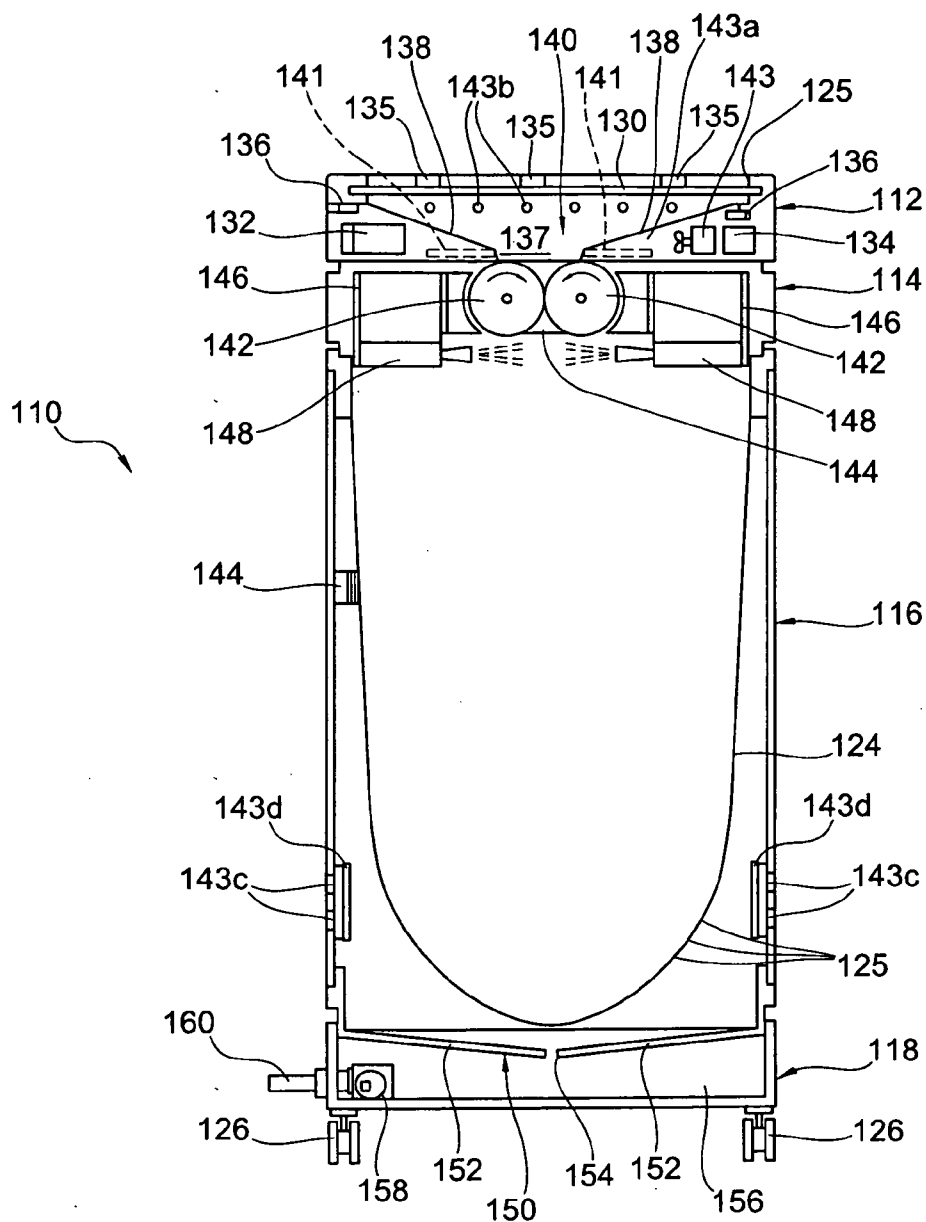




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(19) **United States**(12) **Patent Application Publication**
Borowski et al.(10) **Pub. No.: US 2011/0056952 A1**(43) **Pub. Date: Mar. 10, 2011**(54) **WASTE COLLECTION DEVICE, AND WASTE
RECYCLING SYSTEM****Publication Classification**(76) Inventors: **David Borowski**, Green Bay, WI
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Diego, CA (US); **Benjamin Thorp**,
Richmond, VA (US)(51) **Int. Cl.**
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B65D 25/00 (2006.01)(21) Appl. No.: **12/754,985**(52) **U.S. Cl. 220/495.06; 383/116; 383/127;
220/87.1**(22) Filed: **Apr. 6, 2010****Related U.S. Application Data**(63) Continuation-in-part of application No. 12/585,249,
filed on Sep. 9, 2009.(57) **ABSTRACT**A waste collection device configured to shred, treat waste
with disinfectant, and/or remove water from the waste, and a
waste recycling system.

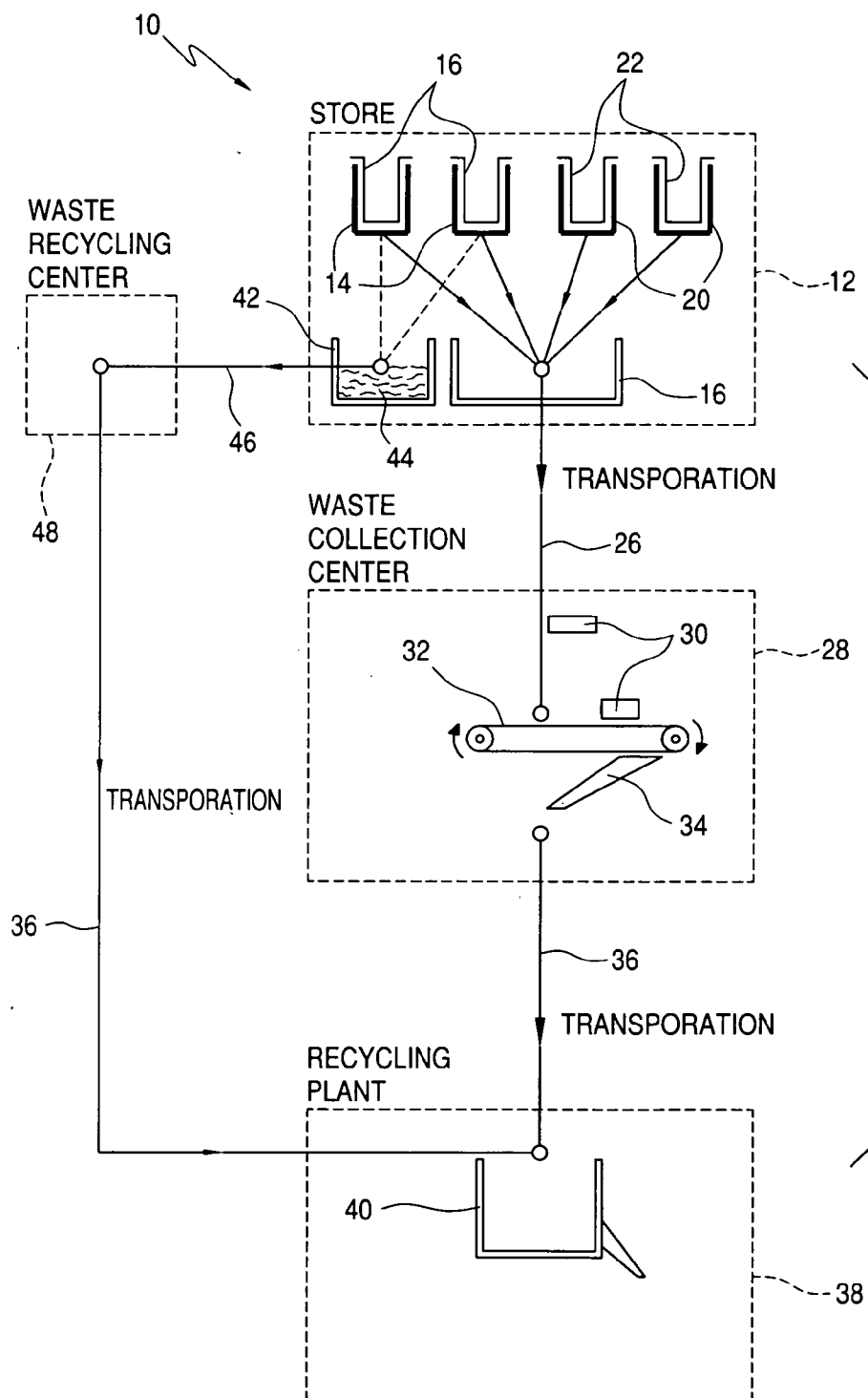


FIG. 1

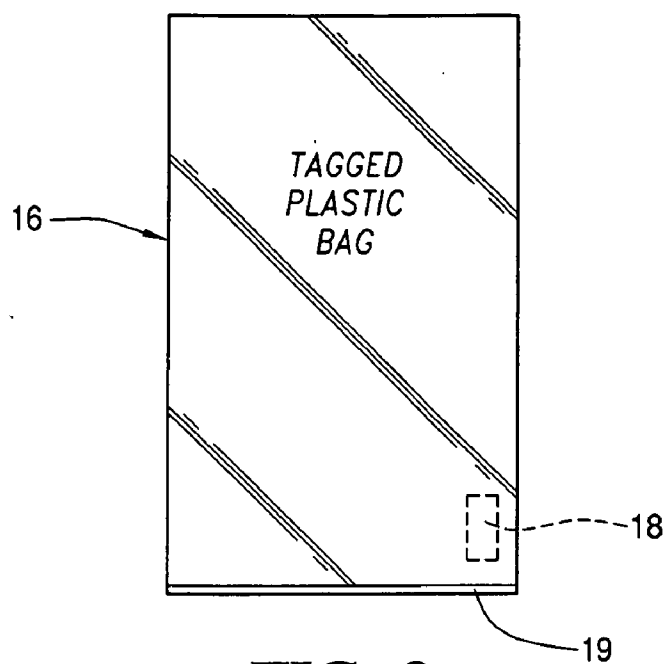


FIG. 2

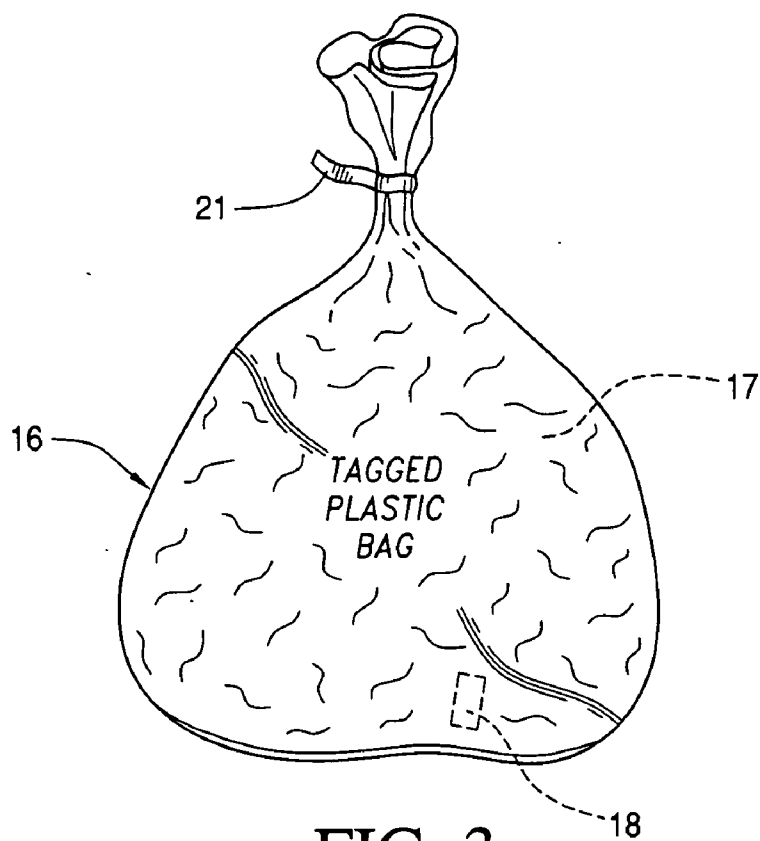


FIG. 3

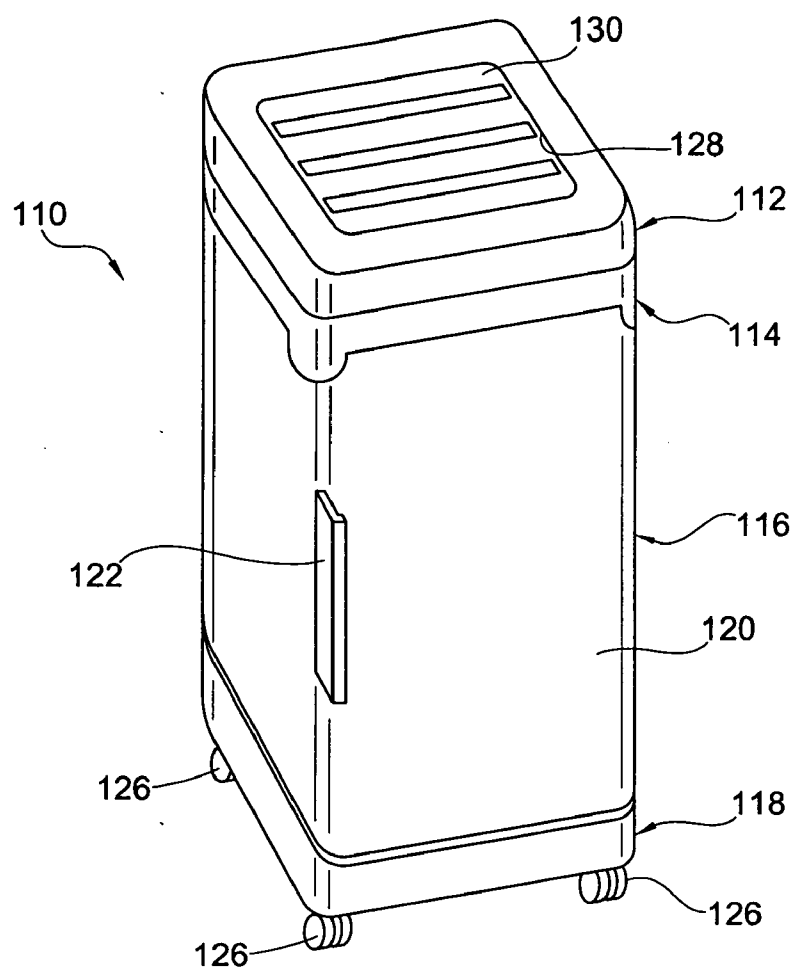


FIG. 4

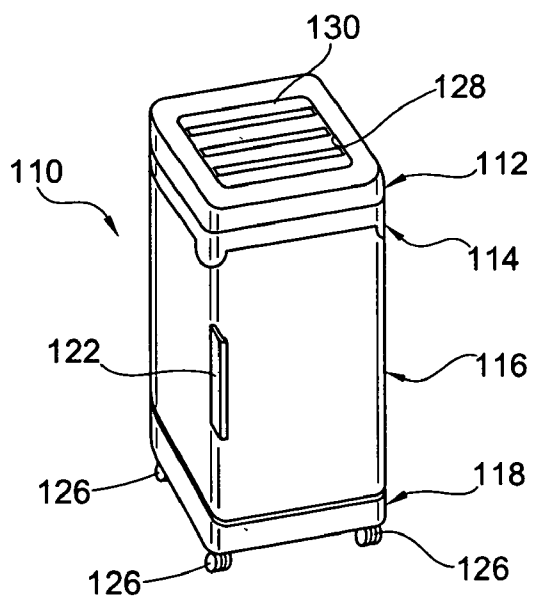


FIG. 5

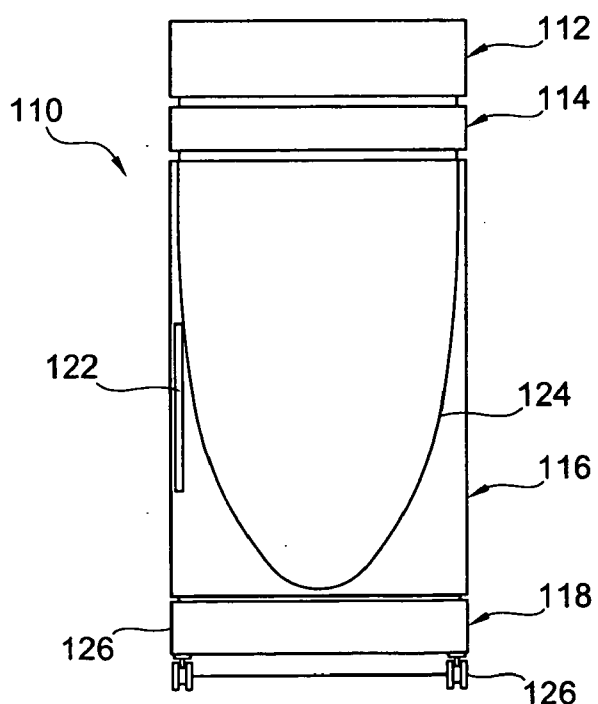


FIG. 6

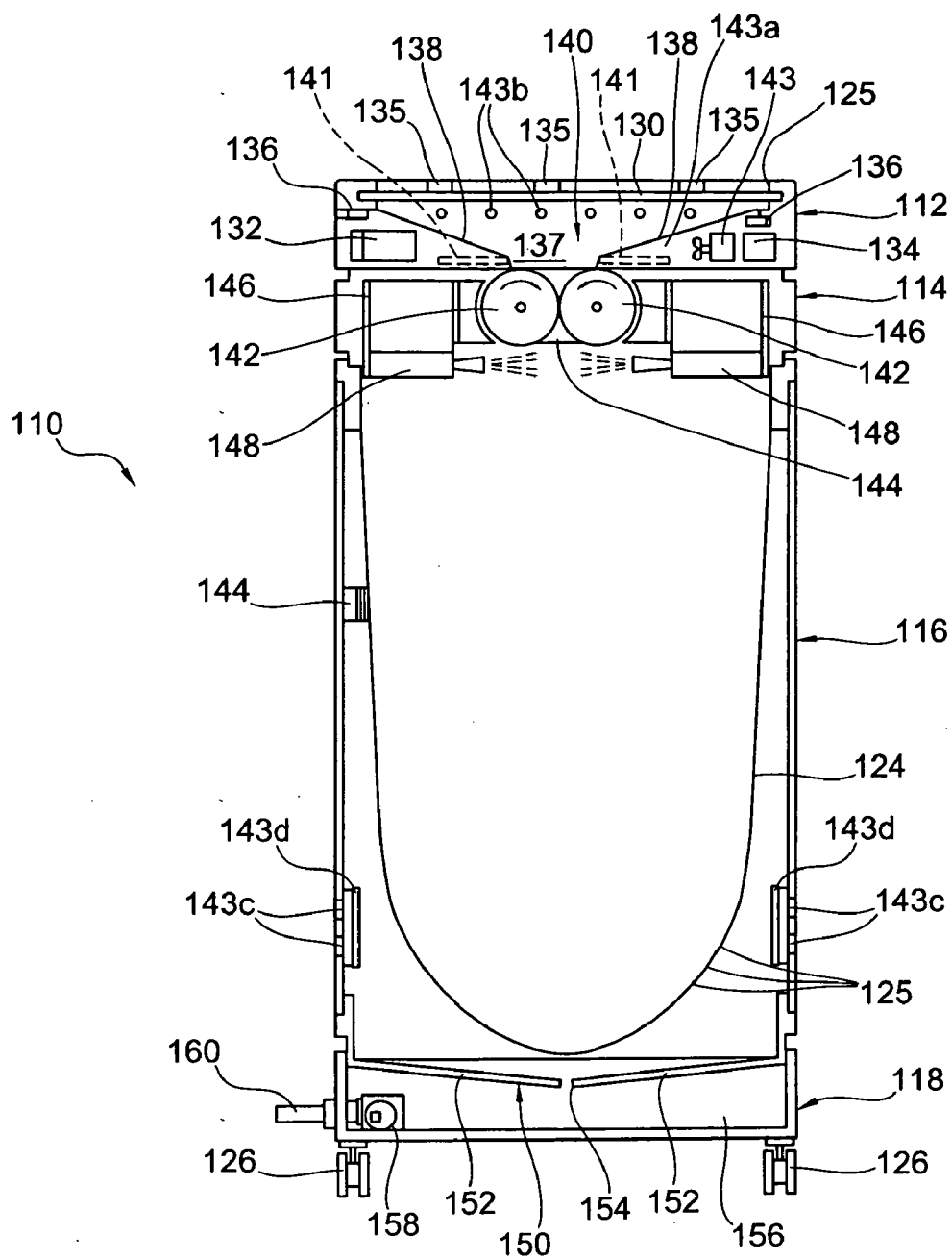


FIG. 7

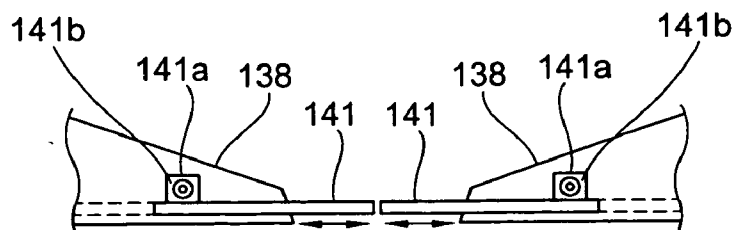


FIG. 8

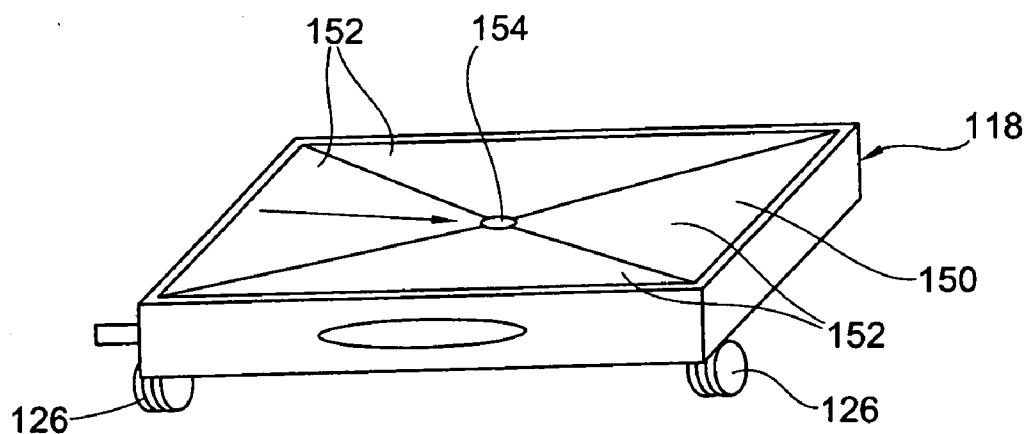


FIG. 9

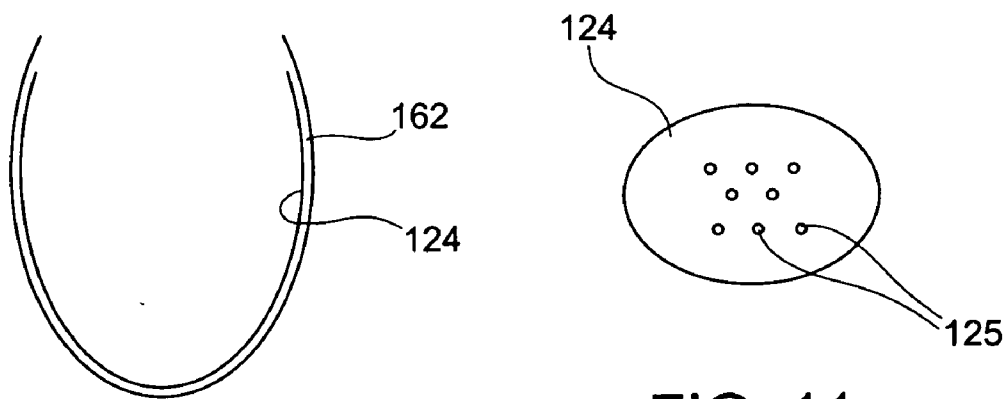


FIG. 10

FIG. 11

WASTE COLLECTION DEVICE, AND WASTE RECYCLING SYSTEM

PRIOR APPLICATION

[0001] This is a Continuation-In-Part of U.S. Patent Application entitled "A Waste Recycling System Using Tagged, Bar Coded or Other Distinctively Marked Containers, Method of Recycling, and Container Device", application Ser. No. 12/585,249, filed Sep. 9, 2009, now pending.

FIELD OF THE INVENTION

[0002] A waste collection device, in particular a waste collection device configured for use by customers or individuals onsite in store, retail and/or office environments, and a waste recycling system. In preferred embodiments of the waste collection device, the waste collection device is configured to shred waste, disinfect waste, reduce or remove water content, liquids and/or contaminating liquids from the waste, and tag the waste for recycling purposes.

BACKGROUND OF THE INVENTION

[0003] Today, most waste from stores, convenience stores, fast food chains, restaurants, retail, and office environments or locations is discarded by people or individuals (e.g. mainly customers and employees) into waste cans or waste receptacles provide onsite. These waste receptacles typically are fitted with removable plastic bags, which can be closed when filled and removed from the receptacles, and then disposed of in garbage cans or dumpsters usually located outside the buildings and adjacent to the parking lot of these locations to facilitate removal by a waste disposal service.

[0004] Typically, the waste is not sorted onsite, and all different types of waste are thrown into the same waste receptacles resulting in a wide variety of waste mixed together, including trash, garbage, paper products, food, and other waste items. The plastic bags filled with waste are thrown into a garbage can or dumpster, and mixed with other plastic bags containing waste. This waste is transported in the dumpsters or garbage trucks to land fills, and typically not sorted before landfilling.

[0005] Currently, there exists a need to recover materials, which requires sorting waste into targeted waste to allow this particular waste to be effectively recycled. Once certain types of waste are mixed together, even subsequent sorting may not allow the waste to be recycled due to the contamination from the other waste. In particular, food and beverage containers (e.g. paper cups, paper containers, plastic bottles, plastic containers) should not be mixed with other waste, if the waste beverage and food containers are going to be recycled into new products suitable for contact and use with food and beverage that meet the standards and guidelines of the Food and Drug Administration (FDA). Further, to ensure proper handling of the waste food and beverage containers, the custody of this waste from the point of disposal (e.g. store waste receptacle) through recycling of this waste must be established, tracked, maintained, and verified to assure no contamination thereof. Thus, it is preferred that this type of waste be immediately sorted at the onsite location, and maintained separate from the general mixed waste stream throughout collection, transport, storage, and recycling thereof. However, if maintained separate in the way described here it can be co-transported from facility to facility.

[0006] Due to the large amount of labor involved with sorting, it is desirable that individuals, users, customers and/or consumers of the food and beverage containers begin the process of sorting by placing these items in marked collection bins, vessels and/or receptacles. For example, individuals, users, customers and/or consumers immediately placing used paper cups into marked waste containers begins the process of effectively sorting this particular type of waste. The marked waste containers preferably contain a removable disposable bag or liner, which when filled could be removed and then disposed of into garbage cans or dumpsters.

[0007] In the case of paper cups and plates, the paper substrate is of a high quality paperboard stock, which has been treated with a plastic, wax, or resin coating process to make the paperboard resistant to water penetration and resulting degradation. It is desirable to be able to recycle this particular type of paper stock into new food grade paperboard suitable for manufacturing paper cups, plates, and other direct food contact containers while maintaining a sanitary environment and ensuring a high degree of custody and segregation to avoid the inclusion of any hazardous or deleterious materials

[0008] Due to the increasing public, private and government awareness and interest in "going green", and being environmentally friendly, there exists renewed interest and demand for recycled products having greater percentages of recycled material content. Thus, this demand will require new and effective systems and methods of recycling waste into renewable products.

[0009] In most store, retail, office and commercial environments, simple trash, waste and garbage cans or receptacles are still used today to collect and remove waste from these environments. It is common to provide removable and disposable plastic bags and liners in the trash, waste and garbage cans to facilitate removal and transfer of the waste to garbage cans and dumpsters. In order to recycle the waste, in particular waste to be recycled into food grade products (e.g. paper and plastic cups, plates, bowls), it is desirable to treat the waste prior to and/or during the collection, transport, storage, and recycling stages. In particular it is desirable to shred the waste to reduce its volume, and disinfect and remove water or liquid from the waste to prevent deterioration of the waste (e.g. breaking down of the waste chemically or biologically) to maintain the high quality of the material to be recycled from the waste, particularly waste to be recycled into food contact or grade recycled products.

[0010] Further, it is desirable to collect the waste immediately after use by the individual, user, customer or consumer, in particular at the onsite environment again to obtain the material to be recycled before any deterioration thereof. For example, new paper products are filled with food or beverage particularly at stores, cafes, fast food establishments, restaurants, food courts, convenience stores, offices, commercial locations, and other numerous environments, and then consumed immediately onsite. Thus, it is desirable to provide a waste collection device onsite that is configured to operate onsite and be capable of safely and effectively interfacing or being used by the individual, user, customer or consumer, and then treating the waste being discarded by mechanical treatment (e.g. shredding, rollers, knurling, splicing, separating, pressure, heat), chemical treatment, biological treatment, light treatment (e.g. laser, UV, IR), shredding, disinfecting, removing water, compressing, treating with air or other gases, and/or heating). It is particularly desirable to treat the waste immediately upon being discarded into the waste collection

device, however, later additional or timed treatments can be applied inside the waste collection device again to maintain the high quality of the stock material to be recycled.

SUMMARY OF THE INVENTION

[0011] A first object of the present invention is to provide an improved waste collection device.

[0012] A second object of the present invention is to provide a waste collection device configured to disinfect waste.

[0013] A third object of the present invention is to provide a waste collection device configured to disinfect waste as the waste is being discarded into the waste collection device.

[0014] A fourth object of the present invention is to provide a waste collection device configured to remove water or liquid from the waste.

[0015] A fifth object of the present invention is to provide a waste collection device configured to remove water or liquid from the waste while the waste is being contained or stored in the waste collection device.

[0016] A sixth object of the present invention is to provide a waste collection device configured to disinfect and remove water or liquid from the waste.

[0017] A seventh object of the present invention is to provide a waste collection device configured to simultaneously disinfect and remove water or liquid from the waste.

[0018] An eighth object of the present invention is to provide a waste collection device configured to shred the waste.

[0019] A ninth object of the present invention is to provide a waste collection device configured to remove water or liquid from the waste, and then remove the water or liquid from the waste collection device to a remote location.

[0020] A tenth object of the present invention is to provide a waste collection device configured to remove water or liquid from the waste and collect the water or liquid to be removed batchwise from the waste collection device.

[0021] An eleventh object of the present invention is to provide a waste recycling system, including the waste collection device according to the present invention.

[0022] A twelfth object of the present invention is to provide a waste recycling system, including the waste collection device according to the present invention using tagged disposable bags, in particular electronically tagged disposable bags provided with an RFID tag.

[0023] A thirteenth object of the present invention is to provide a waste recycling system using tagged, bar coded and/or otherwise distinctively marked plastic bags or other containers, for example, composite bags, composite paper bags, composite plastic/paper bags, non-composite paper bags, plastic containers, plastic boxes, paper boxes, and cardboard boxes, for collecting targeted waste in combination with the waste collection device according to the present invention.

[0024] A fourteenth object of the present invention is to provide a waste recycling system using electronically tagged, bar coded, and/or otherwise distinctively marked plastic bags or other containers in combination with the waste collection device according to the present invention.

[0025] A fifteenth object of the present invention is to provide a waste recycling system using tagged, bar coded, and/or otherwise distinctively marked plastic bags or other containers for collecting and tracking custody of targeted waste from collection to recycling in combination with the waste collection device according to the present invention.

[0026] A sixteenth object of the present invention is to provide a waste recycling system for identifying electronically tagged, bar coded, and/or otherwise distinctively marked plastic bags or other containers containing targeted waste from a general waste stream or recyclable waste stream in combination with the waste collection device according to the present invention.

[0027] A seventeenth object of the present invention is to provide a waste recycling system for electronically sorting electronically tagged, bar coded, and/or otherwise distinctively marked plastic bags or other containers containing a targeted waste from a general waste stream or recyclable waste stream in combination with the waste collection device according to the present invention.

[0028] An eighteenth object of the present invention is to provide a waste recycling collection system, which affords the ability to track custody of targeted waste from the waste receptacle to the recycling process to eliminate contamination of the targeted waste being recycled in combination with the waste collection device according to the present invention.

[0029] A nineteenth object of the present invention is to provide a waste recycling method of using electronically tagged plastic bags or other containers, for example, including at least one RFID, UHFID or similar wireless electronic tag associated therewith for collecting targeted waste and tagging the plastic bags or other containers to allow locating and sorting of the plastic bags, for example, from the general waste stream at a waste collection center or from recyclables at a waste recycling center in combination with the waste collection device according to the present invention.

[0030] A twentieth object of the present invention is to provide an electronically tagged plastic bag device or other container in combination with the waste collection device according to the present invention.

[0031] A twenty first object of the present invention is to provide an electronically tagged plastic bag device or other container including at least one RID, UHFID or similar wireless electronic tag in combination with the waste collection device according to the present invention.

[0032] A twenty second object of the present invention is to provide a plastic bag or other container device including an electronic tag, for example, at least one RFID, UHFID or similar wireless electronic tag for electronically tagging the plastic bag or other container device and targeted waste contents thereof in combination with the waste collection device according to the present invention.

[0033] A twenty third object of the present invention is to provide a system of recycling using a tagged, electronically tagged, bar coded, and/or otherwise distinctively marked plastic bags or other containers, which can be tracked and monitored for each individual targeted waste generating location with regards to their specific volumes and the quality of their specific material in combination with the waste collection device according to the present invention.

[0034] A twenty fourth object of the present invention is to provide a system of recycling using tags to allow segregation of the containers at a receiving station so that the containers can be rerouted to a different destination separately, or with a known percent of untagged containers.

[0035] The present invention is directed to a system, and method, for recycling waste, in particular targeted waste. Further, the present invention is directed to a plastic bag or other container device (i.e. containment device) for use in the

system and method according to the present invention. The other containers, for example, are composite bags, composite paper bags, composite plastic bags, composite plastic/paper bags, non-composite paper bags, plastic boxes, paper boxes, and cardboard boxes and other suitable containers that can be used to collect targeted waste and be tagged and/or marked to allow later sorting from other waste or recyclables.

[0036] The present invention is particularly suitable for recycling targeted waste. Targeted waste is a particular type of waste selected to be collected and recycled such as a particular item and/or similar type of material. For example, used paper cups are targeted waste to be recycled into food board, which can be made into new paper cups having a certain percentage of recycled material content. The targeted waste is collected and/or sorted to be the same item or material content mainly for facilitating the recycling process to make recycled stock materials. As another example, containers made of the same plastic material (e.g. polyethylene, PET, polyurethane) are targeted waste to be collected and sorted, and then recycled. The targeted plastic waste is sorted and collected into the same plastic bags with a unique tag.

[0037] In a preferred embodiment, targeted waste is collected in a recycling receptacle such as a garbage can, trash can, receptacle, garbage receptacle, trash receptacle, box or container. Specifically, marked and/or tagged waste receptacles (i.e. marked and/or tagged for the particular item or material) for collecting only the targeted waste(s) are set up in the store so that customers and/or employees of the store selectively dispose of the targeted waste(s) into the marked waste receptacles. For example, a recycling receptacle having a sign for "USED PAPER CUPS ONLY" is printed or displayed on the receptacle to indicate to customers and/or employees to only place used paper cups only into this particular marked receptacle. In a preferred embodiment, the marked waste receptacle is fitted with a removable plastic bag or liner to contain and remove the targeted waste from the marked waste receptacle when filled or being emptied, for example, at closing of the store for the day.

[0038] In the paper cup example, it is desirable to shred the used paper cups at the location of the store, thus affording an additional sorting step and allowing a higher bulk density for containment and shipping. For example, a paper shredder is located at the store for this purpose. The paper shredder can be located in the customer area (i.e. front of the store) so that customers of the store throw the used paper cups directly into the paper shredder fitted with a removable plastic bag or liner. Alternatively, the paper shredder is located in a non-customer accessed portion of the store (i.e. back of the store), and employees periodically empty used paper cups from waste receptacle(s) into the paper shredder, which shreds the used paper cups and places them in a plastic bags or liners readied for transportation from the store.

[0039] The plastic bags or other containers utilized in the system and method according to the present invention are provided with at least one tag, preferably and electronic tag such as an RF tag (e.g. RFID, UHFID), or similar wireless electronic tag to electronically tag the plastic bags. Alternatively, or in addition, the bags may be marked with a bar code or other distinctive marking to identify the bag. For example, each RF device or bar code can be unique to one bag or other container. The RF tags can be associated with the plastic bags or other container in a variety of different ways. For example, the at least one RF tag is loosely placed inside each plastic bag or other container (e.g. by the manufacturer or person at the

store location), or secured or attached to the plastic bag or other container by heat bonding, adhesive, pocketing, plastic tie and/or mechanically to the outside or inside of the plastic bag or other container. Preferably, the at least one RF tag is located inside the tagged plastic bags or other container in an effort to maintain the RF tag or tags within the particular plastic bag or other container throughout use of the plastic bags or other container to avoid loss or separation from the plastic bag or other container.

[0040] In a preferred embodiment, multiple RF tags are associated with each plastic bag or other container to provide redundancy in the event one or more RF tags are damaged or disabled so that the plastic bag or container can still be located, for example, in the general waste stream at a waste collection center. The RF tags are relatively inexpensive, and thus economically allowing for redundancy of the RF tags in the applications of the present invention(s).

[0041] The plastic bags or other containers containing the targeted waste can be selectively picked up and collected from multiple stores, however, the costs may prohibitive such selective transport of this waste. A less costly alternative involves collecting the targeted waste as part of the general waste stream collection process or as part of another recycling collection process. For example, it is desirable that the tagged plastic bags or other containers containing the targeted waste are co-mingled along with the other store waste, and then transported together as a general waste stream to a waste collection center. Alternatively, the plastic bags or other container containing the targeted waste can be co-mingled with recyclables (i.e. other bulk materials collected for recycling), and sent to a recycling center.

[0042] Electronic detectors for the RF tags are provided at the processing centers to locate the electronically tagged plastic bags or other containers containing the targeted waste. For example, the electronic detectors could be located on garbage trucks, unloading docks, sorting fields or areas, conveyors, chutes, or other suitable location or locations at a waste processing center.

[0043] The tagged plastic bags or other containers according to the present invention are sorted by manual or automated procedure, and collected together at the processing center. These plastic bags or other containers are aggregated (e.g. baled or palletized) and then transported to a plant for recycling. For example, the shredded cups are transported to a paper mill where they are broken down into their constituent parts, and the fiber is reprocessed into pulp suitable for manufacturing into products with direct food contact. At this point the resultant pulp can either be sold or made into paper or paperboard. If the pulp is made into food board, one possible application is making paper cups.

[0044] The present invention is also directed to a waste collection device. The waste collection device is preferably a stand alone waste collection device. The waste collection device is preferably configured to be a self-contained unit, and collect waste onsite, for example, at a store, retail, office and/or commercial environments or locations.

[0045] The waste collection device according to the present invention is configured to treat the waste, in particular treat the waste when being discarded into and/or stored in the waste collection device. In preferred embodiments, the waste collection device can treat the waste by shredding, disinfecting, removing water or liquid as the waste to maintain the quality of the stock material of the waste as it is being inserted and/or stored in the waste collection device. In a more pre-

ferred embodiment, the waste is treated in multiple steps or multiple processes, again to maintain the quality of the stock material of the waste for recycling purposes.

[0046] In a preferred embodiment, the waste collection device according to the present invention includes a collection vessel. The collection vessel, for example, can include a collection vessel top portion supported by a collection vessel housing. A shredder mechanism can be located between the collection vessel top portion and the collection vessel housing. Alternatively, the shredder mechanism can be located inside the collection vessel top portion and/or the collection vessel housing. The collection vessel housing can be provided with an access door (e.g. front door) for providing access to the inside of the collection vessel housing.

[0047] A collection vessel lower portion is located below the collection vessel housing. In a preferred embodiment, the collection vessel lower portion contains a collection pan, sump pump, drain and/or siphon to collect and eliminate the water or liquid from the waste collection device.

[0048] A waste collection bag is removable provided in the collection vessel housing. An upper end of the waste collection bag is maintained opened by the collection vessel top portion and/or collection vessel housing when installed in the collection vessel housing to allow shredded waste to fall via gravity into the collection bag during operation of the waste collection device.

[0049] The waste collection bag is preferably constructed (e.g. perforated) to allow water or liquid to drain from the waste collection bag when installed inside the collection vessel housing. For example, a lower portion of the waste collection bag is provided with an opening(s) and/or drain(s). A preferred embodiment of the collection bag is a disposable plastic bag having a lower portion perforated with multiple holes (e.g. pattern design or matrix arrangement of drain holes). The liquid or water drains from the waste collection bag as waste is being shredded into the waste collection bag by the shredder mechanism. The liquid or water continues to drain from the shredded waste contained and stored in the waste collection bag with time due to the effects of gravity.

[0050] When the waste collection bag is filled, the waste collection bag is removed from the waste collection device. For example, a front door on the collection vessel housing is opened, and then the filled waste collection bag is removed therefrom. In a preferred embodiment, a transport bag is fitted around (i.e. nested outside) the waste collection bag just prior to removal of the waste collection bag from the collection vessel housing. The transport bag is preferably a non-perforated bag configured to contain and seal the filled waste collection bag, and prevent leaking of the waste collection bag during removal from the collection vessel housing and subsequent transport and storage thereof.

[0051] The waste collection bag and/or the transport bag can be fitted with an RFID tag to carry out the waste recycling processes according to the present invention. Preferably, the RFID tag is provided in the transport bag to avoid contact with any liquid or water. Further, preferably the waste collection bag and/or transport bag are coated or impregnated with a biocide (e.g. liquid, powder, coating), which is activated in the presence of liquid or water or water vapor. Alternatively, biocide can be sprayed or dispersed into or onto the shredded material.

[0052] The collection bag upper portion is preferably provided with an access door through which waste can be inserted. For safety purposes, the access door is preferably an

automated door having a proximity sensor to “sense” the presence of a hand as it approaches the opening to open the automated door. The shredder mechanism located below the automated door is provided with an interlock so that the shredder mechanism will not operate when the automated door is open, and will lock the automated door closed during operation of the shredder mechanism. The interlock can also include one or more proximity sensors so that the shredder mechanism will not operate if an individual or user is within a predetermined distance of the waste collection device (e.g. within several feet of the waste collection device). This provides interlock redundancy, and an additional level of safety against injury to the individual or user of the waste collection device.

[0053] In the preferred configuration, there is both a mechanical interlock(s) and an electronic interlock(s). The top of the container is configured so that when the access door is opened, there is a false bottom (e.g. sliding or rotating door(s)) so that it is impossible to put a user's hand, fingers or foreign objects (e.g. sticks, metal objects) into the collection vessel shredder blades or mechanism. When the door is closed, the waste falls or slides from the false bottom into the vessel, and the electronic interlock(s) start the shredding mechanism.

[0054] The waste collection device is preferably configured to disinfect the waste, in particular disinfect the waste as it is being inserted into the waste collection device and/or when the waste is being stored inside the waste collection device. For example, the waste collection device is provided with a spray device for disbursing a liquid or powdered disinfectant onto the shredded waste. The spray device is preferably located inside the waste collection device, and configured to spray the shredded waste falling out of the shredder mechanism. Alternatively, or in addition, the spray device disburses disinfectant onto the waste sitting in the waste collection bag. For example, the waste stream is sprayed when exiting the shredder mechanism, and again sprayed at a later time when sitting in the waste storage bag. A time sequenced or programmed sequence of spraying can be configured to ensure that the waste is adequately disinfected while sitting in the waste storage bag. In operation, a waste storage bag can be replaced in minutes, hours, or even days depending on the amount of use of the particular waste collection device. Thus, timed or programmed re-treatment of the waste may be necessary to prevent deterioration of the waste stock material to allow later recycling thereof.

[0055] Disinfecting of the waste can also be accomplished by using ultra violet (UV) light, microwaving, refrigeration, freezing and/or irradiation, for example, from electronic devices located inside the waste collection device. This disinfecting preferably occurs inside the waste collection device while the waste is being processed and/or stored, however, it can also occur upstream or downstream relative to the waste collection device.

[0056] A preferred embodiment of the waste collection device is configured to collect the liquid or water draining from the waste collection bag contained in the collection vessel housing. In one embodiment, the collection container is configured to collect the liquid or water draining from the waste collection bag (e.g. removable containment vessel, flexible collection bag, collection tray or container positioned inside the collection vessel housing and positioned beneath the draining waste collection bag). In another embodiment, a collection pan having a sump pump is positioned inside the

collection vessel housing beneath the draining waste collection bag. The sump pump is provided with a pan level sensor so that the sump pump is operated when the pan is filled. The sump pump can pump the waste liquid or water to a collection container located inside or outside the waste collection device, or via a conduit or pipe can pump the waste liquid or water to a remote located (e.g. floor drain located remote from the waste collection device, sewer). In a further embodiment, a sump is provided in the collection vessel, and is filled with a desiccant or other absorption device to collect and store the waste liquid or water. The sump can be emptied manually, or it can be equipped with a sump pump.

[0057] The collection vessel of the waste collection device can be configured to be mobile. For example, a set of swivel wheels can be fitted to the bottom of the collection vessel.

[0058] In use, for example, the waste collection device is co-located with a traditional refuse or waste container. As the customer approaches he or she discards any cover, straw, stir stick, sleeve, etc. in the waste container. As the customer's hand approaches the collection vessel, the powered automated door opens and the customer drops the recyclable product or waste into the opening. When the customer has retreated a distance of 2 to 4 feet from the collection vessel, the automated door closes, and sensors in the collection vessel head sense the presence of a cup and proceed to initiate the shredding process. This process begins by locking the powered automated door closed, and is interlocked electrically and mechanically. Once the interlocks have been proven, the shredder mechanism activates feeding the cup through the shredder mechanism producing preferably a cross-cut waste material. As the waste material is exiting the shredder, a fine mist of water based or dry disinfectant/biocide is sprayed onto the waste material, and the waste material then drops into the collection bag.

[0059] Once the waste material is in the collection bag, the waste liquid or water drains by gravity through the bags perforated holes, and into the drainage sump. When the collection bag is full as signaled by an indicator (e.g. light or sound), the attendant places the transport bag around the waste collection bag, and removes the combined bags from the collection vessel for disposal thereof.

BRIEF DESCRIPTION OF THE DRAWINGS

[0060] FIG. 1 is a schematic diagram showing the recycling of targeted waste from a store into new products having recycled content.

[0061] FIG. 2 is side elevational view of a new unopened electronically tagged plastic bag or other container device according to the present invention having at least one RF tag.

[0062] FIG. 3 is a side elevational view of a used filled plastic bag or other containment device according to the present invention having at least one RF tag containing targeted waste readied for transportation to a processing plant.

[0063] FIG. 4 is a perspective view of a preferred embodiment of the waste collection device according to the present invention showing the automated door in an open position.

[0064] FIG. 5 is a perspective view of the waste collection device shown in FIG. 4, however, with the automated door in a close position.

[0065] FIG. 6 is a front diagrammatic view of the waste collection device shown in

[0066] FIG. 4.

[0067] FIG. 7 is a front diagrammatic elevational view of the waste collection bag device shown in FIG. 4.

[0068] FIG. 8 is a diagrammatic broken away front diagrammatic elevational view of the sliding doors of the collection vessel upper portion.

[0069] FIG. 9 is a perspective view of the lower portion of the collection vessel.

[0070] FIG. 10 is a front diagrammatic elevational view of the waste collection bag and transport bag.

[0071] FIG. 11 is a diagrammatic bottom view of the waste collection bag showing the perforations.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0072] A schematic diagram of the waste recycling system 10 according to the present invention is shown in FIG. 1.

[0073] The waste recycling system begins at a store location 12. Preferably the store location 12 is just one of a series of stores of similar or dissimilar ownership that have agreed to cooperate with the desired recycling program to obtain the quantity of used waste material required for commercial recycling.

[0074] It is important to note that the preferred embodiments described in this section are directed towards particular types or otherwise targeted waste, for example, used paper cups and used plastic beverage containers. However, the system, method and device according to the present invention can have many applications for recycling different types of waste (e.g. paper plates, foam plates, plastic utensils, paper bags, paper wrappers, foam containers) and maintaining separation and custody of the waste from the point of collection to the recycling process or processing plant to avoid contamination of the particular waste material.

[0075] The initial selective collection of the targeted waste is a preferred initial step to avoid any mixing of the targeted waste with other general waste to avoid any contamination of the targeted waste. Further, providing and maintaining a hygienic environment from start to finish by using new plastic bags or other containers, which are substantially sanitary due to the method of manufacturing, maintains the quality of the targeted waste material through the collection, transportation, sorting and recycling steps. Typically, the food or beverage contamination of the used containers, for example paper cups, is not a factor effecting the final quality and sanitary standards of the recycled pulp or other finished product, since this type of contamination is effectively removed in the recycling process, for example, when making paper stock with recycled content from the waste paper material from the used paper cups.

[0076] In the preferred embodiment, the used paper cups are collected in marked recycling receptacles 14 (e.g. garbage can, trash can, garbage receptacle, trash receptacle, cardboard box, cardboard container, paper container, paper box, composite container, composite box, specialized container). The receptacles 14 are marked so as to identify the particular type or targeted waste to be discarded into the marked waste receptacle 14. For example, the marked recycling receptacle 14 can be marked "USED PAPER CUPS ONLY" by a sign, label, printing, or other suitable display manner. Another receptacle can be marked "SPOONS, FORKS AND KNIFES" for plastic or wooden utensils.

[0077] As an option or improvement, the marked waste receptacles 14 in the store are paper shredders and/or compactors configured to shred and/or compact the used paper cups. The paper shredder and/or compactor can be located in the front portion of the store allowing customer access, or can

be located in a back portion of the store to only allow employee access and operation of the shredder and/or compactor. The paper shredder and/or compactor use plastic bags or liners (e.g. heavier gauge plastic bags) including at least one RF tag associated therewith for electronically tagging the plastic bag or liner.

[0078] The marked recycling receptacles 14 are located inside the store 12 where customers have access to these marked recycling receptacles 14 so that customers discard their used paper cups or plastic beverage containers into the marked recycling receptacles 14 when finished consuming their beverages. The marked recycling receptacles 14 may each be fitted with a plastic bag 16 having at least one RF tag 18 associated therewith.

[0079] Alternatively, employees of the store 12 can sort through regular waste receptacles 20 (i.e. unmarked waste receptacles) in the store 12 having standard plastic bags 22 (i.e. having no RF tags), to selectively remove and sort the used paper cups or plastic beverage containers from the other general store waste. The sorted used paper cups or beverage containers are then collected in plastic bags 16 each having at least one RF tag 18 associated therewith. However, this method of sorting the used paper cups or plastic beverage containers from the other general store waste is more labor intensive and expensive. Further, the targeted waste can be contaminated from the other general store waste materials, and is less desirable from initially separating the targeted waste into the marked waste receptacles 14.

[0080] The electronically tagged plastic bags 16 are removed from the marked recycling receptacles 14, and then collected with the regular plastic bags 22 containing general store waste from the store 12. Both the tagged plastic bags 16 and regular plastic bags 20 are thrown into a dumpster 24 together to then enter the general waste stream 26. Alternatively, a garbage truck picks up the plastic bags 16, 20 together directly from the store 12. The electronically tagged plastic bags 16 containing the targeted store waste and the regular plastic bags 20 containing the general store waste are co-mingled together in the dumpster 24 or garbage truck, and are transported together as a general waste stream 26 to a waste collection center 28. Alternatively the electronically tagged plastic bags 16 or other containers are kept segregated from the regular plastic bags 20 containing the general store waste and are co-mingled with other materials (e.g. cardboard) that is currently being recycled by the individual store.

[0081] In another embodiment, the receptacle 14 itself is made to be recycled along with the targeted waste contents contained therein to directly serve as a waste "container" according to the present invention. For example, the receptacle 14 can be a paper or cardboard box that is electronically tagged with at least one RF tag associated therewith. Alternatively, the filled receptacle 14 is placed in a plastic bag 16 electronically tagged with at least one RF tag associated therewith. The receptacle 14 and targeted waste contents contained therein are discarded into the dumpster 24 or garbage truck as a unit. This particular receptacle 14 may or may not have a plastic bag or liner depending on the particular application. In any event, it is desirable that such a receptacle remains intact when co-mingled with the waste stream and then later be sorted out, for example, at a waste collection center.

[0082] The waste collection center 28 includes one or more RF sensors 30 for electronically detecting the electronically tagged plastic bags 16 or containers containing the targeted

store waste. An RF sensor 30 can be located near or adjacent a location where the dumpsters 24 or garbage trucks unload the general waste stream 26, for example, onto a sorting floor of the waste collection center 28. Unloading and/or sorting equipment such as lifts or trucks can be fitted with RF sensors 30 to locate the electronically tagged plastic bags 16, containing the targeted store waste, being moved or sorted on the sorting floor. Alternatively, the general waste stream 26 is loaded onto a sorting conveyor 32 fitted with one or more RF sensors 30 located along the sorting conveyor 32. The sorting conveyor 32 can be fitted with a mechanism to "kick out" the electronically tagged plastic bags 16 from the sorting conveyor 32 onto a chute 34 (or another conveyor) to sort out and collect the electronically tagged plastic bags 16.

[0083] The electronically tagged plastic bags 16 containing the targeted store waste are collected (e.g. placed on pallets) for transportation as a targeted waste stream 36 to a recycling plant 38 such as a paper mill, plastic pellet manufacturing plant, or other recycling facility. For recycling paper cups, the targeted store waste is shipped to a paper mill for recycling into new paper stock having recycled material content. Once at the paper mill each individual bag is automatically weighed and a generator's attribution established. The targeted waste quantity and quality along with collection and transportation data is recorded and used for quality control purposes.

[0084] Alternatively, or in addition, the store 12 can be provided with a separate dumpster 42 for collecting a recyclable waste 44, for example, cardboard waste. The electronically tagged plastic bags 16 can also be collected in the dumpster 42, and co-mingled with the recyclable waste 44. The recyclable waste stream 46 is transported to a waste recycling center 48, at which the electronically tagged plastic bags 16 are sorted from the recyclable waste 44.

[0085] The electronically tagged plastic bags 16 can be provided with a single RF tag 18, or preferably multiple RF tags 18 to provided operational redundancy in the event one or more of the RF tags are separated from the plastic bags 16, or damaged. The RF tags 18 are preferably adhesively secured to the inside of the plastic bags 16 during manufacturing of the plastic bags 16. A targeted waste stream 36 is transported from the waste recycling center 48 to the recycling plant 38 for recycling into new products having recycled content.

[0086] The electronically tagged plastic bags 16 according to the present invention are shown in FIGS. 2 and 3.

[0087] As shown in FIG. 2, a newly manufactured unopened and unused flat plastic bag 16 is shown. The RF tag 18 is located inside the plastic bag 16 preferably near or at the bottom thereof. A heat welded seam 19 defines the bottom of the plastic bag 16. As shown in FIG. 3, the plastic bag 16 is filled with targeted waste 17 (e.g. shredded paper cups or plastic bottles), however, the RF tag 18 remains adhered and attached to the inside surface of the plastic bag 16 to prevent separation from the plastic bag 16. A plastic tie 21 can be used to close an upper portion of the plastic bag 16, or the upper end of the plastic bag 16 can be tied into a knot to close same.

[0088] The waste recycling method according to the present invention includes the step of collecting targeted waste in electronically tagged plastic bags. This method maintains the targeted waste separate from other waste to maintain the custody of the targeted waste.

[0089] Preferably, the target waste is collected immediately after use, for example, after a store customer consumes his or her beverage and then discards the used container. Collecting the targeted waste in marked waste receptacles allows for the

targeted waste to be immediately sorted from other waste, and greatly reduces the risk of contamination by other store waste. Optionally, it is desirable to shred, puncture, perforate, cut, drill, machine or other compromise the wall(s) of the beverage containers (e.g. used paper cups) at the store location (e.g. inside waste collection device) to allow the water or liquid to drain from the beverage containers to facilitate the recycling thereof

Waste Collection Device

[0090] A preferred embodiment of a stand alone type waste collection device **110** according to the present invention is shown in FIGS. 4-11.

[0091] The waste collection device **110** includes a collection vessel upper portion **112**, a collection vessel shredder mechanism **114**, a collection vessel housing **116**, and a collection vessel lower portion **118**.

[0092] The collection vessel housing **116** sits on top of and is supported by the collection vessel lower portion **118**. The combined collection vessel upper portion **112** and collection vessel shredder mechanism **114** sits on top of, and are supported by the collection vessel housing **116**. The subunits (i.e. collection vessel upper portion **112**, collection vessel shredder mechanism **114**, collection vessel housing **116**, and collection vessel lower portion **118**) of the waste collection device **110** can be separate subassemblies connected together (e.g. removably connected together), or can be assembled to become a single assembled unit.

[0093] The collection vessel housing **116** is provided with a door **120** having a handle **122** to allow access to the inside of the collection vessel housing **116**. A waste collection bag **124** is provided inside the collection vessel housing **116**. The waste collection bag **124** is opened at its top and closed at its bottom, however, a lower portion of the waste collection bag **124** is provided with a plurality of perforations **125** (FIGS. 10 and 11). The waste collection bag **124** is situated inside the collection vessel housing **116** so that the upper open end thereof is maintained opened to receive shredded waste from the collection vessel shredder mechanism **114** via gravity. For example, the collection vessel upper portion **112** and collection vessel shredder portion **114** can be assembled together and removable as a subunit from the upper end of the collection vessel housing **116**. The upper end of the waste collection bag **124** is folded over the upper edge of the collection vessel housing **116** to support and hold open the waste collection bag **124**. Alternatively, a frame (e.g. sliding frame or other mechanical support) can be fitted inside the collection vessel housing **116** to support and maintain the upper end of the waste collection bag **124** opened.

[0094] The collection vessel lower portion **118** is fitted with four (4) wheels **126** at the bottom corners thereof to render the waste collection device **110** mobile. For example, the wheels **126** are coaster wheels configured to swivel. This allows the waste collection device **110** to be moved around the store, retail, office, and/or commercial location

[0095] The upper end of the collection vessel upper portion **112** is provided with an opening **128** having an automated door **130** configured to automatically open and close the opening **128**. The waste is thrown into the opening **128** by an individual or user.

[0096] A detailed diagrammatic view of the waste collection device **110** is shown in FIG. 7.

[0097] The collection vessel upper portion **112** is shown with the opening **128** having an automated door **130**. The

automated door **130** is driven by an electric motor/drive **132**, and controlled by electronic control unit **134** having hand proximity sensors **135** and body proximity sensors **136**. The hand proximity sensors **135** are provided around the opening **128** for operating the automated door **130**, and body proximity sensors **136** are provided around the front and sides of the waste collection device **110** to sense the body of an individual or user proximate to the front and sides of the waste collection device **110**. The body proximity sensors are used in combination with an interlock arrangement (e.g. electronic and/or mechanical) to prevent the collection vessel shredder mechanism **114** to operate when an individual or user is proximate or near the waste collection device **110** (e.g. no shredding operation if individual or user is within 2 to 3 feet of waste collection device **110**).

[0098] The collection vessel upper portion **112** is configured to collect and direct the waste towards the collection vessel shredder portion **114**. For example, the collection vessel upper portion **112** is provided with a collection bin **137** having inner inclined wall portions **138** located under the automated door **130** to direct the waste by gravity to a center trough **140** located above the collection vessel shredder mechanism **114**.

[0099] A pair of sliding doors **141**, **141** are positioned above a pair of rotary shredding cutters **142**, **142** to provide a false bottom when a user is throwing waste into the collection vessel upper portion **112** through an opened automated door **130**. A detailed view of the sliding doors **141**, **141** is shown in FIG. 8. A pair of electronic stepping motors **141a**, **141a** provided with friction driving wheels **141b**, **141b** are controlled by electronic control unit **134**, or other separate control unit, to open and close the sliding doors **141**, **141**. Alternatively, the friction driving wheels **141b**, **141b** can be replaced with rotary gears to cooperate with a rack formed into or attached to the sliding doors **141**, **141** to drive the sliding doors **141**, **141** opened and closed.

[0100] Preferably, the sliding doors **141**, **141** are programmed to remain closed when the rotary shredding cutters **142**, **142** are operating to provide a fail safe against personal injury to the user. For example, when a user approaches the waste collection device **110**, the automated door **130** opens while the sliding doors **141**, **141** remain closed.

[0101] After the user retreats from the waste collection device **110** a predetermined distance, the automated door **130** is closed, then the rotary shredding cutters **142**, **142** are operated, and then the sliding doors **141**, **141** are opened to drop the waste located in the collection bin **137** into the operating rotary shredding cutters **142**, **142**. After the waste passes through the rotary shredding cutters **142**, **142**, then the operation of the rotary shredding cutters **142**, **142** is stopped, and then the sliding doors **141**, **141** are closed and readied for the next user to approach the waste collection device **110**. It is most preferred that the sliding doors **141**, **141** must be closed first before the automated door **130** can then be opened, and that the automated door **130** must be completely closed before the rotary shredding cutters **142**, **142** can be operated.

[0102] The collection vessel shredder mechanism **114** includes the pair of rotary shredding cutters **142**, **142** (e.g. cross-cut rotary shredding cutters) located immediately beneath the center trough **140** of the collection vessel upper portion **112**. The rotary shredding cutters **142**, **142** are connected to an electronic drive/motor **144**. The waste is thrown into the collection bin **137** by the user. The waste then moves downwardly via gravity and the rotating rotary shredding

cutters **142, 142**, which also draw the waste downwardly by and between the rotary shredding cutters **142, 142**.

[0103] A fan **143** is provided within the collection vessel upper portion **112**. The fan **143** is configured to draw in air from outside the waste collection device **10**, and circulate the air within a cavity **143a** of the collection vessel upper portion. The pressurized air inside the cavity **143** then vents out vent holes **143b**, for example, provided in the walls of the collection bin **37**. The pressurized air entering inside the collection bin **37** vents air downwardly, when the automated door **120** is closed, through the shredding cutters **142, 142** down into the collection vessel housing **116**. The collection vessel housing **116** is provided with vent holes **143c** to vent the pressurized air inside the collection vessel housing outside of the waste collection device **110**. The vent holes **143c** can be fitted with air filters **143d** (e.g. activated charcoal filters, dust filters, filters provided with neutralizer, sanitizer, deodorizer, scent or other chemicals) to clean or purify the air exiting the waste collection device **110**. The pressurized air circulated in this manner removes moisture and/or vapors located or trapped inside the waste collection device **110**, in particular removes moisture or vapors from the shredding cutters **142, 142**, electronics, and other components that could be damaged by such moisture or vapors.

[0104] The collection vessel shredder mechanism **114** is provided with a pair of reservoirs **146, 146** (e.g. disposable and removable containers) fitted with electronic spraying devices **148, 148** controlled by electronic control unit **134**, or other separate electronic controls. For example, the reservoirs **146, 146** are filled with liquid or powder disinfectant or biocide that is sprayed onto the shredded waste exiting the collection vessel shredder mechanism **114** and entering into the upper opening of the waste collection bag **124**.

[0105] The shredded waste filling the waste collection bag **124** may include waste water or liquid from used containers (e.g. coffee from coffee cup, beverage from beverage cup, liquid from food). This waste water or liquid moves downward by gravity inside the waste collection bag **124**, and drains out of the perforations **125** (FIGS. 7, 10 and 11) in the lower portion of the waste collection bag **124**. This waste liquid or water drips down into the collection vessel lower portion **118**, as shown in FIGS. 7 and 9.

[0106] As shown in FIG. 9, the collection vessel lower portion **118** includes a tray portion **150** having four (4) triangular-shaped inclined wall portions **152** for directing the waste liquid or water to a center through hole **154**, which drains into a collection reservoir **156**. An electronic sump pump **158** (FIG. 7) is provided in the collection reservoir **156** for pumping the collected waste water or liquid through a pipe or conduit **160** to a remote location (e.g. sewer or floor drain).

[0107] When the waste collection bag **124** is filled, a sensor **164** (FIG. 7) indicates this condition by a visual display and/or alarm. Then, the combined collection vessel upper portion **112** and collection vessel shredder mechanism **114** are lifted from the top of the collection vessel housing **116**. The collection vessel housing **116** is opened, and a non-perforated waste transport bag **162** (FIG. 10) is fitted around the waste collection bag **124** (i.e. the waste collection bag **124** is nested within waste transport bag **162**).

Operation

[0108] The waste collection device **110**, for example, is provided in the front portion of a store or retail location. A user approaches the waste collection device to dispose of

waste (e.g. used paper coffee or beverage cup). The automated door **130** opens when the hand proximity sensors **135** sense the user's hand in close proximity to the opening **128** of the collection vessel upper portion **112**. The user then drops his or her cup into the collection bin **137** of the collection vessel upper portion **112**. The automated door **130** closes when the user removes his or her hand in proximity to the automated door **130**.

[0109] When the user retreats, for example, two (2) to three (3) feet from the waste collection device **110** out of range of the body proximity sensors **136**, the electronic control unit **134** turns on the collection vessel shredder mechanism **114** to begin shredding operation of the used cup. The used cup is drawn downwardly by gravity and the rotating rotary shredding cutters **142, 142**, and then the used cup is shredded into numerous shredded pieces of waste. The shredded waste pieces are sprayed with disinfectant or biocide by the electronic control unit **134** operating the spraying devices **148**. The electronic control unit **134** can be programmed to control the operational sequence and dwell time of the automated door **130**, the collection vessel shredder mechanism **114**, and the spraying devices **148**.

[0110] The shredded waste pieces fall down into the waste collection bag **124**. When the waste collection bag **124** is filled, the sensor **164** provides a filled bag signal to the electronic control unit **134**, which sends a signal to a light or sound indicator. The waste liquid or water drains from the waste collection bag **124** into the collection vessel lower portion **118**. The waste liquid or water is pumped by the electronic sump pump **158** via the conduit **126** to a floor drain.

We claim:

1. A waste collection device for collecting waste at a store or retail location, said device comprising:

a stand alone collection vessel configured to shred and disinfect the waste.

2. A device according to claim 1, wherein said collection vessel is configured to remove water or liquid from the waste.

3. A device according to claim 1, including a removable waste container disposed within said collection vessel.

4. A device according to claim 3, wherein said removable waste container is a disposable plastic bag disposed within said removable container.

5. A device according to claim 4, wherein said disposable plastic bag is tagged.

6. A device according to claim 5, wherein said disposable plastic bag is electronically tagged with an RFID.

7. A device according to claim 4, wherein a lower portion of said disposable plastic bag is provided with at least one drain to allow water or liquid from the waste to drain out of said disposable plastic bag.

8. A device according to claim 4, wherein a lower portion of said disposable plastic bag is perforated to allow water or liquid from the waste to drain out of said disposable plastic bag.

9. A device according to claim 1, wherein said collection vessel includes:

a collection vessel top portion;

a collection vessel middle portion configured to receive a removable waste container; and

a collection vessel bottom portion.

10. A device according to claim 9, including a shredder mechanism located below said collection vessel top portion.

11. A device according to claim 9, wherein said collection vessel bottom portion includes a sump.

12. A device according to claim 4, including a transport bag configured to be affixed to said disposable plastic bag.

13. A device according to claim 12, wherein said transport bag is configured to seal said disposable plastic bag inside to prevent drainage of said disposable bag when removing said disposable plastic bag from said collection vessel, and storing and transporting said disposable plastic bag.

14. A device according to claim 10, wherein said collection vessel top portion includes an automated door using a proximity sensor to sense the presence of a user's hand to open and close said automated door.

15. A device according to claim 15, wherein said automated door is provided with an interlock configured so that said shredder mechanism can only operate when said automated door is in a closed and locked position.

16. A device according to claim 15, wherein said interlock includes at least one proximity sensor configured to prevent said shredding device from operation when a user is in proximity to said collection vessel.

17. A device according to claim 1, including a spray device disposed within said collection vessel for spraying disinfectant onto the waste contained within said collection vessel.

18. A device according to claim 3, wherein said waste container is a waste collection bag made of a polymer derived from corn or soybeans.

19. A device according to claim 3, wherein said waste container is a waste collection bag coated or impregnated with a biocide powder which is activated in the presence of liquid or water vapor.

20. A waste recycling system for collecting targeted store waste and maintaining a chain of custody of said targeted waste from collection to recycling, said system comprising: collecting waste in a waste collection device at a retail or store location, said waste collection device configured to treat said waste with a disinfectant and remove water or liquid from said waste.

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