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(54) **Title:** TRASH COMPACTOR CARTON WITH ANTIMICROBIAL PROPERTIES

(57) **Abstract:** Embodiments of the invention relate to trash compactor boxes that have an antibacterial or antimicrobial feature incorporated therein. In a general embodiment, the carton boxes have a built-in compound, such as an antimicrobial, antiseptic, and/or a biocide material.

Trash Compactor Carton with Antimicrobial Properties

CROSS REFERENCE TO RELATED APPLICATIONS

This application claims the benefit of U.S. Provisional Application Serial No. 5 61/556,896, filed November 8, 2011, titled “Trash Compactor Carton with Antimicrobial Properties,” the entire contents of which are hereby incorporated by reference.

FIELD OF THE INVENTION

Embodiments of the present invention relate generally to trash compactor 10 cartons and boxes having antimicrobial properties.

BACKGROUND

Trash compactors are used to handle all types of waste materials, such as spent food and drinks and other organic materials, disposable cutlery, paper, plastic, glass or metal items, such as cans and bottles, and so forth. Collecting and disposing of trash 15 in confined conditions, particularly on-board passenger transport vehicles, such as aircraft, trains, ships, buses, RVs, and other land, water, air, or other passenger transport travel vessels can be challenging. However, a good deal of rubbish is generated on such vehicles. For example, after in-flight beverage service, unused items are collected, which often includes left-over portions of meals and drinks (such 20 as coffee, tea, soft drinks, and cocktails), drink cups, napkins, newspapers, food wrappers, tea bags, beverage cans, other packaging or non-consumable items and the like, food wastes (and in particular, food wastes that are organic in nature such as fruit, fruit skin, and bones), coffee grounds and tea bags, semi-liquid materials such as water-based mixtures, alcohol, fats and oils, or any other type of disposable item 25 that a passenger may consume or bring on-board.

Non-consumable items are also collected inside the trash compactor, which include beverage cartons, cans, and bottles, disposable cutlery, napkins, newspapers and magazines, and so forth. These vehicles thus have equipment on-board for compacting waste, thereby reducing the space and volume required for the storage of 30 various waste materials.

Trash compactors are also used for residential and commercial uses, for example, in homes, restaurants, and any other locations where waste is generated and space is at a premium. Embodiments of the invention will be described throughout the remainder of this document for use in connection with passenger transport
5 vehicles, but it should be understood that uses in other locations and for other purposes are possible as well, and are to be considered within the scope of the invention.

SUMMARY

Embodiments of the invention relate to trash compactor boxes that have an
10 antibacterial or antimicrobial feature incorporated therein. In a general embodiment, the carton boxes have a built-in compound, such as an antimicrobial, antiseptic, and/or a biocide material.

BRIEF DESCRIPTION OF THE FIGURES

Aircraft trash compactors typically include a chamber with a front door in
15 order to receive a carton box, as shown in Figure 1.

The trash compactor also houses a hydraulic press arrangement to compact the waste, which is compacted inside the carton box, as shown in Figure 2.

The carton box is sealed and replaced once full, as shown in Figure 3.

Figures 4 and 5 show an example of one type of carton box that is often used
20 on-board aircraft in connection with trash compactors.

Figures 6 and 7 shows examples of leakage on a carton.

Figure 8 shows arrows pointing to areas where the formation of mold bacterial colonies is most prevalent

Figure 9 shows an *E. coli* forming unit (Cfu) assay on a membrane filter using
25 mFC medium. The *E. coli* colonies are the dark spots.

DETAILED DESCRIPTION

Carton boxes for use on-board aircraft in connection with trash compactors are generally either a three-layer box or a corrugated box. Certain boxes have at least an inner layer that is generally waterproof or water resistant to prevent leaching of liquid or semi-liquid substances from the interior of the box out to the metal interior of the trash compactor itself. The boxes are generally positioned inside a trash compactor, as shown in Figure 1. In use, once the box is full, a hydraulic press with a platen is moved to compress trash inside the carton in order to compact the trash to smaller size. An example of this step in process is shown in Figure 2, and the compressed trash in a box is shown in Figure 3.

Examples of traditional trash compactor carton boxes are shown in Figures 4 and 5. Although these boxes may be treated to waterproofed, nonetheless, there are often instances when the trash either sits in the compactor for too long, is not removed timely, or leakage occurs at a faster rate than expected (examples are shown in Figures 6 and 7), all of which can cause mold growth inside the compartment, often at the areas marked in Figure 8. The presence of mold spores may present a health hazard to humans, potentially causing allergic reactions. Poor housekeeping of the equipment during service, contact with spent food, and the inevitable fact that trash compactors are typically used in dark areas with little to no light exposure, further encourages mold and/or bacteria colony formation and growth, examples of which are shown in Figure 9. There are varieties of such species with different potential health hazards. There is thus needed a way to impart trash compactor cartons or boxes with antimicrobial properties.

The present inventors have thus determined that it would be beneficial to impart an antibacterial or antimicrobial feature to trash compactor cartons or boxes. In a general embodiment, the carton boxes have a built-in compound, such as an antimicrobial, antiseptic, and/or a biocide material. The term "antimicrobial" is used herein to encompass, but not be limited to, all potential compounds that kill or inhibit the growth of bacteria, fungus, mold, mildew, parasites, microorganisms, viruses, and any other unwanted species that may grow in a waste carton. The term is intended to encompass, but not be limited to, any types of antimicrobials, antiseptics, disinfectants, biocides, sterilizers, deodorizers, decontaminants, purifiers, or any other

substances that can freshen, clean, deodorize, inhibit odors, and/or prevent or inhibit unwanted growth of any of the above-described species. Potential examples of such chemicals are manufactured and sold by Total Science Antiseptic Solutions, a company based in France. However, it should be understood that a number of
5 chemical companies (such as Dow Chemical, BASF, DuPont, Microban, and/or Eastman Chemical), manufacture chemicals that may be used with the embodiments described.

The cartons may be impregnated with, incorporated with, sprayed, coated, painted, or otherwise associated or provided with an antimicrobial chemical or
10 compound in order to prevent the formation and migration of these species to the permanent structure of the equipment. Any vehicle of introducing the compound into the substrate that forms the box is possible, and specific, non-limiting examples are described herein.

The application or incorporation of the selected compound to or into the carton
15 box should generally not hinder the performance of the box. It does, however, improve the overall hygiene of the equipment, plus it safeguards against any potential human contact problems during servicing and maintenance operations. It is preferable that the compound not leach or migrate out of the box in use (e.g., when the box is exposed to moisture), and thus, the most appropriate methods of maintaining the
20 compound in association with the box are preferred.

In one embodiment, the box may be penetrated with an appropriate antimicrobial compound. For example, the box may be formed (in whole or in part) and then soaked (in whole or part) or otherwise engulfed or submerged in the compound. In this embodiment, it is likely that the compound will be in a liquid or
25 gas form.

In another embodiment, the compound is combined with the material used to form the box. For example, the material may be in solid, liquid, or gas form and incorporated into the box itself. For example, the compound may be added to the raw carton components prior to formation of the box itself. The compound may be
30 powder-like particles, a liquid solution, or a gas, and of which may be added, poured or is injected into or mixed with the cardboard precursors.

In a further embodiment, the compound is applied to an outer surface or one of the layers of the carton. For example, it may be sprayed, painted, doctor bladed, coated or otherwise applied to a surface or a layer of the carton. The compound may be applied to any of the layers or any compartments of the carton. For example, in the
5 3-layer option, one, two or all three of the layers may be treated. In the corrugated box option, any one or more of the inner, the outer, or the corrugated portion may be treated. In a specific embodiment, the inner-most layer of the carton is treated, which is the layer that is in most close contact with waste. In another embodiment, the
10 outer-most layer of the carton is treated, which is the layer that is in most close contact with the interior of the trash compactor. In another embodiment, the middle layer(s) is/are treated. Any one or all of the above combinations may be used. The compound may be applied to most, if not all of the carton, such that the carton is encapsulated with the compound. Additionally or alternatively, the component may be applied to only a portion of the carton.

15 Whichever method is selected, it is possible that a preventive barrier may be also applied over the box in order to maintain the integrity of the compound during use.

 Regarding the compound itself, any appropriate antiseptic (liquid, solid, gas/vapor spray) and/or biocide or biocidal compound (synthetic and/or naturally
20 occurring) and/or antimicrobial compound may be used. Additionally or alternatively, elements such as silver, copper, copper alloys or combinations thereof that have antimicrobial properties may also be used. The primary goal is that the compound selected should impart one or more of the following properties to the carton:

- 25 - prevent and/or reduce the formation of unpleasant odor, which often becomes stronger with time, as the equipment continuously handles food waste;
- prevent and/or reduce the formation of undesired species in and around the trash carton;
- the built-in anti-microbial component helps to make the carton box (as well as the
30 trash compactor) operation and maintenance cleaner, fresher and longer lasting.

Changes and modifications, additions and deletions may be made to the structures and methods recited above and shown in the drawings without departing from the scope or spirit of the invention and the following claims.

What is claimed is:

1. A trash compactor carton comprising antimicrobial properties.
- 5 2. The trash compactor carton of claim 1, configured for use with a trash compactor used on-board a passenger transport vehicle.
3. The trash compactor carton of any of the preceding claims, wherein the antimicrobial properties are provided by an antimicrobial material embedded or
10 impregnated or soaked into the carton.
4. The trash compactor carton of any of the preceding claims, wherein the antimicrobial properties are provided by an antimicrobial material applied to an outer surface, and inner surface, a layer of the carton, or combinations thereof.
15
5. A method of making a trash compactor carton having antimicrobial properties, comprising:
 - (a) manufacturing the carton; and
 - (b) applying an antimicrobial material to an outer surface, an inner surface, a layer
20 of the carton, or any combination thereof.
6. A method of making a trash compactor carton having antimicrobial properties, comprising:
 - (a) providing a carton material;
 - 25 (b) embedding, impregnating, or soaking the carton materials with an antimicrobial material.



Figure 1

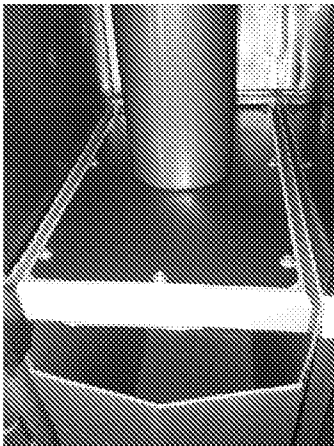


Figure 2



Figure 3

2/2

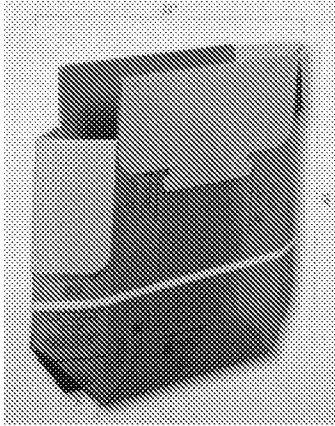


Figure 4

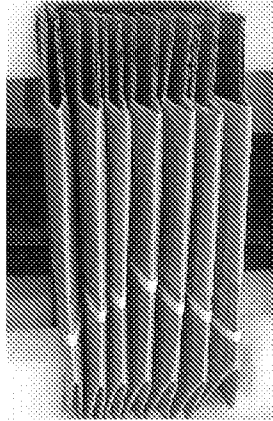


Figure 5

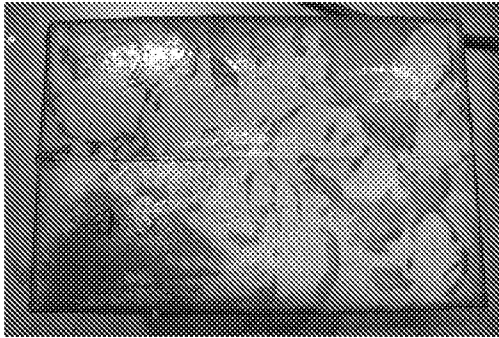


Figure 6

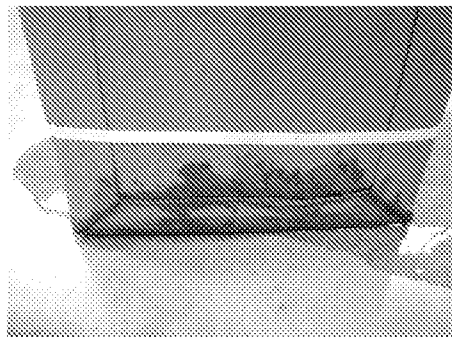


Figure 7

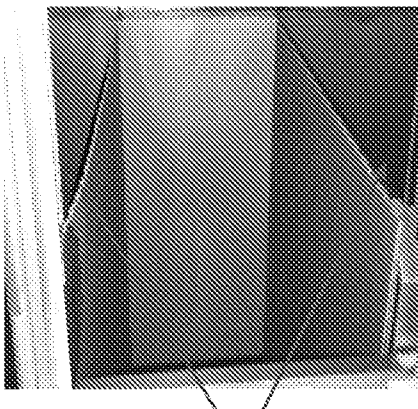


Figure 8

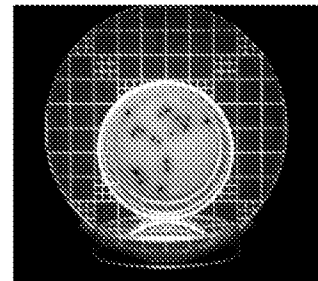


Figure 9

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2012/064056

A. CLASSIFICATION OF SUBJECT MATTER
INV. D21H21/36 B65F1/00
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)
D21H

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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Y	claims 1-14 figure 1	1-6

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Y	claims 1-20 figure 1	1-6

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Y	paragraphs [0015], [0016], [0044] claims 1-52	1-6

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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

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 "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

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INTERNATIONAL SEARCH REPORT

International application No PCT/US2012/064056

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Y	page 1, line 59 - page 2, line 4 claims 1-15	1-6

INTERNATIONAL SEARCH REPORT

Information on patent family members

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