert, wherein the insert is provided with a plurality of apertures formed thereon; and (3) at least one anti-microbial compound disposed within or on the inner surface of the insert, wherein the at least one anti-

microbial compound is operable to diffuse through the plurality of apertures into the internal space of the package and contact the produce.

[0009] In accordance with still another embodiment of the present invention, an insert system for a produce packaging system is provided, the produce packaging system including a package defining an internal space, comprising: (1) an insert operable to be received within the internal space of the package, wherein the insert includes a base portion and an upstanding portion extending upwardly away from the base portion, wherein the insert includes an outer surface and an inner surface, wherein the insert is provided with a plurality of apertures formed thereon; and (2) at least one anti-microbial compound disposed within or on the inner surface of the insert, wherein the at least one anti-microbial compound is operable to diffuse through the plurality of apertures into the internal space of the package.

[0010] Further areas of applicability of the present invention will become apparent from the detailed description provided hereinafter. It should be understood that the detailed description and specific examples, while indicating the preferred embodiment of the invention, are intended for purpose of illustration only and are not intended to limit the scope of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] Other advantages of the present invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

[0012] Figure 1a is a perspective view of a package insert, in accordance with a first embodiment of the present invention;

[0013] Figure 1b is a perspective view of an alternative package insert, in accordance with a second embodiment of the present invention;

[0014] Figure 2a is a bottom perspective view of a package insert showing a sustained release device, in accordance with a third embodiment of the present invention;

[0015] Figure 2b is a perspective view of the package insert showing a sustained release device depicted in Fig. 2a, wherein gas, vapor, or volatiles of an anti-fungal compound are released, in accordance with a fourth embodiment of the present invention; and

[0016] Figure 3 is a perspective view of a package system having a package insert received therein, wherein a sustained release device is producing gas, vapor, or volatiles of an anti-fungal compound in proximity to fresh produce, in accordance with a fifth embodiment of the present invention.

[0017] The same reference numerals refer to the same parts throughout the various Figures.

DETAILED DESCRIPTION OF THE INVENTION

[0018] The following description of the preferred embodiment(s) is merely exemplary in nature and is in no way intended to limit the invention, or uses.

[0019] In accordance with the general teachings of the present invention, a package insert (i.e., a distribution gas insert) is provided for use in conjunction with packaging systems, especially those used for containing fresh produce, such as but not limited to berries (e.g., strawberries, blueberries and/or the like). However, it should be appreciated that the present invention can be practiced in connection with any type

of packaged fresh produce, or other foodstuff, that is susceptible to microbial growth, including but not limited to fungal growth.

[0020] In accordance with one embodiment, a package insert is generally shown at 10 in Fig. 1a. In this embodiment, the package insert 10 includes a base portion 12 and an upstanding wall or bridge portion 14. The upstanding wall portion 14 includes first and second major faces 16, 18, and at least one side face 20. Formed on the respective base and floor portions are a plurality of holes 22 that are operable to communicate with an interior portion 24 of the package insert 10. By way of a non-limiting example, a container or sachet 26 can be disposed and/or received within the interior portion 24, the purpose of which will be explained herein. Alternatively, the container or sachet 26 can be placed on the bottom surface of the base portion 12.

[0021] In accordance with another embodiment, an alternative package insert is generally shown at 100 in Fig. 1b. In this embodiment, the package insert 100 includes a base portion 102 and at least one upstanding chimney, pipe, cylinder or tube portion 104. The chimney portion 104 includes a rounded surface 106 (although any number of configurations would be suitable). Formed on the respective base and chimney portions are a plurality of holes 108 that are operable to communicate with an interior portion 110 of the package insert 100. By way of a non-limiting example, a container or sachet 112 can be disposed and/or received within the interior portion 110, the purpose of which will be explained herein.

[0022] The design of the package system that will receive the package insert of the present invention will ensure that a proper distribution of gases, vapors, and/or volatiles has been developed (e.g., by using software such as Solidworks® (parametric software for 3D modeling) and Fluent® (computational fluid dynamics)).

Ultimately, the packaging system of the present invention will maximize the flow of gas or volatiles inside the package. An intended objective of the present invention is to expose the total overall surface of the fresh produce, especially "hard to reach" areas that may otherwise not be sufficiently exposed to the released gas, vapor, or volatiles.

[0023] In accordance with one aspect of the present invention, the container or sachet is intended to house various anti-microbial compounds, including but not limited to anti-fungal compounds, and/or mixtures thereof. By way of a non-limiting example, these compounds can include, without limitation, various naturally-occurring volatile compounds such as but not limited to hexanal, acetaldehyde, and 2E-hexanal. These volatiles can be incorporated (e.g., microencapsulated) into various carriers (including but not limited to biodegradable carriers), such as but not limited to cyclodextrins, to prevent premature release and so to allow slow diffusion over a long period of time. These microencapsulated volatiles can be incorporated into the container or sachet, whereupon they can diffuse out of the container or sachet, up through the holes formed in the package insert, and throughout the rest of the volume of the produce container, thus aiding in the preservation of the fresh produce from attack by fungal organisms.

[0024] In addition to the compounds previously described, the following volatile compounds, including those having anti-microbial and/or anti-fungal properties, can also be used in the practice of the present invention, such as but not limited to cinnamic acid, 1-methylcyclopropene, isoprene, terpenes, as well as any other volatile organic compounds (VOCs) which could be later released. By way of a non-limiting example, additional possible compounds can include 2-nonanone, cis-3-

hexen-1-ol, methyl jasmonate, benzaldehyde, propanal, butanal, ethanol, acetic acid, allyl-isothiocyanate (AITC), thymol, eugenol, citral, vanillin, trans-cinnamaldehyde, cinnamic acid, salicylic acid, furfural, β -ionone, 1-nonanol, nonanal, 3-hexanone, 2-hexen-1-ol, 1-hexanol, and/or the like.

[0025] In accordance with another aspect of the present invention, the anti-microbial and/or anti-fungal compounds can comprise ClO_2 being applied (e.g., as a gas or vapor) to the fresh produce. By way of a non-limiting example, this system will slowly release the ClO_2 once activated. This type of product is readily commercially available from ICA TriNova (Forest Park, Georgia), a supplier of ClO_2 sustained release sachet technology.

[0026] Briefly, the ICA TriNova Z-Series ClO_2 technology involves generating the gas by mixing two dry solids, i.e., a ClO_2 precursor and an activator. There is a wide range of ClO_2 release rates and patterns achieved through the choice and pretreatment of granular solid support materials, post-treatment of impregnates, and the ratio of precursor to activator solids. By combination of these variables, products can be designed for rapid release over minutes (or hours), to slow steady release over weeks.

[0027] By way of a non-limiting example, the number and dimensions of the package inserts will be determined as a function of the internal volume of the package system. The gas, vapor, or volatiles released from the container or sachet will be carried through the internal volume of the package insert, slowly permeate throughout the material, escape through the holes (e.g., mini-pores) and spread inside of the package system and throughout the fresh produce. Furthermore, the distribution

process (e.g., interstate transportation) and temperature can influence the flow of the gas throughout the package system.

[0028] By way of a non-limiting example, the ICA TriNova Z-Series ClO₂ technology involves generating chlorine dioxide by mixing two dry solids, e.g., a ClO₂ precursor and an activator. For example, the technology allows for using either sodium chlorite or sodium chlorate as the ClO₂ precursor and these materials can be used in either crystalline or impregnated forms. The activator is a granular porous solid impregnated with an acid or with an acid precursor. Chlorine dioxide is produced by a disproportionation reaction as the two dry solids are mixed: $4H^+ + 5NaClO_2 \rightarrow 4ClO_2 + NaCl + 4Na^+ + 2H_2O$. The efficiency of this reaction is optimized by maintaining localized pH between 2-4 at the particle-to-particle interface.

[0029] The containers or sachets can generate chlorine dioxide either in a gas space or in solution by submerging them in water. For solution applications, the sachets are constructed of a porous material that is both water impermeable and gas permeable. For some applications, such as surface decontamination, a single media dry powder product is more appropriate than a sachet. The dry powder is a stabilized form of impregnate that is activated by environmental conditions or by contact with the surface being treated.

[0030] The containers or sachets can be designed to produce at levels of about 0.1 mg to about 50g of chlorine dioxide.

[0031] Referring to Fig. 2a, there is shown a device 200 to sustain release gas, vapor or volatiles placed at the bottom of the package insert 202 (e.g., in this case a sachet) and how the package insert 202 directs and distributes the gas, vapors, or volatiles. The amount of gas permeating through the package insert 202 will be

regulated by the amount and size of the holes 204 (e.g., mini-pores) (e.g., ranging between 1 to 0.05 mm in diameter), as well as the permeability of the material comprising the package insert 202 (e.g., a polymer) toward the specific gas, vapor, or volatile. Referring specifically to Fig. 2b, the gas, vapor, or volatiles (e.g., see the curvy and broken arrowheaded lines) of an anti-fungal compound are shown as being released from the package insert 202 in a generalized pattern, although the pattern may vary with different package insert designs.

[0032] Referring to Fig. 3, there is shown a package insert 300 with the sustained release device 302 (e.g., container or sachet) placed inside a package system 304, in this case a strawberry container (although any container will suffice), wherein the produce is shown in phantom. The gas, vapor, or volatiles (e.g., see the curvy and broken arrowheaded lines) of an anti-fungal compound are shown as being released within the package system 304 and at least partially enveloping the fresh produce therein. As previously noted, the size and number of package inserts 300 within any particular package system 304 will depend on the capacity/internal volume of the package system 304 and the desired dose of gas, vapor or volatiles.

[0033] While the invention has been described with reference to an exemplary embodiment, it will be understood by those skilled in the art that various changes can be made and equivalents can be substituted for elements thereof without departing from the scope of the invention. In addition, many modifications can be made to adapt a particular situation or material to the teachings of the invention without departing from the essential scope thereof. Therefore, it is intended that the invention not be limited to the particular embodiment disclosed as the best mode contemplated

for carrying out this invention, but that the invention will include all embodiments falling within the scope of the appended claims.

CLAIMS

What is claimed is:

1. A produce packaging system, comprising:
a package defining an internal space;
an insert operable to be received within the internal space of the package;
wherein the insert includes an outer surface and an inner surface;
wherein the insert is provided with a plurality of apertures formed thereon; and
at least one anti-microbial compound disposed within or on the inner surface
of the insert;
wherein the at least one anti-microbial compound is operable to diffuse
through the plurality of apertures into the internal space of the package.
2. The invention according to claim 1, wherein the internal space is operable to
receive an amount of produce.
3. The invention according to claim 2, wherein the produce is operable to be
placed onto the outer surface of the insert.
4. The invention according to claim 3, wherein the at least one anti-microbial
compound is operable to contact the produce.
5. The invention according to claim 1, wherein the insert includes a base portion
and an upstanding wall portion.

6. The invention according to claim 1, wherein the insert includes a base portion and at least one upstanding cylinder portion.
7. The invention according to claim 1, wherein the at least one anti-microbial compound is disposed within a container or sachet.
8. The invention according to claim 1, wherein the at least one anti-microbial compound is encapsulated.
9. The invention according to claim 1, wherein the at least one anti-microbial compound is comprised of a material selected from the group consisting of hexanal, acetaldehyde, and 2E-hexanal.
10. The invention according to claim 1, wherein the at least one anti-microbial compound is comprised of a material selected from the group consisting of cinnamic acid, 1-methylcyclopropene, isoprene, terpenes, 2-nonanone, cis-3-hexen-1-ol, methyl jasmonate, benzaldehyde, propanal, butanal, ethanol, acetic acid, allyl-isothiocyanate (AITC), thymol, eugenol, citral, vanillin, trans-cinnamaldehyde, cinnamic acid, salicylic acid, furfural, β -ionone, 1-nonanol, nonanal, 3-hexanone, 2-hexen-1-ol, 1-hexanol, and combinations thereof.
11. The invention according to claim 1, wherein the at least one anti-microbial compound is comprised of ClO₂.

12. The invention according to claim 1, wherein the at least one anti-microbial compound is released over a sustained period of time.
13. The invention according to claim 1, wherein the produce is a berry.
14. A produce packaging system, comprising:
a package defining an internal space, the internal space being operable to receive an amount of produce;
an insert operable to be received within the internal space of the package;
wherein the insert includes an outer surface and an inner surface;
wherein the produce is operable to be placed onto the outer surface of the insert;
wherein the insert is provided with a plurality of apertures formed thereon; and
at least one anti-microbial compound disposed within or on the inner surface of the insert;
wherein the at least one anti-microbial compound is operable to diffuse through the plurality of apertures into the internal space of the package and contact the produce.
15. The invention according to claim 14, wherein the insert includes a base portion and an upstanding wall portion.
16. The invention according to claim 14, wherein the insert includes a base portion and at least one upstanding cylinder portion.

17. The invention according to claim 14, wherein the at least one anti-microbial compound is disposed within a container or sachet.

18. The invention according to claim 14, wherein the at least one anti-microbial compound is encapsulated.

19. The invention according to claim 14, wherein the at least one anti-microbial compound is comprised of a material selected from the group consisting of hexanal, acetaldehyde, and 2E-hexanal.

20. The invention according to claim 14, wherein the at least one anti-microbial compound is comprised of a material selected from the group consisting of cinnamic acid, 1-methylcyclopropene, isoprene, terpenes, 2-nonanone, cis-3-hexen-1-ol, methyl jasmonate, benzaldehyde, propanal, butanal, ethanol, acetic acid, allyl-isothiocyanate (AITC), thymol, eugenol, citral, vanillin, trans-cinnamaldehyde, cinnamic acid, salicylic acid, furfural, β -ionone, 1-nonanol, nonanal, 3-hexanone, 2-hexen-1-ol, 1-hexanol, and combinations thereof.

21. The invention according to claim 14, wherein the at least one anti-microbial compound is comprised of ClO_2 .

22. The invention according to claim 14, wherein the at least one anti-microbial compound is released over a sustained period of time.

23. The invention according to claim 14, wherein the produce is a berry.
24. An insert system for a produce packaging system, the produce packaging system including a package defining an internal space, comprising:
an insert operable to be received within the internal space of the package;
wherein the insert includes a base portion and an upstanding portion extending upwardly away from the base portion;
wherein the insert includes an outer surface and an inner surface;
wherein the insert is provided with a plurality of apertures formed thereon; and
at least one anti-microbial compound disposed within or on the inner surface of the insert;
wherein the at least one anti-microbial compound is operable to diffuse through the plurality of apertures into the internal space of the package.
25. The invention according to claim 24, wherein the internal space is operable to receive an amount of produce.
26. The invention according to claim 24, wherein the produce is operable to be placed onto the outer surface of the insert.
27. The invention according to claim 24, wherein the at least one anti-microbial compound is operable to contact the produce.

28. The invention according to claim 24, wherein the upstanding portion includes a wall portion or a cylinder portion.

29. The invention according to claim 24, wherein the at least one anti-microbial compound is disposed within a container or sachet.

30. The invention according to claim 24, wherein the at least one anti-microbial compound is encapsulated.

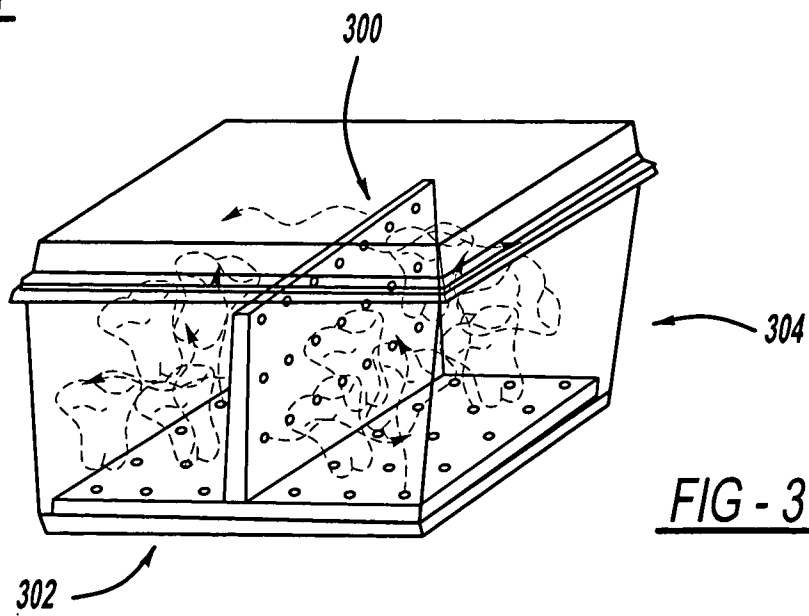
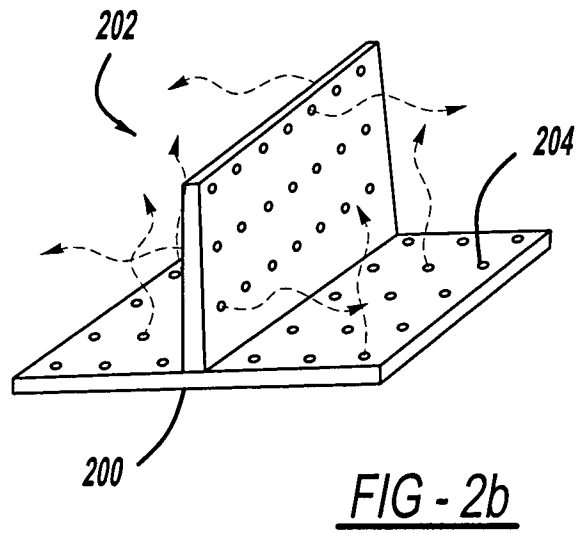
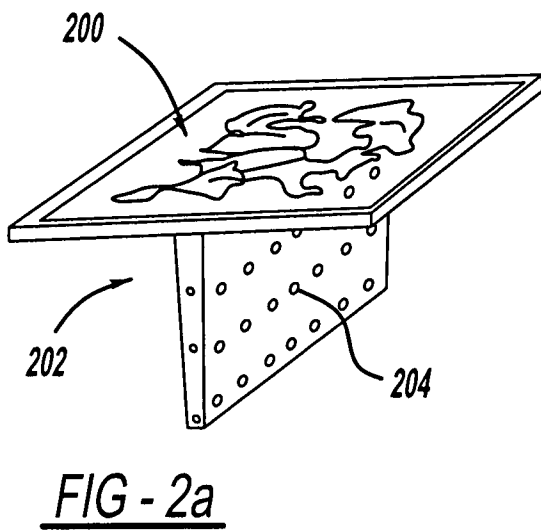
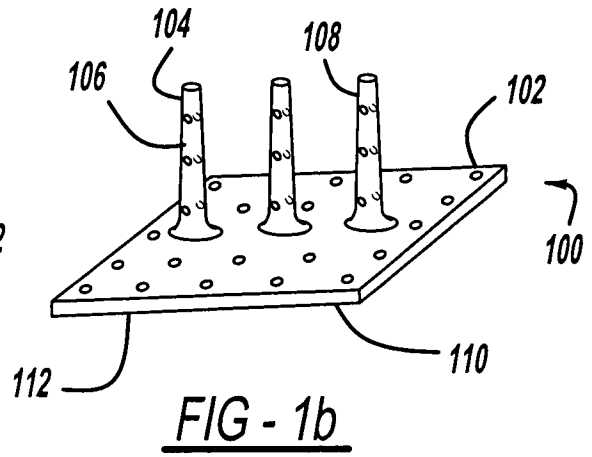
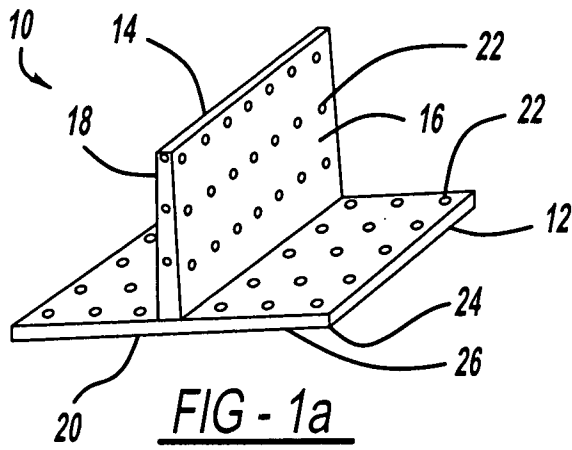
31. The invention according to claim 24, wherein the at least one anti-microbial compound is comprised of a material selected from the group consisting of hexanal, acetaldehyde, and 2E-hexanal.

32. The invention according to claim 24, wherein the at least one anti-microbial compound is comprised of a material selected from the group consisting of cinnamic acid, 1-methylcyclopropene, isoprene, terpenes, 2-nonanone, cis-3-hexen-1-ol, methyl jasmonate, benzaldehyde, propanal, butanal, ethanol, acetic acid, allyl-isothiocyanate (AITC), thymol, eugenol, citral, vanillin, trans-cinnamaldehyde, cinnamic acid, salicylic acid, furfural, β -ionone, 1-nonanol, nonanal, 3-hexanone, 2-hexen-1-ol, 1-hexanol, and combinations thereof.

33. The invention according to claim 24, wherein the at least one anti-microbial compound is comprised of ClO₂.

34. The invention according to claim 24, wherein the at least one anti-microbial compound is released over a sustained period of time.

35. The invention according to claim 24, wherein the produce is a berry.



INTERNATIONAL SEARCH REPORT

International application No

PCT/US2008/009552

A. CLASSIFICATION OF SUBJECT MATTER
 INV. B65D81/28 B65D81/24

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
 B65D

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	EP 0 351 636 A (CLEMES DENNIS CHARLES CLEMES DENNIS CHARLES [ZA]) 24 January 1990 (1990-01-24) the whole document	1-4, 8, 12-14, 18, 22, 23
X	US 2 707 352 A (FISCHER CHARLES W) 3 May 1955 (1955-05-03) the whole document	1-4, 8, 12-14, 18, 22, 23
X	GB 125 372 A (HIORTH KARL ALBERT FREDRIK [NO]) 2 October 1919 (1919-10-02) the whole document	1, 2, 4, 8, 12, 14, 18
A	EP 0 128 795 A (LEON JEAN GABRIEL [FR]; LOEVENBRUCK FRANCOIS [FR]; TROADEC JEAN RENE []) 19 December 1984 (1984-12-19) the whole document	1-35
	-/--	

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 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.
- *Z* document member of the same patent family

Date of the actual completion of the international search

17 November 2008

Date of mailing of the international search report

08/12/2008

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
 NL - 2280 HV Rijswijk
 Tel. (+31-70) 340-2040,
 Fax: (+31-70) 340-3016

Authorized officer

Visentin, Mauro

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2008/009552

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	FR 2 536 045 A (GROSS PETER [ES]) 18 May 1984 (1984-05-18) the whole document -----	1-35
A	WO 99/46175 A (ATIFON LTD [IL]; GELLER AVNER [IL]) 16 September 1999 (1999-09-16) the whole document -----	1-35
A	US 3 761 289 A (WOLF D) 25 September 1973 (1973-09-25) the whole document -----	1-35
A	GB 349 561 A (FRANKLIN KIDD; RONALD GEORGE TOMKINS; STANLEY ALAN TROUT) 21 May 1931 (1931-05-21) the whole document -----	1-35

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2008/009552

Patent document cited in search report	Publication date	Patent family member(s)	Publication date	
EP 0351636	A	24-01-1990	AU 613775 B2	08-08-1991
			AU 3729489 A	04-01-1990
			DE 68921381 D1	06-04-1995
			DE 68921381 T2	29-06-1995
			ES 2068852 T3	01-05-1995
			US 5106596 A	21-04-1992
			ZA 8900691 A	26-09-1990

US 2707352	A	03-05-1955	NONE	

GB 125372	A	02-10-1919	NONE	

EP 0128795	A	19-12-1984	DE 3469508 D1	07-04-1988
			DK 243884 A	19-11-1984
			ES 288261 U	16-12-1985
			FR 2546138 A1	23-11-1984
			NO 841971 A	19-11-1984
			US 4664922 A	12-05-1987

FR 2536045	A	18-05-1984	ES 8400961 A1	16-02-1984
			GR 77825 A1	25-09-1984
			IT 1205287 B	15-03-1989

WO 9946175	A	16-09-1999	AU 2297699 A	27-09-1999
			BR 9908732 A	21-11-2000
			CA 2323893 A1	16-09-1999
			CN 1292759 A	25-04-2001
			EP 1062161 A1	27-12-2000
			IL 123665 A	13-08-2000
			JP 2002505983 T	26-02-2002
			NO 20004543 A	12-09-2000

US 3761289	A	25-09-1973	NONE	

GB 349561	A	21-05-1931	NONE	
