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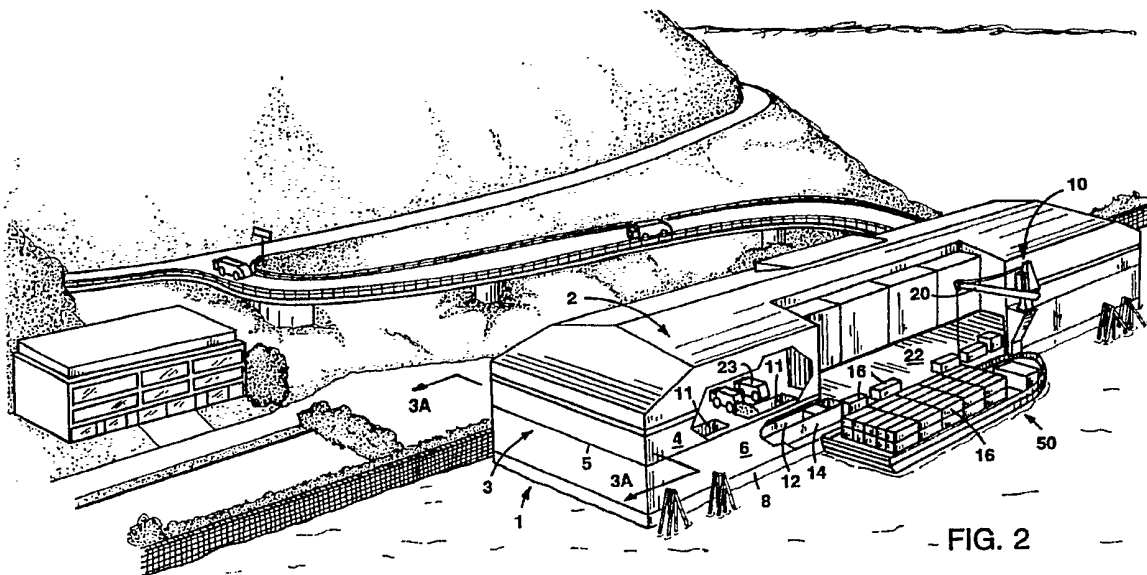
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(54) Disposal of waste

(57) A system is described for processing raw, unprocessed solid waste. A multi-level floating marine vessel 2 is moored alongside a dock. The vessel has a processing deck 6 which receives the solid waste. A compacting device 14 is disposed on the processing deck to compact the raw, unprocessed solid waste. A packing device, disposed on the processing deck packs waste into a standard transport container 16. A container transport vessel 50 is moored adjacent the multi-level floating marine vessel, and containers are loaded from the multi-level floating marine vessel to the container transport vessel through openings in the processing deck, for transport on the transport vessel to a remote site for ultimate disposal. The waste is brought by vehicles onto a tipping deck 4 for delivery via openings 11 to pits 12 on the processing deck 6.



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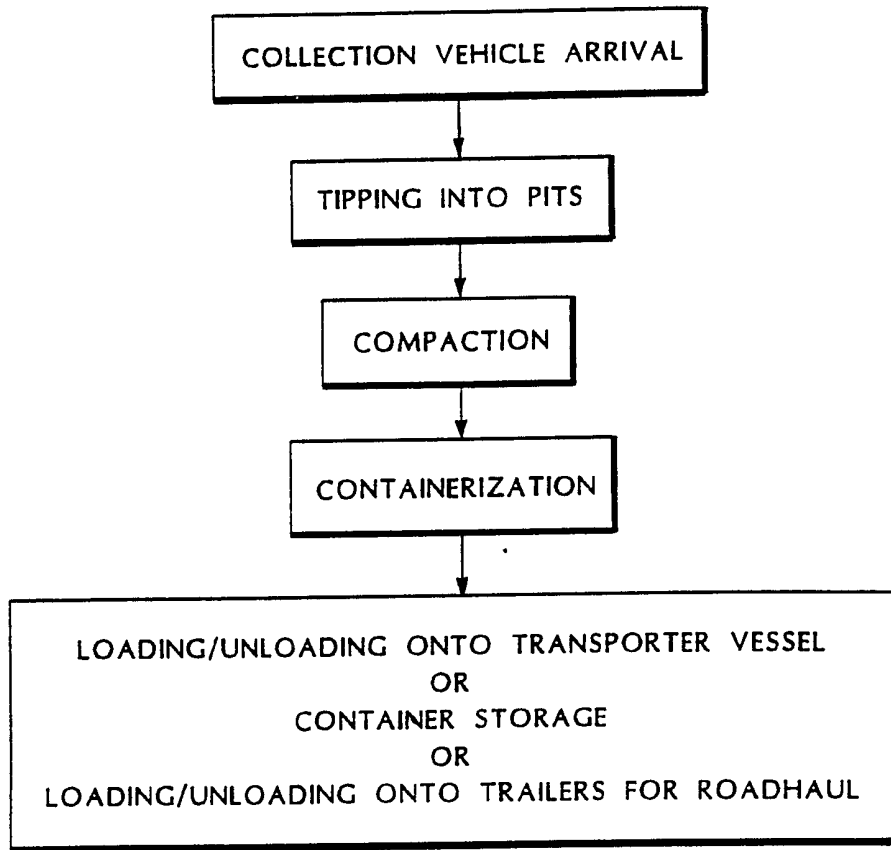


FIG. 1

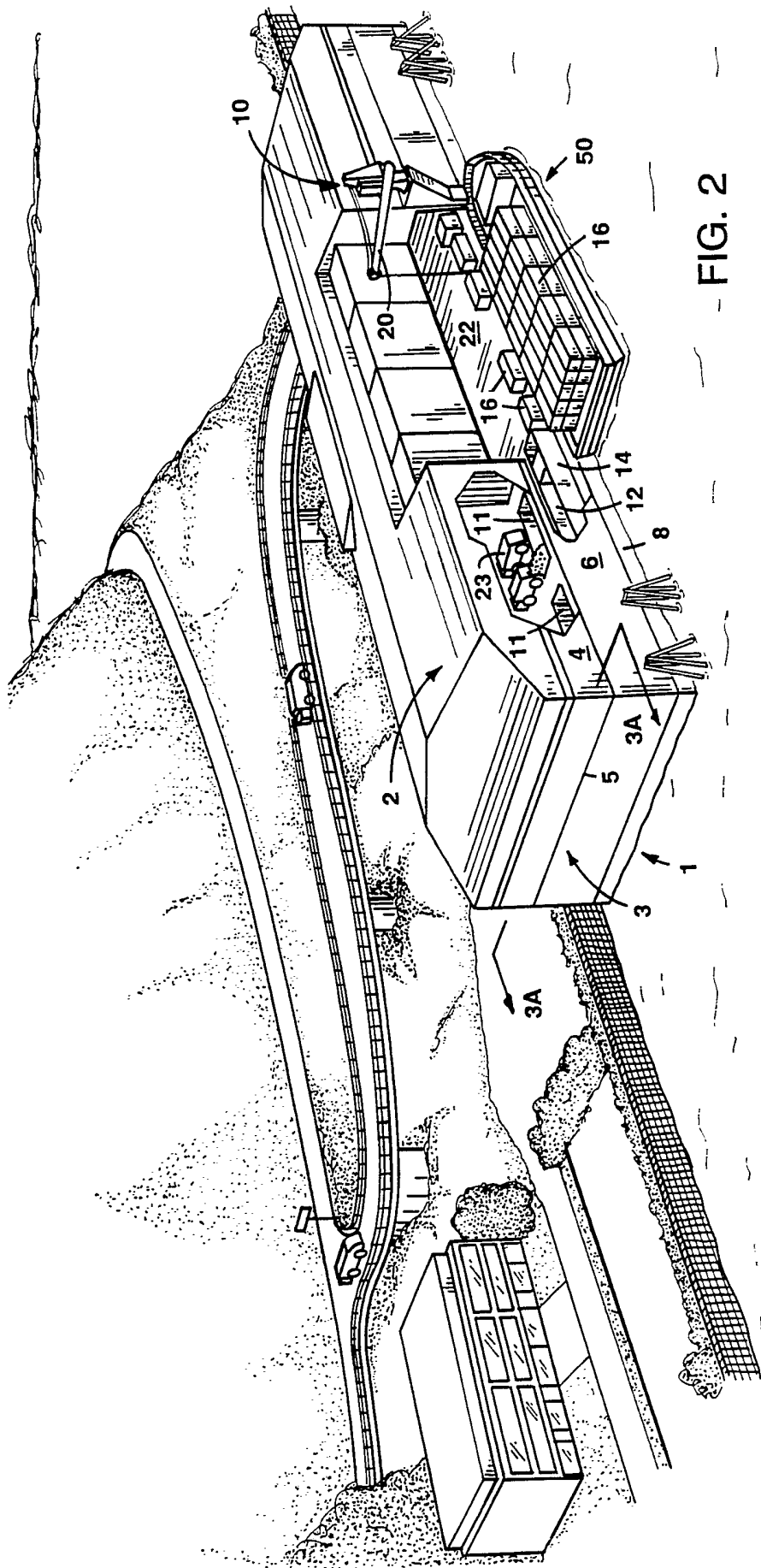


FIG. 2

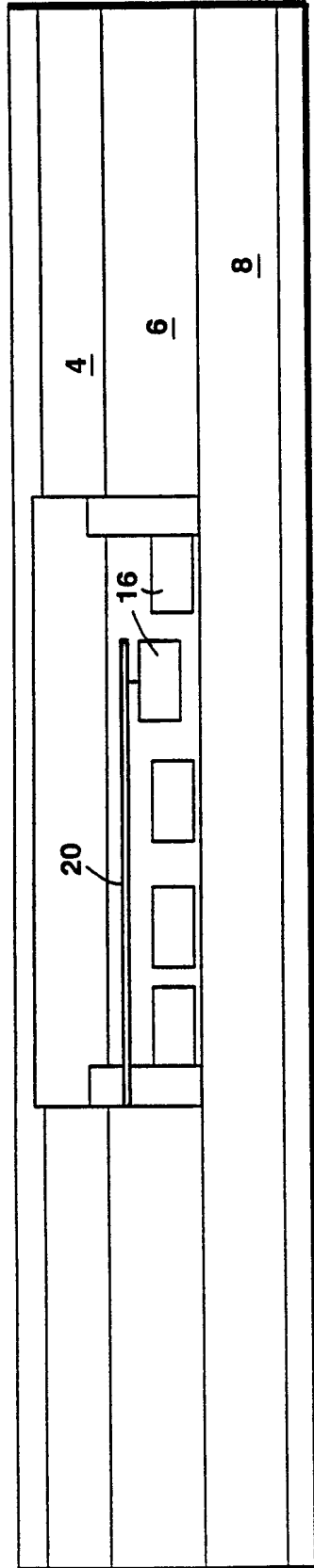


FIG. 3

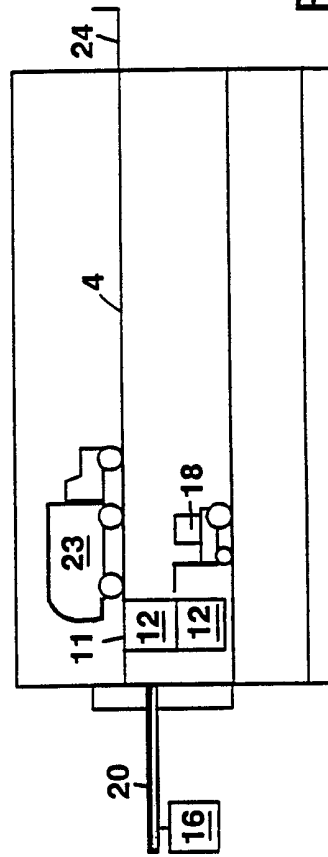


FIG. 3A

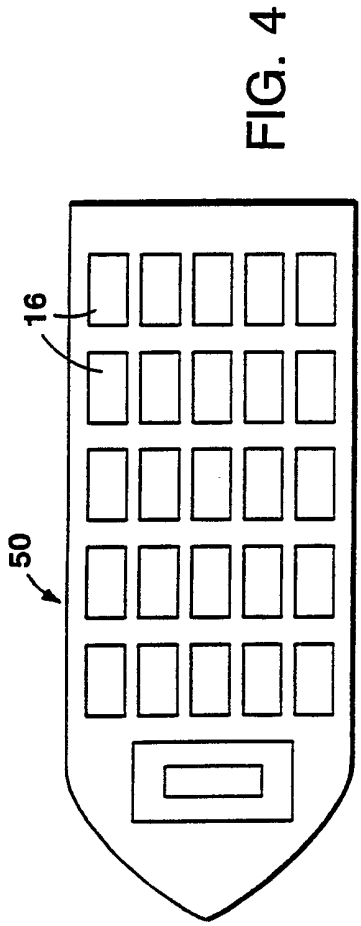


FIG. 4

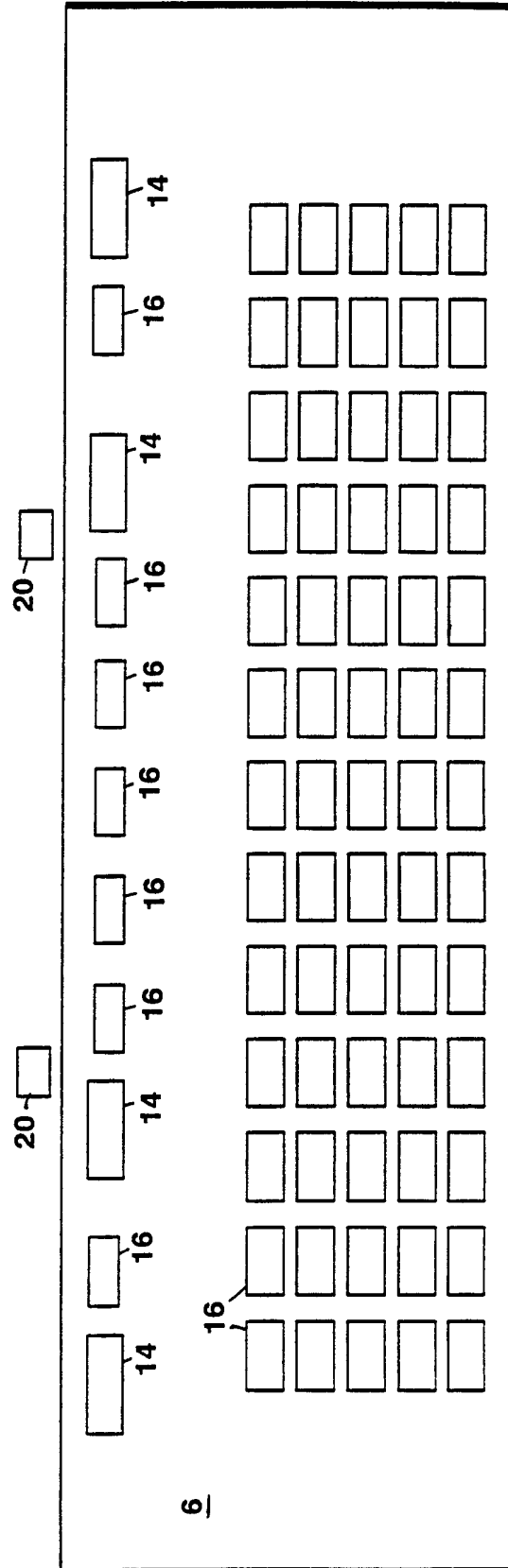


FIG. 5

DISPOSAL OF WASTE

The present invention relates to systems for disposal of solid residential and commercial waste.

Certain coastal and riverine cities are presently using barges to transport residential and commercial solid waste to landfill sites. Large volumes of waste can thus be consolidated in a single barge, allowing the waste to be more efficiently transported than it would be by collection truck. This allows collection trucks to be dedicated to the task for which they are designed, i.e., to continue with their collection activities. Additional coastal cities will most likely utilize this inexpensive method of waste transportation as available landfill sites become more distant.

Barges are typically loaded with solid waste at a marine or riverine transfer station, which is typically an elevated pier (usually enclosed within a building) from which garbage trucks dump their loads directly into a barge. A number of such operations are in place, best represented by the system of marine transfer stations in New York City. In some cities, e.g., London and Hong Kong, solid waste has been containerized at the marine transfer station, and the containers loaded from the pier onto the barge.

In one aspect, the invention features a Marine (which term includes riverine) Based Transfer Station (MARTS), which comprises a multi-level floating marine vessel which is moored alongside a dock. The MARTS includes a processing deck, adapted to receive the solid waste, a compacting device, disposed on the processing deck, for compacting the solid waste, and, a packing device, disposed on the processing deck, for packing the waste into a container.

In preferred embodiments, the vessel further includes a tipping deck above and coextensive with said processing level, a general utilities deck below the processing deck, and a roof above the tipping deck on
5 which empty containers will be stored. The tipping deck preferably has at least one opening which is accessible to the collection vehicles from the dock. The processing deck contains compaction and container loading equipment, and preferably has storage space for empty containers and
10 sufficient empty deck space for forklifts to manoeuvre with both empty and full containers. The processing deck also preferably includes a container loading and unloading dock. One or more cranes are preferably disposed adjacent the loading and unloading dock, to
15 enable containers to be moved to and from a transport barge as well as to and from the compactors.

In another aspect, the invention features a method of transferring solid waste, including the steps of loading the solid waste onto a floating transfer station,
20 compacting the solid waste, packing the compacted waste into a plurality of containers, and, transferring said containers from said floating transfer station to a transport device. The compacting and packing steps take place within the floating transfer station.

25 The MARTS can be readily moored in densely populated waterfront areas, where the siting of a pier-based transfer station would be difficult. The MARTS is ideally suited for major coastal cities because it is space efficient in its design, and, as it is a floating
30 structure, it does not use valuable land. Additionally, the MARTS utilizes the advantages of marine-based transportation, allowing large amounts of waste to be transported by barge, decreasing truck traffic and thereby minimizing the impact of waste removal activities
35 on neighborhoods.

The MARTS can be permanently moored at a desired location. Alternatively, the MARTS can be temporarily moored, allowing it to be moved from one location to another to serve a plurality of locations. This mobility is particularly advantageous when a location requires temporary service due to scheduled or unscheduled unavailability of land-based disposal facilities.

Further, the marine-based MARTS has the capability to self-unload on to transport vessels, trailers for roadhaul or railfloats for barging to a railhead, greatly increasing the efficiency of the waste-handling process.

The invention is hereinafter more particularly described with reference to and as shown in the accompanying drawings, in which:-

Fig. 1 is a flow chart illustrating the movement of waste through a system according to one embodiment of the invention;

Fig. 2 is a schematic perspective view of a floating transfer station, according to one embodiment of the invention, at its mooring site, showing containers being loaded;

Figs. 3 and 3a are, respectively, a waterside view in elevation, and cross sectional view of the floating transfer station of Fig. 2 taken along line A-A of Fig. 2;

Figs. 4 is a top view of the transporter vessel 50 shown in Fig. 2;

Fig. 5 is a plan view of the processing deck of the floating transfer station shown in Fig. 2;

Fig. 6 is a plan view of the tipping deck of the transfer station of Fig. 2; and

Fig. 7 is a top view of the roof storage area of the transfer station of Fig. 2.

In preferred embodiments, the Marine Based Transfer Station is a fully enclosed specially designed barge, e.g., a self-contained steel deckhouse barge 3, as shown schematically in Fig. 2. The barge is preferably a mild steel, longitudinally framed double hull barge with a single flush deck, stiffened with transverse web frames and longitudinal stiffeners. The barge dimensions will depend on the required waste flow capacity. Preferably, the barge measures approximately 50 feet (15.24m) of length and 105 feet (32.004m) of width per each increment of 200 ton (1.81×10^5 Kg) per day capacity. Thus, the standard 1,600 ton (1.45×10^6 Kg) per day barge is 400 feet (121.92m) long and 105 feet (32.004m) in beam. The barge is designed for mooring either substantially parallel to or substantially perpendicular to a pier in protected water.

The barge includes a hull 1, which preferably is a simple rectangular shape, having a flat transom bow and stern. Transverse bulkheads and various flats and compartments may be located within the hull, as is known in the art.

A large deckhouse 2 comprises the upper structure (commonly referred to as the "superstructure") of barge 3. Deckhouse 2 is located on the processing deck 5 and is supported by external webs and internal transverse and longitudinal beams. The deckhouse 2 encloses a tipping deck 4, a process deck 6, and general utilities deck 8. On top of deckhouse 2 is a roof storage area 10. The preferred functions of the various decks are as follows:

<u>DECK</u>	<u>FUNCTION</u>
Roof Storage 10	Container Storage
Tipping Deck 4	Truck Receiving and Tipping, Control Room
Process Deck 6	Compaction and Containerization, Container Storage, Dust/Odor Control Machine Shop, Repair Shop, Offices

Utilities Deck 8 Power Generation Equipment,
Leachate Collection System,
Offices, Machine Shop, Repair Shop

Referring to Fig. 1, a flow chart is shown, illustrating the basic processing steps which solid waste undergoes at the MARTS shown in Fig. 2. These steps will be described in further detail hereinbelow, with reference to Figs. 2-7.

First, collection trucks 23 enter the barge via the access ramp 24, as shown in Fig. 3b. The access ramp 24 is hingedly joined to the tipping deck 4, so that it may be lowered to rest on an elevated roadway leading to the pier (not shown). The elevated roadway typically will rise approximately 25 feet (7.62m) over a length of 210 feet (64.008m) with a 12% grade.

A scale 26 is preferably built into the floor 28 of the tipping deck at the entrance and exit to the barge. After being weighed on scale 26, the collection trucks 23 pull forward along a designated travel lane and back into one of a plurality of tipping bays, as directed by control room and tipping floor personnel.

Waste in the incoming trucks is tipped, through openings 11 in the tipping deck 4, into tipping pits 12. Each tipping pit 12 is preferably approximately 40 feet (12.192m) long and can simultaneously accommodate the waste from several collection trucks. The trucks are preferably of the type which are self unloading, allowing their loads to be tipped directly into the tipping pits. The tipping pits are preferably equipped with a sliding gate on the bottom and a hydraulic wall which work in tandem. The sliding gate opens and the hydraulic wall pushes the waste into the opening, allowing it to fall into the compactors located below.

After tipping their contents into the tipping pits, the collection trucks pull out into the travel lane

and proceed to the barge exit where they are again weighed. The trucks will then exit the barge and drive down the elevated roadway.

The solid waste is fed from the tipping pit to compaction units 14. Preferred compaction units are 1250XHD high density, high volume transfer station compactors, manufactured by Accurate Industries, a Subbury Company, Williamstown, New Jersey. Preferably, the MARTS include four to six compaction units. These compact successive loads of waste into standard shipping containers 16. Each of the compactors will operate independently and be fed by a dedicated tipping pit. Because each tipping station serves a corresponding compactor, maintenance work can be conducted on a single piece of equipment without significantly impeding daily operations and impacting the daily throughput.

Two different methods are available for compaction. The waste may be either hydraulically pushed into and compacted directly in a container, or compacted directly within the compactor and then pushed in the form of a compacted slug into a container. The compactors are preferably equipped with hydraulic grabs which pull the container against the mouth of the compactor. The containers are preferably hermetically sealed units which do not allow odors, liquids or waste to escape.

Next, the containers of compacted waste are moved to a loading/unloading area 22, e.g., by forklift. Two cranes 20 are preferably mounted on the MARTS, one on either side of the container loading/unloading area 22, as shown in Fig. 4. Cranes 20 are used to move the loaded containers onto a container transporter vessel 50 (see Fig. 4) either directly from the compactors or from one of the container loading/unloading positions in the container loading/ unloading area. A preferred crane is the Type GL3632-2 crane, commercially available from

Hagglunds, Inc., Montvale, New Jersey. Transporter vessel 50 then typically takes the containers to another site, at which they may be transferred to trailers and tipped into a landfill.

5 Cranes 20 may also be used to move empty containers from the transporter vessel to the MARTS container loading and unloading dock, to the compactors and to the roof of the MARTS for additional storage. The cranes are also preferably capable of lifting forklifts
10 on and off of the MARTS as well as from deck to deck.

 The containers are typically moved from the crane loading areas to the compactors and to the container storage areas within the MARTS by forklifts 18. The forklifts move the containers to the loading/unloading
15 area where the transporter crane lifts full containers and places them on the transporter vessel. The forklifts may also be used to position the containers in front of the two compaction units nearest the crane loading area, although the compactors are preferably positioned on the
20 MARTS to allow the containers to be directly positioned by crane.

 Containers are primarily stored on the processing deck; additional empty containers may be stored above the tipping deck on the roof. Containers may be moved by
25 crane or forklift, as described above, or, on the deck of the barge, by an automated container handling system using floor mounted rollers or by an overhead rail system.

 The portion of the roof that is immediately above
30 and adjacent to the open portion of the tipping deck, above the container loading and unloading dock portion of the processing deck, preferably includes a plurality of hatch covers 30. Hatch covers 30 may be opened to allow containers to be lifted by crane from the processing deck
35 to the tipping deck and loaded onto trailers, allowing

containerized waste to be transported by truck, if necessary. The side walls of the tipping deck overlooking the container loading/unloading area are also typically opened during this procedure.

CLAIMS

1. A method of disposing of raw, unprocessed residential and commercial solid waste comprising the steps of: loading the solid waste on to a floating transfer station; compacting the raw, unprocessed solid waste; packing the compacted waste into a plurality of standard transport containers; said compacting and packing steps taking place within said floating transfer station; and transferring said containers from said floating transfer station to a transport device for ultimate disposal of the compacted waste at a remote site.

2. A method according to Claim 1, wherein said floating transfer station comprises a top level deck which receives said solid waste.

3. A method according to Claim 2, wherein the solid waste is dumped through openings in said top level deck into a tipping pit, said tipping pit being in communication with a compactor.

4. A method according to Claim 1, wherein said compacting and packing steps are performed on at least one lower deck of said floating vessel.

5. A method according to any preceding claim, wherein said transport device is a transport vessel moored adjacent to the floating transfer station.

6. A method according to any of Claims 1 to 4, wherein said transport device is a container truck.

7. A method according to any preceding claim, further comprising the step of storing said containers on the

floating transfer station prior to transferring the containers to the transport device.

8. A method according to any preceding claim, further comprising the step of moving the containers within the floating transfer station by crane.

9. A method according to any of Claims 1 to 7, further comprising the step of moving the containers within the floating transfer station by an automated container handling system.

10. A method according to any preceding claim, wherein said containers are transferred from the floating transfer station to the transporter device by crane.

11. A floating marine transfer station for processing raw, unprocessed solid waste and transferring the same, comprising a multi-level floating marine vessel which has a processing deck adapted to receive the solid waste, a compacting device disposed on said processing deck for compacting said raw, unprocessed solid waste, and a packing device disposed on said processing deck for packing waste into a standard transport container.

12. A transfer station according to Claim 11, wherein said vessel has a general utilities deck below said processing deck.

13. A transfer station according to Claims 11 or 12, wherein said vessel has a tipping deck above and coextensive with said processing level.

14. A transfer station according to Claim 13, wherein said vessel has a roof above the tipping deck on which empty containers will be stored.

15. A transfer station according to Claims 13 or 14, wherein said tipping deck has a roof with hatch covers through which containers can be loaded on to trailers.

16. A transfer station according to any of Claims 13, 14 or 15, wherein said tipping deck has a pair of side openings through which solid waste collection vehicles can enter prior to, and exit after unloading.

17. A transfer station according to any of Claims 11 to 16, wherein the vessel is adapted to float so as to maintain the processing deck above the water line.

18. A transfer station according to any of Claims 11 to 17, wherein the waste is compacted directly into the container.

19. A transfer station according to any of Claims 11 to 17, wherein the waste is compacted prior to packing into the container.

20. A system for processing and disposing of raw, unprocessed solid waste, comprising: a dock; a multi-level floating marine vessel moored adjacent said dock, said multi-level floating marine vessel having a processing deck adapted to receive the solid waste, a compacting device disposed on said processing deck for compacting said raw unprocessed solid waste, and a packing device disposed on said processing deck for packing waste into a standard transport container; and a container transport vessel moored adjacent said multi-level floating marine vessel for transport of compacted waste to a remote site for ultimate disposal; said processing deck having openings dimensioned to allow said container to be loaded from said multi-level floating marine vessel to said container transport vessel.

21. A system according to Claim 20, wherein said marine vessel further comprises a general utilities deck located below the processing deck on the vessel.

22. A system according to Claim 20 or 21, wherein said marine vessel further comprises a tipping deck located above and approximately coextensive with said processing deck on the vessel, said tipping deck having at least one opening accessible from the dock for loading solid waste onto the vessel.

23. A system according to Claim 22, wherein said tipping deck and processing deck openings are accessible to the movement of containers.

24. Substantially as hereinbefore described with reference to the accompanying drawings, a method of disposing of raw, unprocessed residential and commercial solid waste.

25. A floating marine transfer station for processing raw, unprocessed solid waste and transferring the same, substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

26. A system for processing and disposing of raw, unprocessed solid waste, substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

Relevant Technical Fields

- (i) UK Cl (Ed.M) B8E, B8Q (Q4A, Q4C)
- (ii) Int Cl (Ed.5) B65F 9/00

Search Examiner
 D MCMUNN

Date of completion of Search
 19 OCTOBER 1994

Databases (see below)

(i) UK Patent Office collections of GB, EP, WO and US patent specifications.

Documents considered relevant following a search in respect of Claims :-
 1-26

(ii) ONLINE DATABASES: WPI

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- X: Document indicating lack of novelty or of inventive step. P: Document published on or after the declared priority date but before the filing date of the present application.
- Y: Document indicating lack of inventive step if combined with one or more other documents of the same category. E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.
- A: Document indicating technological background and/or state of the art. &: Member of the same patent family; corresponding document.

Category	Identity of document and relevant passages	Relevant to claim(s)
Y	GB 2259510 A (FES) see whole document	1-13,16-22
Y	GB 2118149 A (AMEY RONDSTOM) see particularly lines 14-20 page 1	1-5,7-13, 16-22
&, Y	US 5148758 (FES) see whole document	1-13,16-22
Y	US 3962965 (BENNES MARREL) see whole document	1-4,6-13, 16-12

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