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(54) AUTONOMOUS CONTAINER WITH SOLID WASTE COMPACTING SYSTEM

(57) The present invention discloses a container with a solid waste compaction system comprising hoisting means (1) for hoisting the container by means of a loading arm of a waste collector vehicle or equivalent hoisting device having one or several openings (2) for waste material disposal, and a rear door (3) for residue discharge, further comprising one or several drums (4) for residue deposition and waste compression mechanism(s) (5) in each drum. The solar panels (7) installed serve the purpose of supplying the electro-hydraulic compression mechanisms (5) and charging electrical power accumulators. The system is then provided with great operation autonomy, and may be complemented with generator groups or wire connection to the mains network.

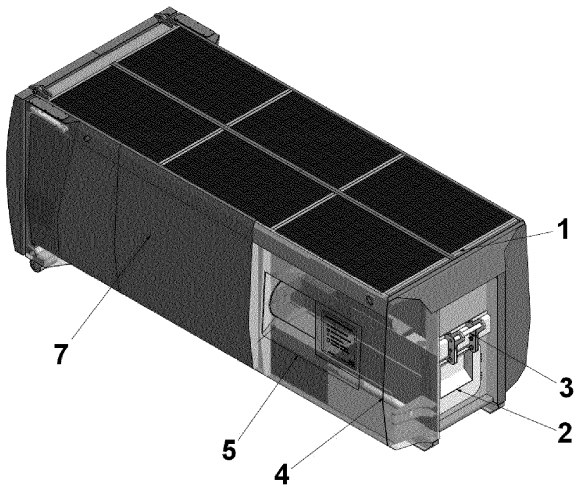

Figure 4

EP 2 617 560 A1

Description

1. Introduction

[0001] The present equipment is designed with the purpose of solving several problems arising from daily need towards urban solid waste collection, either of undifferentiated or recycled nature.

[0002] A great deposition capacity, safety, polyvalence, and mobility, together with low acquisition and exploitation costs, turn this equipment into the ideal solution for several applications such as: urbanizations, villages and small interior towns, beaches, camping sites, holiday resorts, street markets, concerts or summer festivals, football stadiums, central discharge sites for large city sweeping, ecopoints for locations with large waste volumes.

[0003] The present equipment is intended to be conveyed in vehicles equipped with loading arms according to DIN 14505 and 30722, commonly known as "polibennes", DIN 30720 commonly known as "multibennes" or similar thereto.

2. Presentation

[0004] Recently, a propensity towards increasing the storage capacity within collection points has been registered within the scope of urban solid waste collection, due to the fact that population density has increased within urban zone, but also due to a necessity towards collection circuit rationalization.

[0005] The protection of stored waste material is also fundamental, avoiding the action of "garbage removing individuals" and animals, which disperse the waste material thus hindering its collection.

[0006] The equipment herein disclosed, besides comprising these two characteristics, allows compacting deposited waste, in as much as it incorporates an electro-hydraulic compression mechanism (5). Up to such point, there is nothing new, the waste compactor already exists for a long time, but it has the inconvenience of requiring an electrical connection to the mains network, which limits its use in public road, not only due to the requirement for an electrical connection point, but also due to the danger inherent to its presence.

[0007] This equipment is above all innovative in its power autonomy, which has so far always been the greatest obstacle to the use of compactors in public road.

[0008] The main action herein undertaken was to reassess and resize power requirements, thus adapting the hydraulic group (6) and compression mechanism (5) to work at low voltage, and allowing it to be supplied by solar panels. The present mechanism is autonomous, waiving from an electrical connection to the mains network and operating at low voltage. This way, autonomy, mobility, high collection and safety rates are achieved.

[0009] In order to increase its polyvalence and adaptability, the present equipment can have a connection to the mains network, a diesel or gasoline generator, and adjustable solar panels.

Brief description of the Drawings

[0010] For an easier understanding of the invention, drawings are herein attached, which represent preferred embodiments of the invention which, however, do not intend to limit the scope of the present invention.

Figure 1 represents a perspective view of an autonomous container with solid waste compaction system according to the present invention. The reference numbers refer to the following elements:

1 - hoisting means;
2 - openings for waste material disposal;
3 - rear door;
4 - drum;
5 - compression mechanism;
6 - hydraulic group;
7 - solar panels;
8 - volume of compressed matter;
9 - dashboard protection door;
10 - double-effect cylinders for door opening and closing.

Figure 2 represents a partially cross-sectional perspective view, wherein the inner compaction mechanism is to be observed within the drum with the respective pneumatic cylinder, as well as the storage volume of compressed waste.

Figure 3 represents the diagram of the control electro-hydraulic circuit of compaction cylinder, as well as of the opening and closing of the container door (3), wherein one may observe that the compaction cylinder control and the door opening and closing cylinder control are carried out by two electrovalves which are controlled by the programmable automate. The reference numbers refer to the following elements:

11 - double-effect cylinder for compaction;
12 - electrovalve for door control;
13 - electrovalve for compactor directional control;
14 - electrovalve for rear door control;
15 - pump;
16 - pressure controller;
17 - pressure regulators within the compaction cylinder circuit;
18 - valve for unidirectional control.

Figure 4 represents a perspective view of an autonomous container comprising solid waste compaction system according to the present invention. The reference numbers refer to the following elements:

1 - hoisting means;
2 - openings for waste material disposal;
3 - rear door;
4 - drum;
5 - compression mechanism;
7 - solar panels;

3. Characteristic

[0011] The base equipment consists of a container comprising the following main elements:

- Drum(s) (4)
- Compression mechanism (5)
- Solar panels (7)
- Accumulators
- Accumulator charge regulator
- Electro-hydraulic group(6)
- Power and control electrical switchboard panel (protected by an anti-vandalism door)
- Protection door (9) for the switchboard panel.

[0012] The equipment was designed for public road assembly, being exempt from access restrictions towards its use. The arrangement of control elements shall be as high as to allow their operation exclusively by adults, although their use by children is not problematic.
[0013] Its operation is extremely simple, its control being carried out automatically, preferably by a programmable automate. A set of instructions transmitted by light signs (LEDs) has been designed in order to simplify first-time use, namely:

Information

- Green sign - Operational equipment;
- Yellow sign - Equipment in operation;
- Red sign - Equipment out of service (for example, upon accumulator discharge or waste material overload).

Operation

- Upon green light, press the black button to open the drum.
- Raise the drum and deposit the waste material bag;
- Close of the drum.

[0014] In its preferred embodiment, the container has a 5.5 m length, a 2.5 m width and a 2.2 m height, and each drum has a 0.470 m diameter, a 0.730 m length and consequently a capacity of about 130 liters.
[0015] The volume of compressed matter storage (8) has a variable capacity of 12-30 m^3.

4. **Operation**

[0016] The equipment is arranged on public road, for instance, a garden, or parking site, wherein it may receive sun light for the longest time possible, and since it is of constant charge, it is then previously charged.
[0017] Users shall then proceed with waste material depositing, thus following the above-mentioned procedure, until the waste material accumulated within the container causes an increase on compaction pressure up to 3/4 of its utmost limit, the same being detected by a pressure detector. At this point a SMS is automatically sent to the central (via modem-based communication system), reporting that the equipment has reached 3/4 of its utmost capacity thus being necessary to proceed with its removal. Upon continuous use, the equipment will eventually reach its utmost operational pressure, which will cause both the deposition drum (4) to stop, upon actuation of the red sign indicating the state of the equipment, and a further SMS to be sent to the central informing that the equipment is full.
[0018] In the case of the compacting cycle taking longer than expected, the equipment actuates the red sign and a SMS is sent to the central reporting that the equipment is faulty. Should the battery charge be lower to a preset level, a SMS is sent reporting low charge.
[0019] Once full, the equipment is collected and taken to unload at an appropriate site for such purpose. The hydraulic opening of the rear door (3) allows an easy discharge in landfill or recess tank sites.
[0020] Despite the system being particularly simple such that a failure probability is extremely reduced, an option for internal connection of a parallel supplying system is provided for operation with the equipment.
[0021] The panels used shall be of higher quality and resistance, including stone projection resistance. Either way, the panels are arranged such that they are hardly visible and are protected against vandalism or theft.
[0022] This equipment can be designed for simple or bi-flux housing, for such being provided with two independent compression mechanisms and two independent containers for use, for example, in paper/cardboard compaction, on the one side, and packaging on the other side.
[0023] The following claims represent further preferred embodiments of the present invention.

Claims

1. Container with solid waste compaction system comprising hoisting means for hoisting the container by means of a loading arm of a waste collector vehicle or equivalent hoisting device, **comprising** the following elements:

   • one or several drums (4) provided with a lid which is opened for residue deposition;
   • a compression mechanism (5) with a compres-

sion cylinder (6), preferably an hydraulic cylinder, in each drum (4);
• one or several solar panels (7) serving the purpose of supplying the electro-hydraulic compression mechanism(s), which supplies electrical power accumulators, the energy supplied by the solar panels being sufficient to act upon the compression mechanism (5), drum (4), and also upon the door opening and closing cylinders (3) for container evacuation,
thus assuring the container's energetic autonomy.

2. Container with solid waste compaction system according to claim 1, **wherein** it is provided with an electrical connection to the mains network allowing either the container to be supplied with electrical power or the accumulators to be charged.

3. Container with solid waste compaction system according to claim 1, **wherein** it is provided with a diesel or gasoline generator, which allows either the said container to be supplied with electrical power or the accumulators to be charged.

4. Container with solid waste compaction system according to the preceding claims, **wherein** it is provided with a set of light signs which supply information on the state of the equipment.

- Green sign - Operational equipment;
- Yellow sign - Equipment in operation;
- Red sign - Equipment out of service.

5. Container with solid waste compaction system according to the preceding claims, **comprising** the following operation steps:

- Upon green light, pressing the black button to open the drum;
- Depositing the waste material bag;
- Closing of the drum;
- Compacting.

6. Container with solid waste compaction system according to the previous claim, **comprising** a pressure detector and a communication system, wherein the communication system sends a message to a central control system, when the pressure detector registers ¾ of the utmost pressure in the compression system.

7. Container with solid waste compaction system according to claim 6, **wherein** when the pressure detector reaches utmost pressure, the equipment is automatically stopped and/or a message is sent.

8. Container with solid waste compaction system according to claim 4, further **comprising** a temporizer, which, when the compacting cycle takes longer than anticipated, it stops the equipment thus actuating the red light and sending a SMS to the central reporting that the equipment is faulty.

9. Container with solid waste compaction system according to claim 4, **comprising** a battery charge controller, which, when the charge within the batteries is lower to a preset limit thus hindering the compactor operation, actuates the red light and sends a SMS to the central reporting low charge.

10. Container with solid waste compaction system according to claim 1, **comprising** a charge regulator for the accumulators and a power and control electrical switchboard panel.

11. Container with solid waste compaction system according to claims 5 to 10, **wherein** door opening and closing cylinder (3) control and compaction cylinder (6) control are carried out, respectively, by means of two electrovalves (12, 13) which act upon double-effect cylinders (10, 11), which operate respectively for the actuation of the door (3) and compaction cylinders (6), the valves being controlled by an automatic control system, preferably a programmable automate.

12. Container with solid waste compaction system according to claim 1, **wherein** in its preferred embodiment, it has a 5.5 m length, a 2.5 m width and a 2.2 m height, and each drum (4) has a 0.470 m diameter, a 0.730 m length and consequently, a drum (4) capacity of about 130 liters.

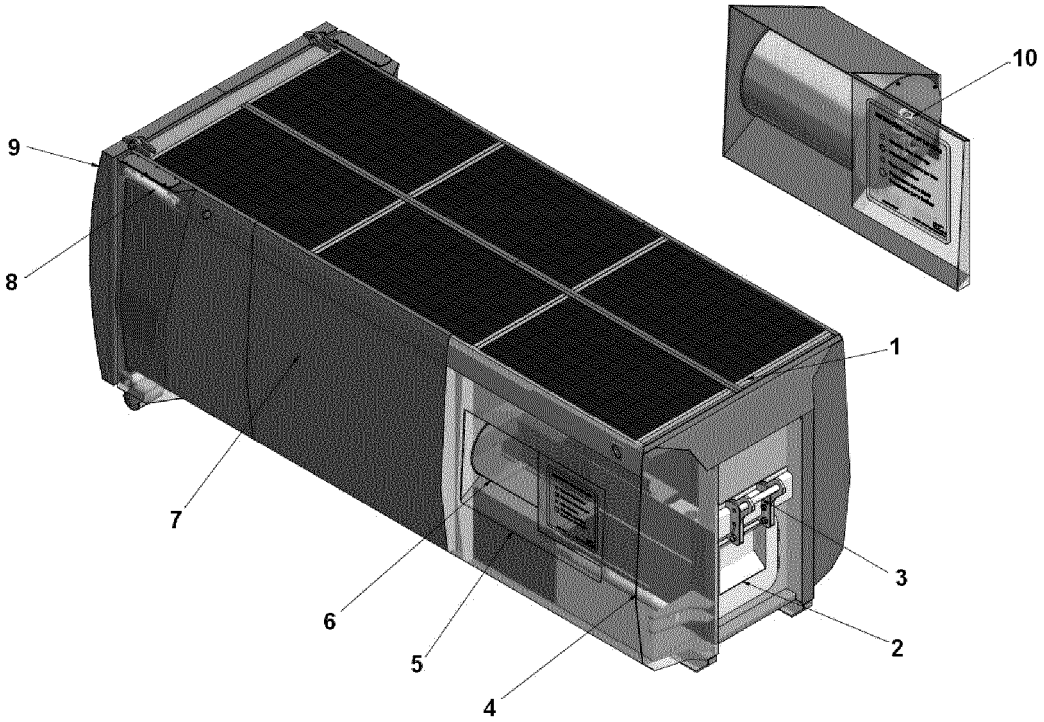

Figure 1

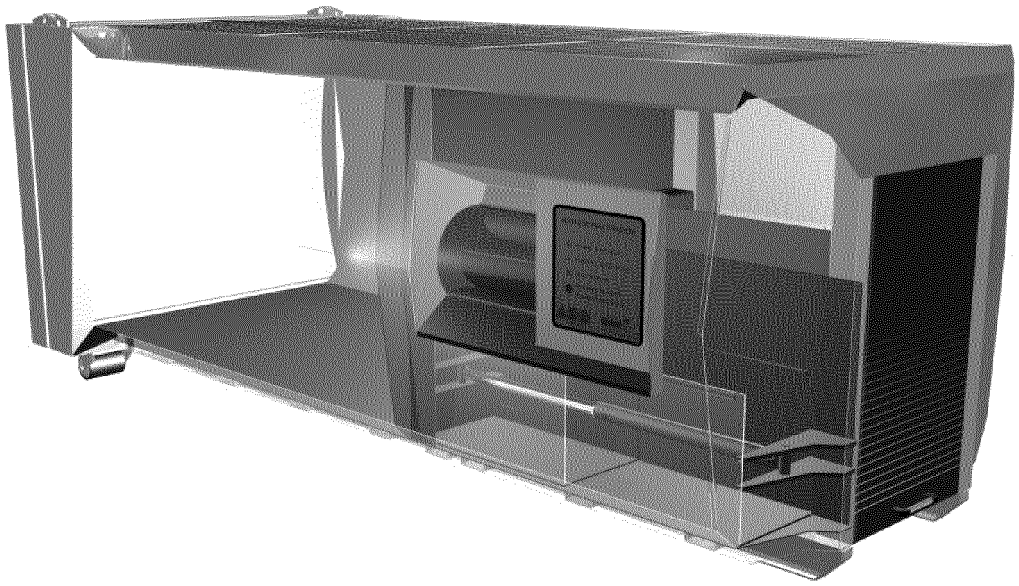

Figure 2

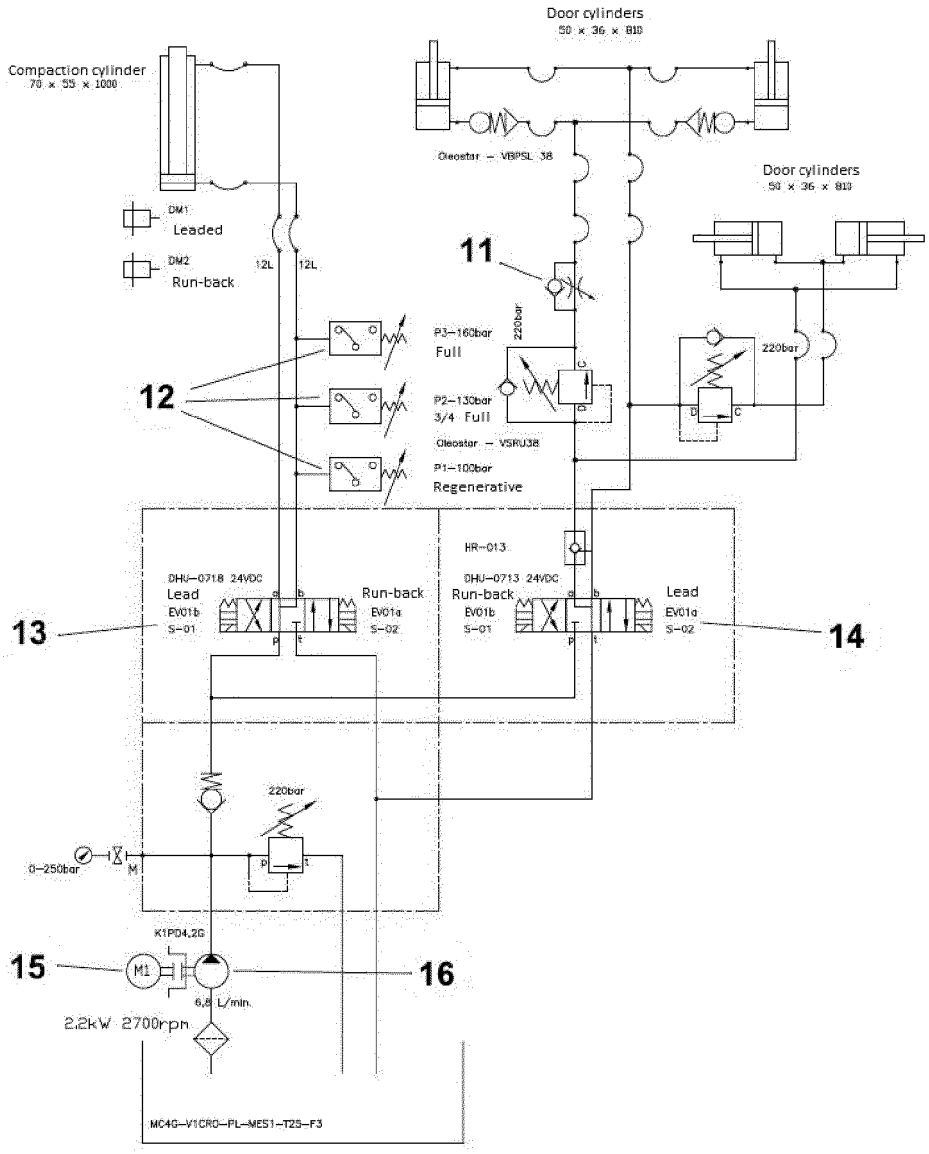
Door cylinders
50 x 36 x 810
Compaction cylinder
70 x 55 x 1000
Oleostar – VBPSL 38
Door cylinders
50 x 36 x 810
DM1
Leaded
DM2
Run-back
12L
12L
11
P3–160bar
Full
220bar
12
P2–130bar
3/4 Full
Oleostar – VSRU38
P1–100bar
Regenerative
220bar
HR–013
DHU–0718 24VDC
Lead
EV01b
S–01
Run-back
EV01a
S–02
DHU–0713 24VDC
Run-back
EV01b
S–01
Lead
EV01a
S–02
13
14
220bar
0–250bar
K1PD4,2G
15
M1
16
6,8 L/min.
2,2kW 2700rpm
MC4G–V1CR0–PL–ME51–TZS–F3

Figure 3

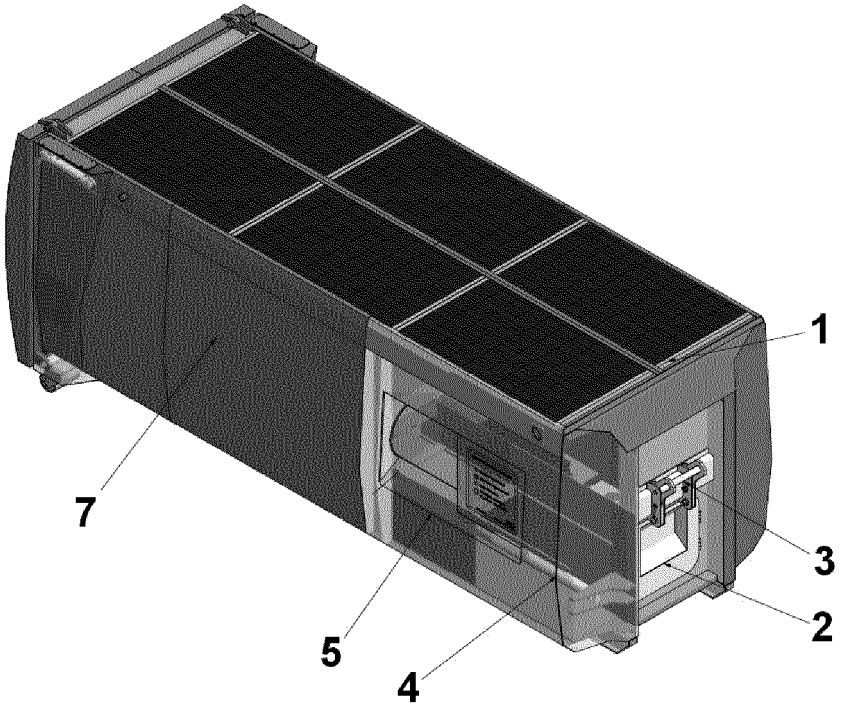

Figure 4

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2011/053945

A. CLASSIFICATION OF SUBJECT MATTER
INV. B30B9/30
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)
B30B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Y	US 5 348 125 A (STRIBLING ROBERT [US]) 20 September 1994 (1994-09-20) abstract; figures	3
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Y	US 7 481 160 B1 (SIMON JAY S [US] ET AL) 27 January 2009 (2009-01-27) column 5, line 50 - line 57; claims; figures	6-9,12

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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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

Date of the actual completion of the international search	Date of mailing of the international search report
8 December 2011	16/12/2011

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Bélibel, Chérif

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INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2011/053945

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
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