



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
02.08.2017 Bulletin 2017/31

(51) Int Cl.:
B65F 1/14 (2006.01)

(21) Application number: **17153142.9**

(22) Date of filing: **25.01.2017**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
MA MD

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(30) Priority: **26.01.2016 IT UB20160417**

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(54) **APPARATUS FOR THE COLLECTION AND COMPACTION OF WASTE**

(57) An apparatus (1) for the collection and compaction of waste (4), comprising at least a collection chamber (2) having at least one input compartment (3) for the waste (4), and compacting means (9, 10) associated with

said collection chamber (2) and adapted to compact the waste (4) contained within the collection chamber (2) it-self.

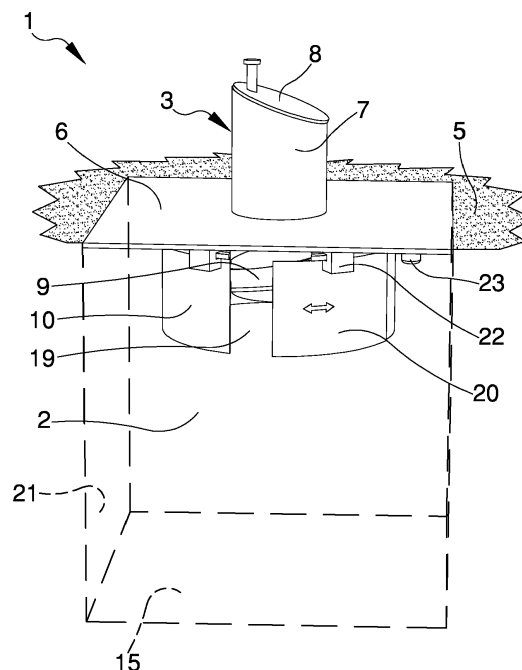


Fig.1

Description

[0001] The present invention relates to an apparatus for the collection and compaction of waste.

[0002] To date, wastes are collected in specific containers, so-called "bins", comprising a collection chamber having at least a waste input compartment.

[0003] Consumers introduce the wastes, through the input compartment, inside the collection chamber letting them fall by gravity inside the latter.

[0004] The wastes, falling freely, are collected in a disorderly manner which results in a large loss of space inside the collection chamber.

[0005] This causes a considerably shortening of the filling times of each bin, resulting therefore in frequent emptying operations of the collection chamber.

[0006] In order to reduce the number of such emptying operations, the bins are generally positioned in long rows along roadsides or in special areas nearby inhabited urban areas, negatively affecting the aesthetic impact of such areas where the presence of numerous bins or waste unloading areas often becomes a sign of degradation and untidiness.

[0007] To overcome such problems, at least in part, another type of bin is known which has the collection chamber buried underneath the road surface.

[0008] Nevertheless, although there is a considerable reduction in the aesthetic impact of the bins on the nearby urban area, waste collection does in any case occur by free fall of these through the entry compartment located above the road surface.

[0009] In the same way as the first type of known bins, in this case too, the free fall of wastes causes a big waste of space inside the collection chamber, and requires frequent emptying operations.

[0010] The main aim of the present invention is to provide an apparatus for the collection and compaction of waste which permits optimizing the space inside the collection chamber, thus extending the filling times of the collection chamber itself.

[0011] Another object of the present invention is to provide an apparatus for the collection and compaction of waste which allows considerably reducing the number of the emptying operations of the collection chamber.

[0012] Another object of the present invention is to provide an apparatus for the collection and compaction of waste which allows overcoming the mentioned drawbacks of the prior art within the ambit of a simple, rational, easy, effective to use and affordable solution.

[0013] The above mentioned objects are achieved by the present apparatus for the collection and compaction of waste having the characteristics of claim 1.

[0014] Other characteristics and advantages of the present invention will become more evident from the description of a preferred, but not exclusive, embodiment of an apparatus for the collection and compaction of waste, illustrated by way of an indicative, but non-limiting example in the accompanying drawings, wherein:

Figure 1 is a front view of the apparatus according to the invention in a first operating configuration;

Figure 2 is a front view of the apparatus according to the invention in a second operating configuration;

Figure 3 is a sectional view of the apparatus according to the invention;

Figures 4-7 are schematic representations of the device according to the invention at work.

[0015] With particular reference to such illustrations, reference number 1 globally indicates an apparatus for the collection and compaction of waste.

[0016] The apparatus 1 comprises a collection chamber 2 having an input compartment 3 for the wastes 4.

[0017] With reference to the particular embodiment shown in the illustrations, the collection chamber 2 is buried, i.e., it is positioned underneath the road surface 5, and the input compartment 3 of the wastes 4 is arranged on the surface, i.e., above the road surface 5.

[0018] Alternative embodiments cannot however be ruled out in which the collection chamber 2 is arranged on the surface, i.e., above the road surface 5.

[0019] The collection chamber 2 can have variable shapes and dimensions depending on the types of ground in which it is buried or on the different types and forms of urban areas in which it is placed.

[0020] For example, particular embodiments cannot be ruled out in which the collection chamber 2 has a substantially cylindrical conformation.

[0021] The collection chamber 2 comprises an upper closure wall 6 defining the input compartment 3.

[0022] In a preferred embodiment shown in the illustrations, the input compartment 3 has a substantially cylindrical conformation.

[0023] In the present case, the input compartment 3 comprises a main body 7 which extends above the road surface 5 and with which is associated a closure element 8 openable and closable by an operator.

[0024] According to the invention, the apparatus 1 comprises compacting means 9, 10 associated with the collection chamber 2 and adapted to compact the wastes 4 contained within the collection chamber itself.

[0025] The compacting means 9, 10 comprise a helical element 9 and a drum element 10 surrounding the helical element 9.

[0026] As can be seen in the illustrations, the helical element 9 winds around a central axis A passing through the collection chamber 2; such winding defines an inner transit area 11 of the wastes 4.

[0027] The inner transit area 11 has a substantially frusto-conical section.

[0028] Furthermore, the inner transit area 11 is delimited laterally by a wall 12 and by a bottom portion 13 at the bottom.

[0029] The wall 12 has a curvilinear profile and a longitudinal extension substantially inclined with respect to the central axis A.

[0030] It is useful to point out that in the present dis-

cussion by the wording "substantially inclined longitudinal extension" is meant that the wall 12 is arranged neither horizontally nor vertically with respect to the central axis A.

[0031] The wall 12 has a transit opening 14 adapted to allow the direct passage of the wastes 4 from the input compartment 3 to the collection chamber 2.

[0032] The drum element 10 is movable in rotation around the helical element 9 to drag the wastes 4 towards the bottom 15 of the collection chamber 2.

[0033] In detail, the drum element 10 is movable in rotation around the central axis A.

[0034] Advantageously, the helical element 9 and the drum element 10 are contained at least partly in the collection chamber 2 and extend up to a predefined height 16 within the collection chamber itself.

[0035] Preferably, the drum element 10 and the helical element 9 are coaxial to one another.

[0036] In detail, the drum element 10 and the helical element 9 are associated with the closure wall 6.

[0037] The apparatus 1 comprises a plurality of grip elements 17 associated with the drum element 10 and adapted to allow the dragging of wastes 4 following the rotation thereof with respect to the helical element 9.

[0038] In detail, the grip elements 17 are defined on the inner surface 18 of the drum element 10 facing towards the helical element 9.

[0039] As is visible in the illustrations, the grip elements 17 are formed projecting from the inner surface 18 and extend longitudinally substantially inclined, i.e. neither horizontally nor vertically, with respect to the central axis A of the drum element 10.

[0040] It is easy to understand that the presence of the grip elements 17 together with the fact that the drum element 10 is movable in rotation allows the compaction of the wastes 4 by rototranslation thereof.

[0041] Alternative embodiments cannot however be ruled out wherein the grip elements 17 are provided with a plurality of hook-shaped elements adapted to promote hooking onto and dragging the wastes 4 towards the bottom of the collection chamber 2.

[0042] The drum element 10 comprises an output compartment 19 for the wastes 4 adapted to allow the direct passage of the wastes 4 at input from the input compartment 3 into the collection chamber 2.

[0043] The output compartment 19 comprises a closure partition 20 movable with respect to the drum element 10 between an inactive position (Figures 1, 4, 5 and 7) wherein the output compartment 19 is opened and a work position (Figures 2 and 6) wherein the output compartment 19 is closed.

[0044] The closure partition 20 is associated with the drum element 10 by interposition of hooking means, not shown in the illustrations, and adapted to allow the movement of the closure partition 20.

[0045] The hooking means are of the type known to the expert in the sector and, for example, comprise a pin element insertable in a respective housing seat provided

with a guiding section which facilitates insertion thereof in the latter.

[0046] With reference to the particular embodiment shown in the illustrations, the closure partition 20 is arranged outside the drum element 10; this means that it is placed on the face of the drum element 10 turned towards the inner walls 21 of the collection chamber 2.

[0047] Alternative embodiments cannot however be ruled out wherein the closure partition 20 is associated with the face of the drum element 10 turned towards the helical element 9.

[0048] With reference to the particular embodiment shown in the illustrations, the drum element 10 comprises a plurality of supporting and balancing elements 22.

[0049] The supporting and balancing elements 22 are associated with the drum element 10 in the proximity of the closure wall 6 and are adapted to allow the axial rotation of the drum element itself around the central axis A.

[0050] In other words, the supporting and balancing means are adapted to prevent the drum element 10 from rotating in an off-axis manner.

[0051] Furthermore, the apparatus 1 comprises motor means 23 for setting the drum element 10 in rotation and for moving the closure partition 20.

[0052] Preferably, the motor means 23 are of the electric type.

[0053] Alternatively, the motor means 23 can be of the hydraulic type.

[0054] The apparatus 1 comprises supply means, not shown in the illustrations, and adapted to supply the motor means 23.

[0055] Preferably, these supply means are of the type of photovoltaic panels and are operatively connected to an energy storage element aimed at ensuring the self-sufficiency of the apparatus 1 in terms of energy.

[0056] The apparatus 1 comprises sensor means, not shown in the illustrations, and adapted to detect the filling level 24 of the collection chamber 2, and at least a data processing central unit, in turn not shown in the illustrations, operatively connected to the sensor means and to the drum element 10.

[0057] Preferably, the sensor means are adapted to send the activation signal following the achievement of the aforementioned predefined height 16 by the wastes 4 contained in the collection chamber 2; this means that when the predefined height 16 and the filling level 24 coincide, the sensor means send the activation signal to the data processing central unit.

[0058] Alternative embodiments cannot however be ruled out in which the sensor means detect a plurality of filling levels 24, which can be modified according to the shape and dimensions of the collection chamber 2, or to special requirements of the experts in the field.

[0059] In other words, in the event of the filling level 24 being such as to obstruct the helical element 9, blocking the fall of the wastes 4 inside the collection chamber 2, the sensor means send an activation signal to the drum element 10.

[0060] The data processing central unit is programmed to actuate the drum element 10 in rotation following the reception of an activation signal by the sensor means.

[0061] In this regard, it is worth specifying that the closure partition 20 is operatively connected to the data processing central unit and the latter is programmed to move the closure partition itself to the work position following the reception of the activation signal by the sensor means.

[0062] More particularly, the data processing central unit is programmed to activate the rotation of the drum element 10 following the achievement of the work position by the closure partition 20.

[0063] Alternative embodiments cannot however be ruled out wherein the drum element 10 is without the closure partition 20, i.e. it has a continuous extension.

[0064] In this case, the drum element 10 is operated in rotation around the central axis A each time the wastes 4 are inserted in the input compartment 3.

[0065] The present invention relates furthermore to a process for the collection and compaction of waste 4.

[0066] The process comprises the following steps of introduction of wastes 4 inside a collection chamber 2.

[0067] To follow, the process comprises a step of compaction of wastes 4 contained in the collection chamber 2 by means of rototranslation of the latter towards the bottom 15 of the collection chamber 2.

[0068] The operation of the present invention is as follows.

[0069] The wastes 4 are inserted in the collection chamber 2 via the input compartment 3.

[0070] The closure partition 20 is in the inactive position (Figures 1, 4 and 5), allowing the direct fall of the wastes 4 inside the collection chamber 2.

[0071] Specifically, the wastes 4 fall inside the collection chamber 2 passing through the inner transit area 11 and the transit opening 14, then reach the helical element 9 and finally fall, passing through the output compartment 19, inside the collection chamber 2.

[0072] As the amount of wastes 4 inserted inside the collection chamber 2 increases, the filling level 24 also increases.

[0073] When the filling level 24 coincides with the predefined height 16, the sensor means send the activation signal of the drum element 10 to the data processing central unit.

[0074] At the same time of sending the activation signal, the closure partition 20 passes from the inactive position, wherein the output compartment 19 is open, to the work position, wherein the output compartment 19 is closed.

[0075] At this point, the drum element 10 begins to rotate around the central axis A (Figure 6).

[0076] The wastes 4, during the rotation of the drum element 10, are retained by the grip elements 17 and dragged towards the bottom 15 of the collection chamber 2.

[0077] Once the filling level 24 drops and is lower than

the predefined height 16, and therefore the helical element 9 is free of wastes 4, the rotation of the drum element 10 is stopped and the closure partition 20 goes back to the inactive configuration (Figure 7).

[0078] It has in practice been found that the described invention achieves the intended objects.

[0079] The fact is underlined that the particular solution of providing compacting means associated internally with the collection chamber permits considerably optimizing the space inside the collection chamber itself and, at the same time, increasing the filling times of the apparatus.

[0080] To this must be added that the presence of a drum element and of a helical element one of which movable with respect to the other allows compacting the wastes by rototranslation thereof towards the bottom of the collection chamber.

[0081] Furthermore, the presence of the sensor means operatively connected to the compacting means allows the actuation of the drum element according to the filling level of the collection chamber itself, considerably reducing the energy wastes tied to its movement.

Claims

1. Apparatus (1) for the collection and compaction of waste (4), comprising at least a collection chamber (2) having at least one input compartment (3) for the waste (4), **characterized in that** it comprises compacting means (9, 10) associated with said collection chamber (2) and adapted to compact the waste (4) contained within the collection chamber (2) itself.
2. Apparatus (1) according to claim 1, **characterized in that** said compacting means (9, 10) comprise at least one helical element (9) and at least one drum element (10) surrounding said helical element (9), said drum element (10) being movable in rotation around said helical element (9) to drag the waste (4) towards the bottom (15) of said collection chamber (2).
3. Apparatus (1) according to one or more of the preceding claims, **characterized in that** said helical element (9) and said drum element (10) are contained at least partly in said collection chamber (2) and extend up to a predefined height (16) within the latter.
4. Apparatus (1) according to one or more of the preceding claims, **characterized in that** said collection chamber (2) comprises an upper closure wall (6) defining said input compartment (3), said drum element (10) and said helical element (9) being associated with said upper closure wall (6).
5. Apparatus (1) according to one or more of the preceding claims, **characterized in that** said drum element (10) and said helical element (9) are coaxial

to one another.

6. Apparatus (1) according to one or more of the preceding claims, **characterized in that** it comprises a plurality of grip elements (17) associated with said drum element (10) and adapted to allow the dragging of waste (4) following the rotation thereof with respect to said helical element (9). 5
7. Apparatus (1) according to one or more of the preceding claims, **characterized in that** said grip elements (17) are arranged at the inner surface (18) of said drum element (10) facing towards said helical element (9). 10
8. Apparatus (1) according to one or more of the preceding claims, **characterized in that** said grip elements (17) are formed projecting from said inner surface (18) and are arranged substantially inclined with respect to the central axis (A) of rotation of said drum element (10). 15 20
9. Apparatus (1) according to one or more of the preceding claims, **characterized in that** said drum element (10) comprises an output compartment (19) for the waste (4) adapted to allow the direct passage of the waste (4) at input from said input compartment (3) into said collection chamber (2). 25
10. Apparatus (1) according to one or more of the preceding claims, **characterized in that** said output compartment (19) comprises a closure partition (20) movable with respect to said drum element (10) between an inactive position wherein said output compartment (19) is opened and a work position wherein said output compartment (19) is closed. 30 35
11. Apparatus (1) according to one or more of the preceding claims, **characterized in that** it comprises sensor means adapted to detect the filling level (24) of said collection chamber (2), and at least one data processing central unit operatively connected to said sensor means and to said drum element (10), said processing central unit being programmed to actuate said drum element (10) in rotation following the reception of an activation signal from said sensor means. 40 45
12. Apparatus (1) according to claim 11, **characterized in that** said sensor means are adapted to send said activation signal following the achievement of said predefined height (16) by the waste (4). 50
13. Apparatus (1) according to one or more of the preceding claims, **characterized in that** said closure partition (20) is operatively connected to said data processing central unit, the latter being programmed to move said closure partition (20) to the work posi-

tion following the reception of said activation signal.

14. Apparatus (1) according to one or more of the preceding claims, **characterized in that** said data processing central unit is programmed to activate the rotation of said drum element (10) following the achievement of said work position by said closure partition (20).
15. Process for the collection and compaction of waste, **characterized in that** it comprises the following steps of:
 - introduction of waste (4) inside a collection chamber (2);
 - compaction of waste (4) contained in said collection chamber (2) by means of rototranslation of the latter towards the bottom (15) of said collection chamber (2).

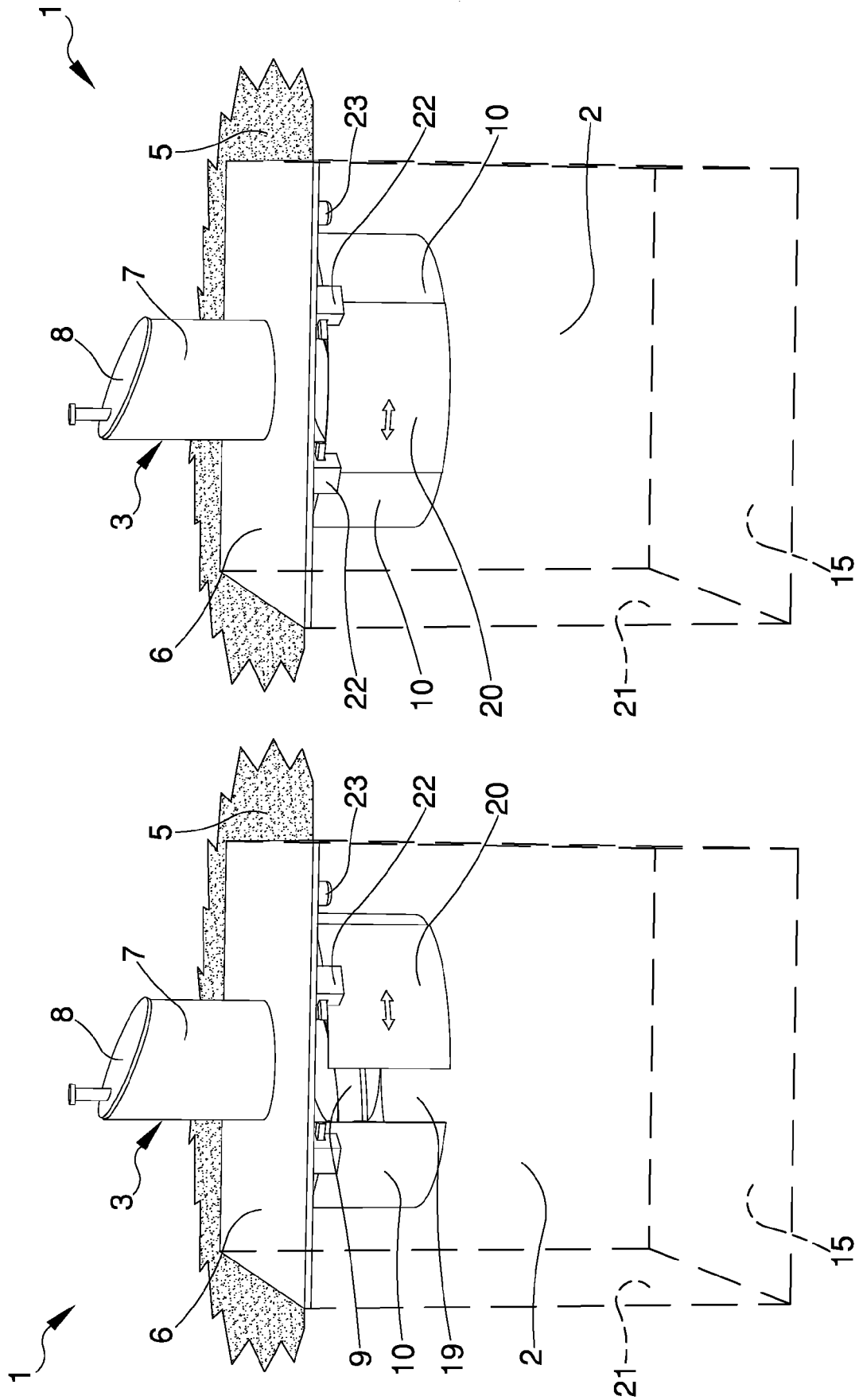


Fig.2

Fig.1

Fig.3

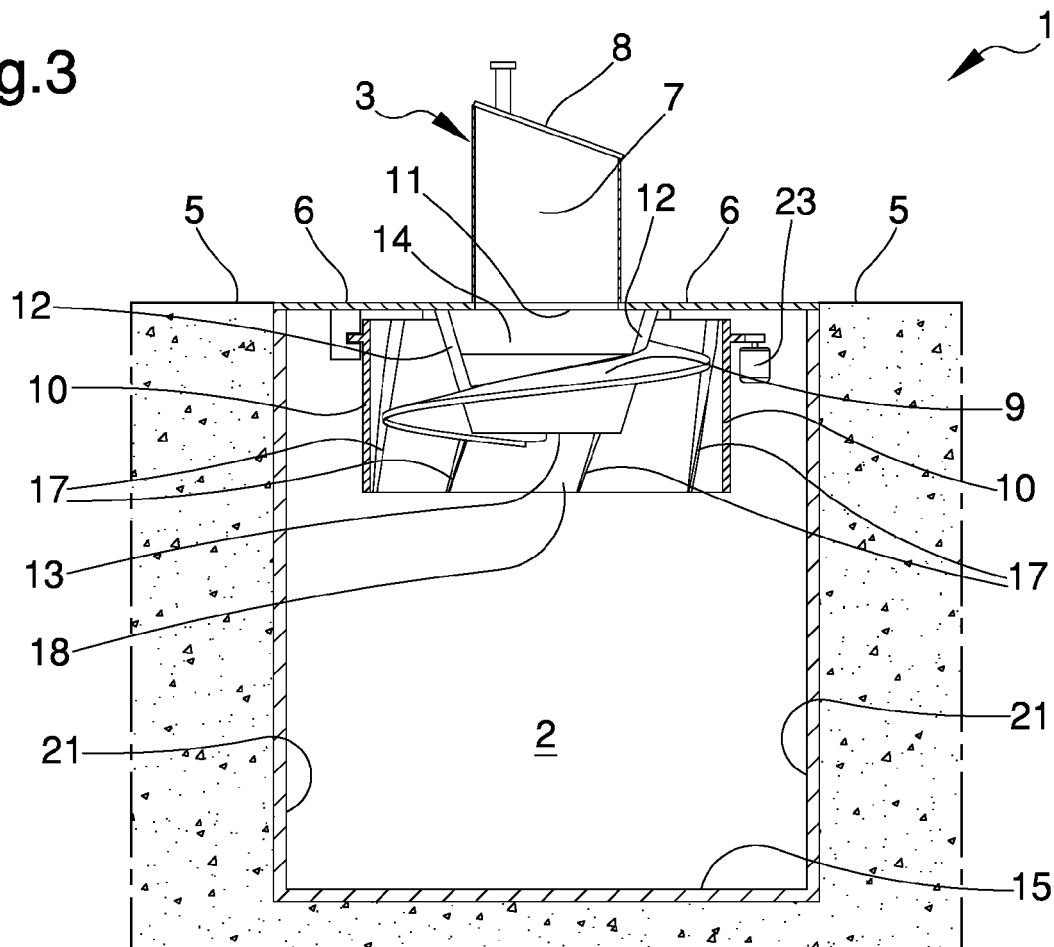
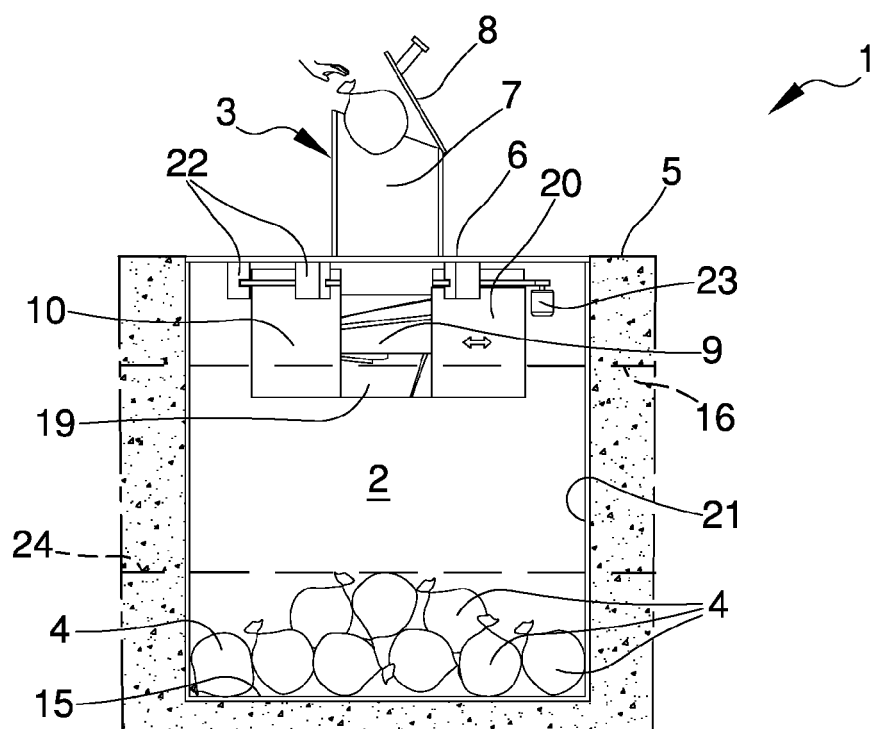


Fig.4



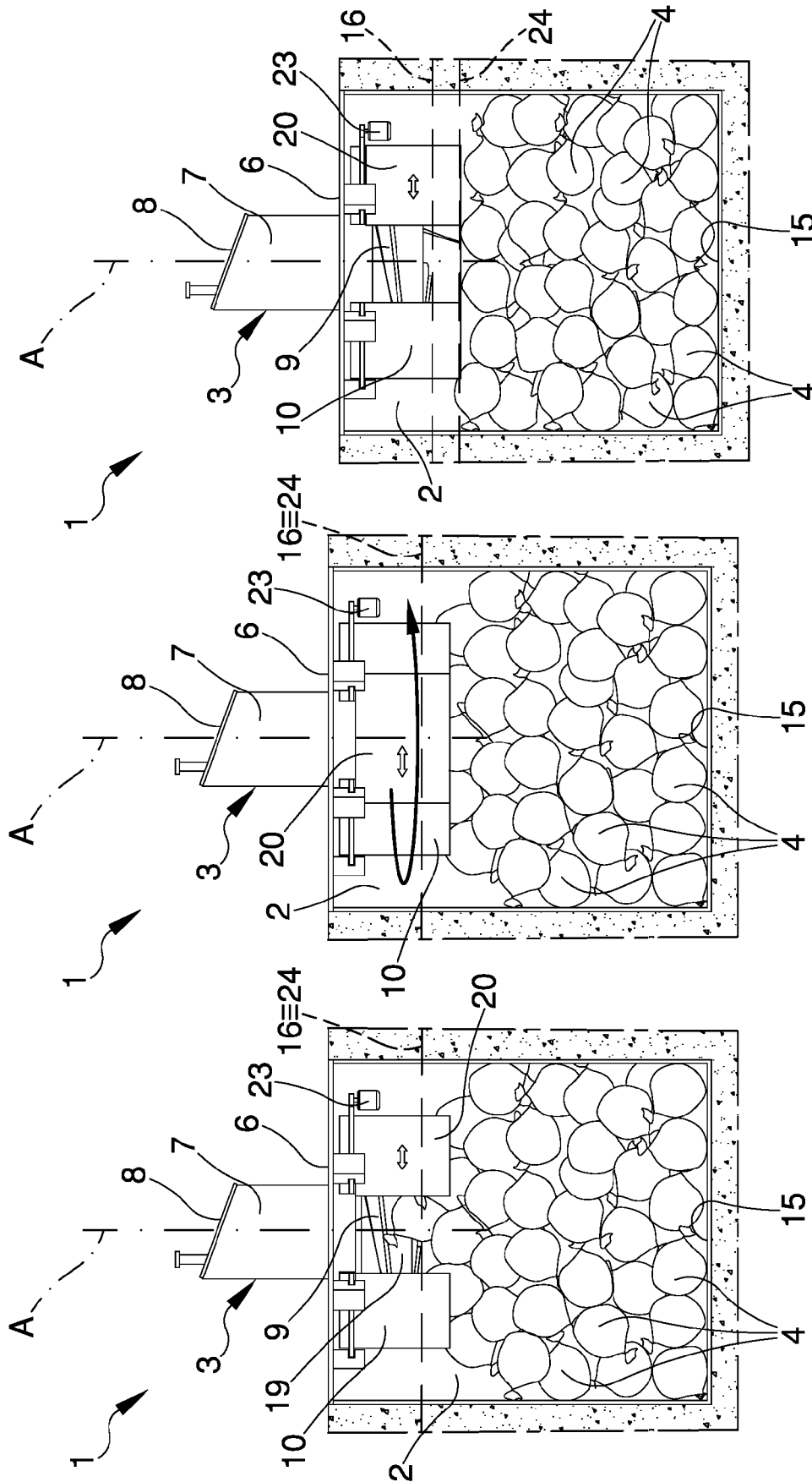


Fig. 5

Fig. 6

Fig. 7



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Application Number
EP 17 15 3142

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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