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(54) **Container assembly for a unit for washing and/or decontaminating objects, particularly refuse receptacles or the like**

(57) A container assembly (1) for a unit for washing and/or decontaminating objects, particularly refuse receptacles or the like. The assembly (1) comprises: a first chamber (3) for receiving a clean working liquid and a second chamber (2) for receiving the working liquid when it is spent and/or contains washing and/or decontamination residues. One of the chambers (2) is defined by a

first container (4), the other chamber (3) is defined by a interface between the first container (4) and a second container (5) external thereto. At least one of the containers (4) is substantially of the variable volume type, so that as liquid decreases in one of the chambers (3) it increases in the other (2), the whole size being limited to the volume of the external container (5).

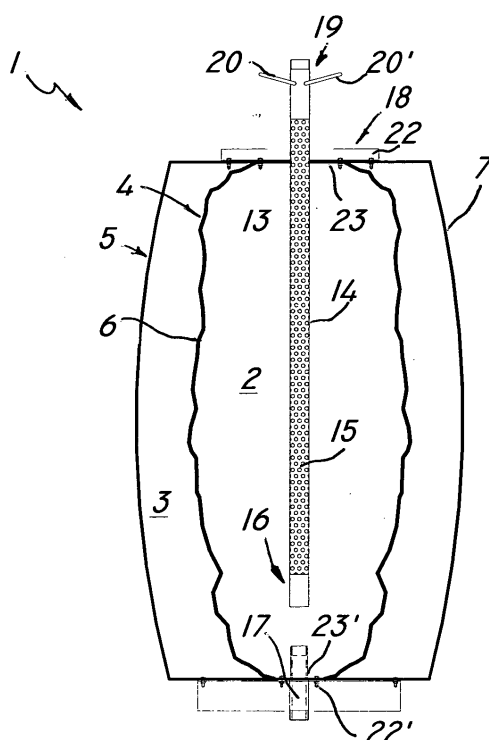


FIG. 2

DescriptionField of the invention

[0001] The present invention generally finds application in the field of storage containers, and particularly relates to a container assembly for a unit for washing and/or decontaminating objects, particularly refuse boxes or the like.

[0002] The invention further relates to a unit for washing and decontaminating objects which comprises such container assembly.

Background of the invention

[0003] Decontamination and washing of objects are generally known to be carried out using special units which operate by application of a hot or cold working liquid, either added or not with suitable decontaminating agents, to the surface of the object to be decontaminated.

[0004] FIG. 1 shows an example of such known units, which comprise a first container A for storage of the clean working liquid, means B for jet application thereof to an object O to be decontaminated, a first hydraulic circuit C for transferring the working liquid from the container A to the jet means B and for washing and/or decontaminating the object O, a draining tank D for the spent working liquid, a second container E for the spent working liquid and a second hydraulic circuit F for connection between the latter two. The two containers A and E are usually formed of a rigid material, such as fiberglass reinforced plastic or metal.

[0005] A well-known drawback of this solution is that the liquid storage containers A and E are rather bulky and require a correspondingly large installation area, which is not always available and is likely to involve high installation and management costs.

[0006] For solid waste decontamination, mobile units are typically used, with units as described above being carried by roadway transport vehicles, such as trucks or the like.

[0007] In this case, due to the excessive bulk of the containers A and E, large trucks must be used, which are not suitable for service in urban environments, with narrow and winding streets.

[0008] Large trucks further require important investments for both purchase and maintenance.

[0009] Another important aspect to be considered is that the larger the mobile unit the higher is the engine power required, involving a very high environmental impact and a dramatic cost increase.

[0010] In an attempt to overcome the above drawbacks, solutions have been developed in which the storage means comprise an outer container and an inner container.

[0011] Nevertheless, these solutions have been technically disadvantageous in practice, as well as susceptible of improvements from both technical and economical

points of view.

Summary of the invention

[0012] The object of this invention is to overcome the above drawbacks, by providing a container assembly that is highly efficient and relatively cost-effective.

[0013] A particular object is to provide a container assembly that requires a very small installation area, in both full and empty conditions.

[0014] A further object is to provide a container assembly that is easy to assemble and dismantle for cleaning or maintenance.

[0015] Yet another object of the invention is to provide a unit for decontaminating and washing solid waste containers of limited size.

[0016] These and other objects, as better explained below, are fulfilled by a container assembly for a unit for washing and/or decontaminating objects which comprises, as defined in claim 1, a first chamber for receiving a clean working liquid, a second chamber for receiving the working liquid when it is spent and/or contains washing and/or decontamination residues, one of the chambers being defined by a first container, the other chamber being defined by an interface between the first container and the second container external thereto, characterized in that at least one of the containers is substantially of the variable volume type.

[0017] Thanks to this particular configuration, in the present assembly, as liquid decreases in one of the chambers it increases in the other chamber, the whole size being limited to the volume of the external container.

[0018] Advantageously, the inner container may have at least one wall of flexible and/or resilient material, so that volume variations in its chamber may occur in a simple and effective manner.

[0019] In another aspect, the invention relates to a decontamination and/or washing unit as defined in claim 13, which comprises a container assembly as described and claimed herein, jet means for application of the clean working liquid to an object to be washed and/or decontaminated, a first hydraulic circuit for supplying the clean liquid contained in one of the chambers to the jet means, a tank for drainage of the spent liquid downstream from the jet means and a second hydraulic circuit for transferring the contaminated liquid collected in the drainage tank into the other chamber.

Brief Description of the Drawings

[0020] Further features and advantages of the invention will be more apparent from the detailed description of a preferred, non-exclusive embodiment of a container assembly according to the invention, which is described as a non-limiting example with the help of the annexed drawings, in which:

FIG. 1 is a schematic view of a prior art washing

and/or decontamination unit;

FIG. 2 is a schematic view of a first embodiment of a container assembly according to the invention;

FIG. 3 is a schematic view of another embodiment of a container assembly according to the invention;

FIG. 4 is a schematic view of a decontamination and/or washing unit according to the invention;

FIG. 5 is a schematic view of the decontamination and/or washing unit of FIG.4 mounted to a vehicle.

FIG. 6 is a schematic view of another embodiment of the decontamination and/or washing unit according to the invention;

FIG.7 is an enlarged view of a detail of FIG.6.

Detailed description of a few preferred embodiments

[0021] Referring to the above figures, the container assembly of the invention may be particularly, but without limitation, useful for washing and/or decontaminating objects, such as vehicles, equipment, refuse collection containers or the like, as shown in FIG. 5.

[0022] The assembly of the invention, generally designated by numeral 1, comprises a first chamber for receiving a clean working liquid and a second chamber for receiving the working liquid when it is spent and/or contains washing and/or decontamination residues. One of the chambers is defined by a first container, the other chamber is defined by an interface between the first inner container and a second outer container locate externally to the first.

[0023] In the embodiment as shown in FIG. 2, the clean working liquid chamber is designated by numeral 3, and the used or exhausted liquid storage chamber is designated by numeral 2. Nevertheless, it will be understood that the chambers may have inverted functions, and be provided in different numbers, without departure from the scope as defined in the annexed claims.

[0024] The chamber 2 is defined by the first inner container 4 and the chamber 3 is defined by the interface between the first container 4 and a second outer container 5 locate externally to the inner container 2.

[0025] A main feature of the invention is that the inner container 4 has a substantially variable volume in such a manner that upon liquid decrease in the chamber 3 occurs a liquid increase in the chamber 2, the overall bulk is limited to the volume of the outer container 5.

[0026] Thanks to this particular configuration, the container assembly of the invention may have half the size of prior art structures.

[0027] For example, for a decontamination and/or washing system having a working liquid capacity of 2 m³, two 2 m³ containers would be required in prior art structures, one for the clean working liquid and the other for the spent working liquid, with an overall volume requirement of 4 m³, notwithstanding the inevitable tolerances. However, when using the variable volume container assembly of the invention, the same working liquid capacity will be available with a space requirement only corre-

sponding to the outer container, in the above example 2 m³.

[0028] The term "variable volume container" as used herein designates a container in which the volume available to the clean working liquid decreases as it is being used and in which, the volume available to the exhausted working liquid correspondingly increases as it is stored in the container. In order to accomplish such function, the container may have, by way of example and without limitation, a bag-like or similar shape, or may include a movable, rigid, semirigid or elastic partition between the clean working liquid container and the container of the exhausted or used liquid.

[0029] Advantageously, the inner container 4 may have a wall 6 of flexible and/or resilient material, which will be preferably selected from the group comprising elastomers, polymers, fabrics or combinations of two or more thereof. A multilayer wall 6 may be further provided, i.e. having an inner layer of corrosion-resistant material. In a preferred non exclusive embodiment, this material may be perbunan rubber or polyethylene.

[0030] According to a first embodiment of the invention, as shown in the above mentioned FIG. 2, the outer container 5 may have a wall 7 of rigid or semirigid wall, such as reinforced plastic or metal. In this case, even when both containers 4 and 5 are completely empty, the size of the assembly is limited to the size of the outer rigid container 5.

[0031] According to another embodiment of the invention, as shown in FIG. 3, the wall 7 of the outer container 5 may be also formed of resilient and/or flexible material, like the wall 6, and formed of the same or a different material. In this case, when empty, the assembly has an insignificant size.

[0032] The assembly 1 may be generally contained in a decontamination and/or washing unit 8, as shown in FIG. 4. This may be used to apply clean working liquid, e.g. contained in the interface 3, to objects O using jet means 9, e.g. of the multinozzle lance type, which are located in the working chamber C. The operating pressure, as well as the composition of the working liquid, will change depending on specific requirements.

[0033] A first hydraulic circuit is provided for transferring such liquid from the interface 3 to the jet means 9, with the liquid flowing in the direction of arrows F₁. As the jet means 9 use the clean working liquid, i.e. as the latter flows out of the interface 3, the level L₁ in it decreases.

[0034] After application to the object O, the exhausted working fluid, flows to the bottom of the chamber C in a draining tank 11 and is transferred from there to the chamber 2, through a second hydraulic circuit 12, in the direction of arrows F₂. In this chamber the spent liquid level L₂ will obviously progressively increase.

[0035] Pumping means P and P' are provided to enhance liquid flow in the circuits 10 and 12.

[0036] In an alternative embodiment of the invention, as shown in Figures 6 and 7, suction means are provided

to enhance liquid motion in the circuit 12, which are generally designated with numeral 25, and include a Venturi ejector 26, preferably located on the bottom of the draining tank 11, having a nozzle 28 for the passage of a high pressure working fluid W_F . As working fluid W_F may be used, for example, water at a relatively high pressure, preferably from 130 to 180 bar.

[0037] The Venturi ejector 26 has an inlet portion 29 susceptible of being immersed in the spent liquid of the draining tank 11 and an outlet portion 30 connected to the hydraulic circuit 12. The Venturi ejector 26 further has a wall 29 of a corrosion-resistant material, such as aluminum, polypropylene, PVC or Nylon.

[0038] In operation, the high pressure working fluid W_F flowing out of the nozzle 27 into the Venturi ejector 26 will convey therein the spent working liquid, and/or the working liquid containing washing and/or decontamination residues, in the direction of arrows F_3 , thereby emptying the draining tank 11 and transferring such liquid to the chamber 2 through the hydraulic circuit 2, in the direction of arrows F_2 .

[0039] Thanks to the suction means 25, a very light-weight container assembly 1 may be used, which is particularly useful when it is mounted to vehicles or the like. A lighter assembly involves reduced investment and management costs, as well as a lower environmental impact.

[0040] In a preferred non exclusive embodiment of the invention, the assembly 1 may comprise a tubular member 13 made of a rigid, semirigid or flexible material, extending at least partly within the inner container 4, in fluid communication with the interface 3, e.g. as shown in FIG. 2

[0041] Advantageously, the tubular member 13 may have a side wall 14 with a number of holes 15 for filtering the used working liquid to be collected in the inner container 4. Thus, any coarse solid particles of dirt collected during washing and/or decontamination of the object O may be retained, to prevent them from contacting the wall 6 and damaging it.

[0042] For the used working liquid to be discharged from the chamber 2, the tubular member 13 may have an end 16 which is adapted to be removably connected to a spent liquid discharging hole 17.

[0043] Conveniently, the assembly of the invention may have a support structure 18 for the inner container 4 and/or the outer container 5. It will be understood that, if the outer container 5 is of the rigid type, as shown in FIG. 2, the support structure 18 will only engage the inner container 4, as the wall 7 needs no support.

[0044] However, if both the walls 7 and 6 are of the resilient and/or flexible type, like in the example of FIG. 3, both containers 4 and 5 shall be engaged by the support structure 18.

[0045] Advantageously, the tubular member 13 may comprise removable connection means 19 of the bayonet, nut and screw, snap type or the like, to allow connection to the support structure 18, and removal thereof

from the inner container 4 for cleaning. Thanks to this particular arrangement of the invention, any access by service personnel to the inner container 4 for inevitable cleaning and maintenance operations may be avoided.

5 In the example of the figures, the removable connection means are two handles 20 and 20' which are removably attachable to appropriate locking receptacles 21 and 21'.

[0046] For quick and easy connection of the containers 4 and/or 5 to the support structure 18, the latter may have a pair of flanges 22 and 22' for connection to corresponding counterflanges 23 and 23' suitably provided on the outer container 5 and/or the inner container 4. It will be understood that, although not clearly shown in FIG. 3, when both containers 4 and 5 are flexible, the support structure 18 has an element for supporting, e.g. by means of an outer frame, the flanges 22 and 22' that support the walls 6 and 7.

[0047] In a further embodiment of the invention, the removable connection means 19 may be located at least at one of the flanges 22 or 22' to minimize the overall size.

[0048] FIG. 5 shows a further embodiment of a washing and decontamination unit of the invention, particularly suitable for urban solid waste containers W, which incorporates the container assembly as disclosed and claimed herein, and which may comprise a vehicle 24 for transport thereof on a roadway V.

[0049] The unit of the invention will further include jet means 9, a first hydraulic circuit 10, a draining tank 11 and a second hydraulic circuit 12.

30 **[0050]** Thanks to this particular configuration, the unit of the invention will have a minimized size, which is particularly suitable to the increasingly narrow and winding urban streets. The minimized size of the unit will further involve reduced investment and management costs, as well as a greatly reduced environmental impact.

35 **[0051]** The above description clearly shows that the container assembly of invention fulfills the intended objects and particularly the one of requiring, in both full and empty conditions, a very small installation area.

40 **[0052]** Thanks to the provision that at least one the containers 4 or 5 is substantially of the variable volume type, as liquid decreases in one of the chambers 2 or 3 it increases in the other, the whole size being limited to the volume of the external container 5.

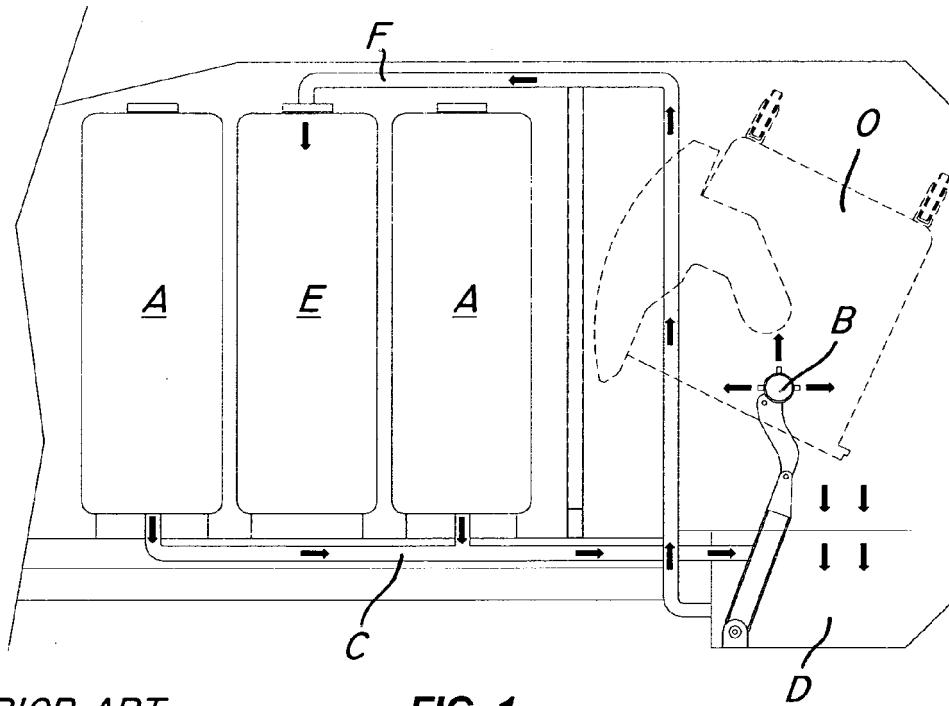
45 **[0053]** The assembly of this invention is susceptible of a number of changes and variants, within the inventive principle disclosed in the appended claims. All the details thereof may be replaced by other technically equivalent parts, and the materials may vary depending on different needs, without departure from the scope of the invention.

50 **[0054]** While the assembly has been described with particular reference to the accompanying figures, the numerals referred to in the disclosure and claims are only used for the sake of a better intelligibility of the invention and shall not be intended to limit the claimed scope in any manner.

Claims

1. A container assembly for units designed to wash and/or decontaminating objects, particularly refuse boxes or the like, comprising:
 - a first chamber (3) for receiving a clean working liquid;
 - a second chamber (2) for receiving the working liquid when it is spent and/or contains washing and/or decontamination residues;
 - a first inner container (2) and a second outer container (5) located externally to said first inner container (2), one of said chambers (2) being defined by said inner container (4), the other of said chambers (3) being defined by an interface between said inner container (4) and said outer container (5);

characterized in that at least one of said containers (4, 5) has a substantially variable volume in such a manner that upon liquid decrease in one of said chambers (3) it occurs a liquid increase in the other of said chambers (2), with an overall bulk corresponding to the only volume of said outer container (5).
2. Assembly as claimed in claim 1, **characterized in that** said inner container (4) has at least one wall (6) made of a flexible and/or resilient material.
3. Assembly as claimed in claim 2, **characterized in that** said flexible and/or resilient material is selected from the group comprising elastomers, polymers, fabrics or combinations of two or more thereof.
4. Assembly as claimed in claim 1, **characterized in that** said outer container (5) has a wall (7) made of a rigid or semirigid material.
5. Assembly as claimed in claim 1, **characterized in that** said outer container (5) has a wall (7) made of a resilient and/or flexible material.
6. Assembly as claimed in claim 1, **characterized in that** it comprises a tubular member (13), extending at least partly within said inner container (4), which is designed to collect the used working liquid and is in fluid communication with said interface (3) designed for storage of the clean working liquid.
7. Assembly as claimed in claim 6, **characterized in that** said tubular member (13) has a side wall (14) with a series of holes (15) for filtering the used working liquid to be collected in said inner container (4).
8. Assembly as claimed in claim 6, **characterized in that** said tubular member (13) extending within said inner container (4) has an end (16) which is adapted to be removably connected to a hole (17) for discharging the used working liquid collected in said inner container (14).
9. Assembly as claimed in claim 6, **characterized in that** it has a support structure (18) for said inner container (4) and/or said outer container (5).
10. Assembly as claimed in claim 9, **characterized in that** said tubular member (13) has means (19) for removable connection to said support structure (18) to allow removal thereof from said inner container (4) and cleaning.
11. Assembly as claimed in claim 9, **characterized in that** said support structure (18) has a pair of flanges (22, 22') for connection to corresponding counterflanges (23, 23') of said outer container (5) and/or said inner container (4).
12. Assembly as claimed in claim 11, **characterized in that** said removable connection means (19) are located at least at one of said flanges (22, 22').
13. Decontamination and/or washing unit, particularly for urban solid waste boxes, comprising:
 - a container assembly (1) as claimed in one or more of claims 1 to 12;
 - jet means (9) for applying said clean working fluid to an object to be washed and/or decontaminated;
 - a first hydraulic circuit (10) for supplying the clean working liquid contained in one of said chambers (3) to said jet means (9);
 - a tank (11) for drainage of the spent liquid downstream from said jet means (9);
 - a second hydraulic circuit (12) for transferring the spent liquid collected in said drainage tank (11) into the other of said chambers (2).
14. Decontamination and/or washing unit as claimed in claim 13, **characterized in that** it comprises suction means (25) for drawing said exhausted liquid, which are located in said draining tank (11).
15. Decontamination and/or washing unit as claimed in claim 13 or 14, **characterized in that** it comprises a vehicle (24) for transport thereof on a roadway (V).



PRIOR ART

FIG. 1

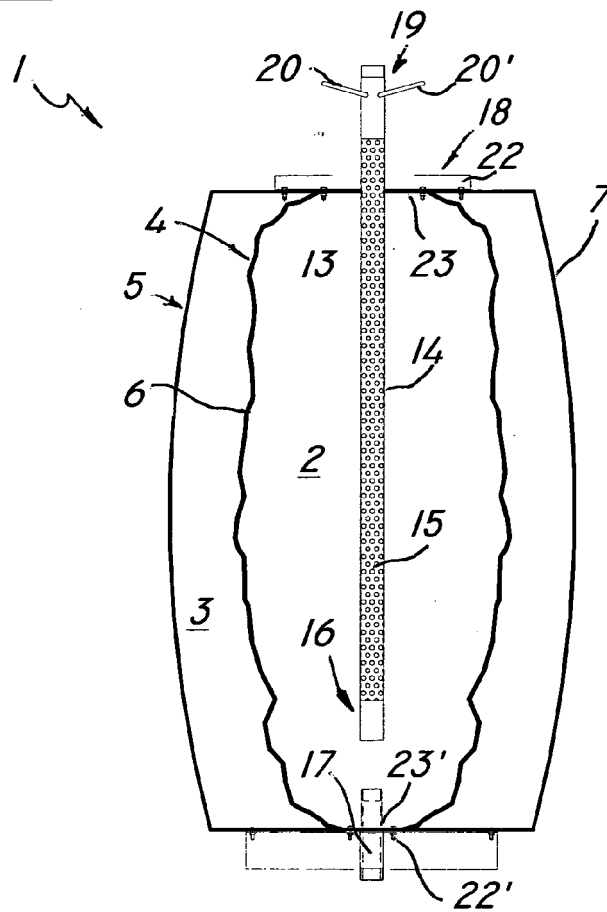


FIG. 2

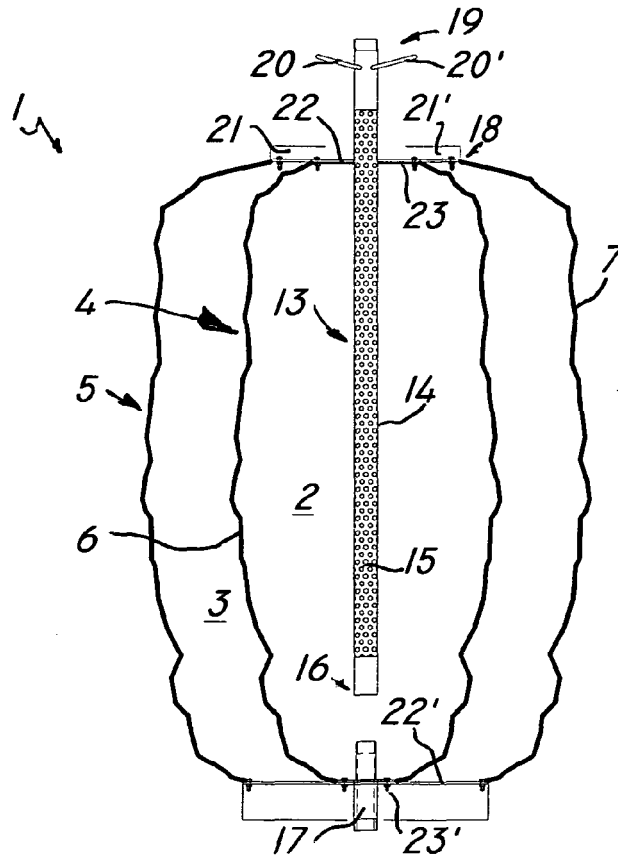


FIG. 3

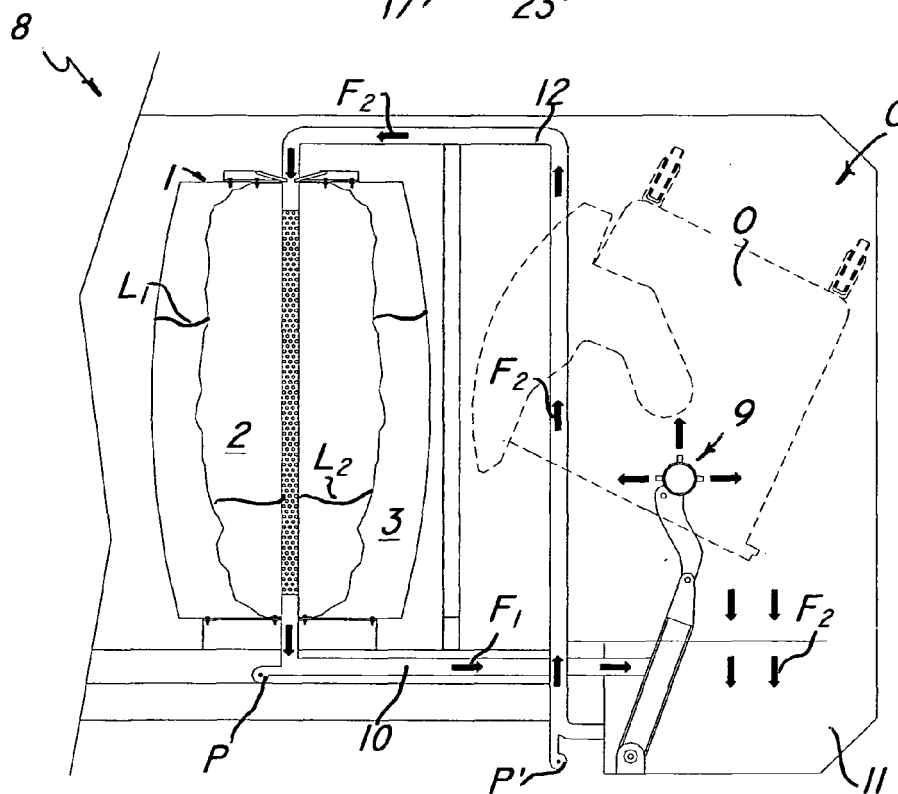


FIG. 4

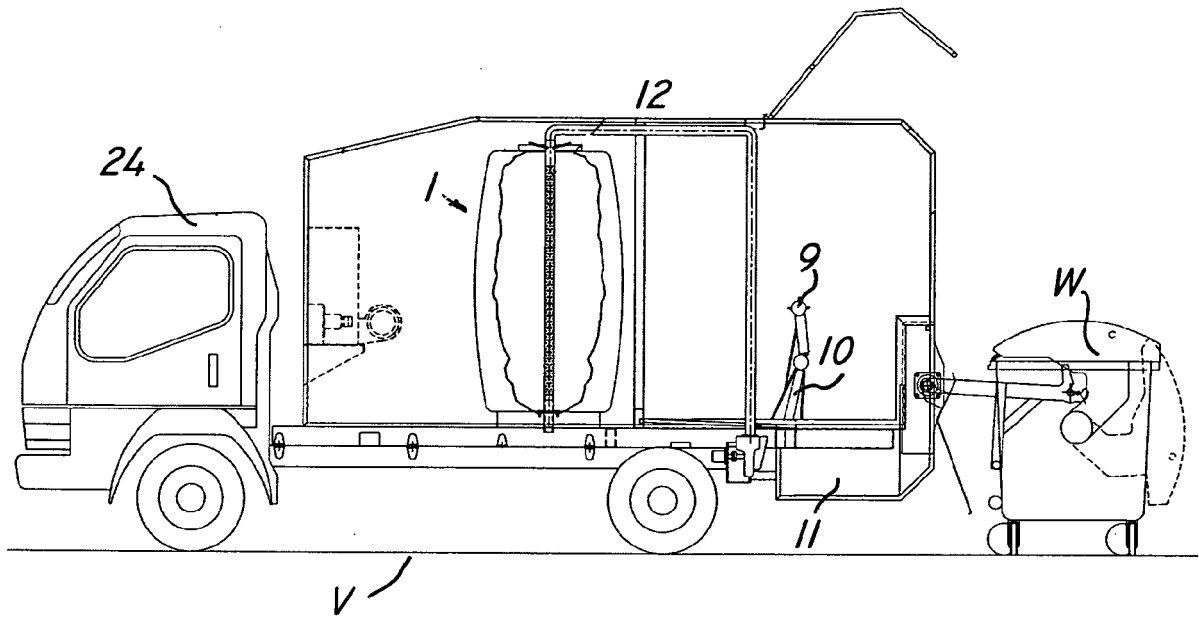


FIG. 5

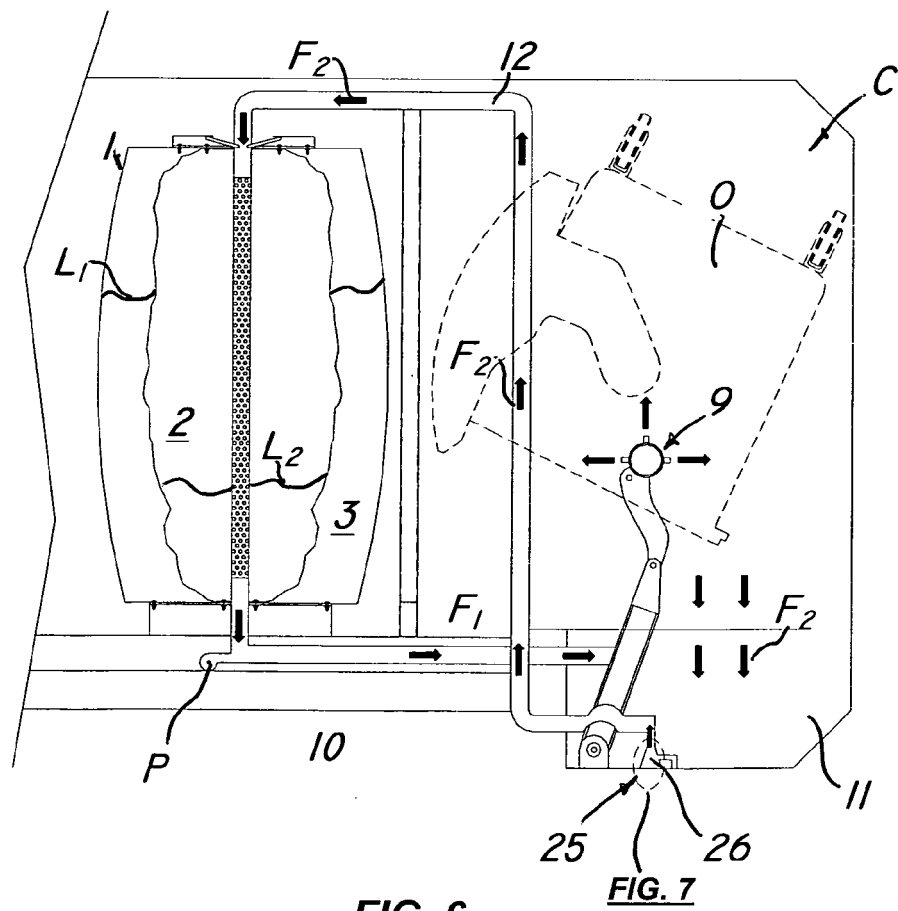


FIG. 6

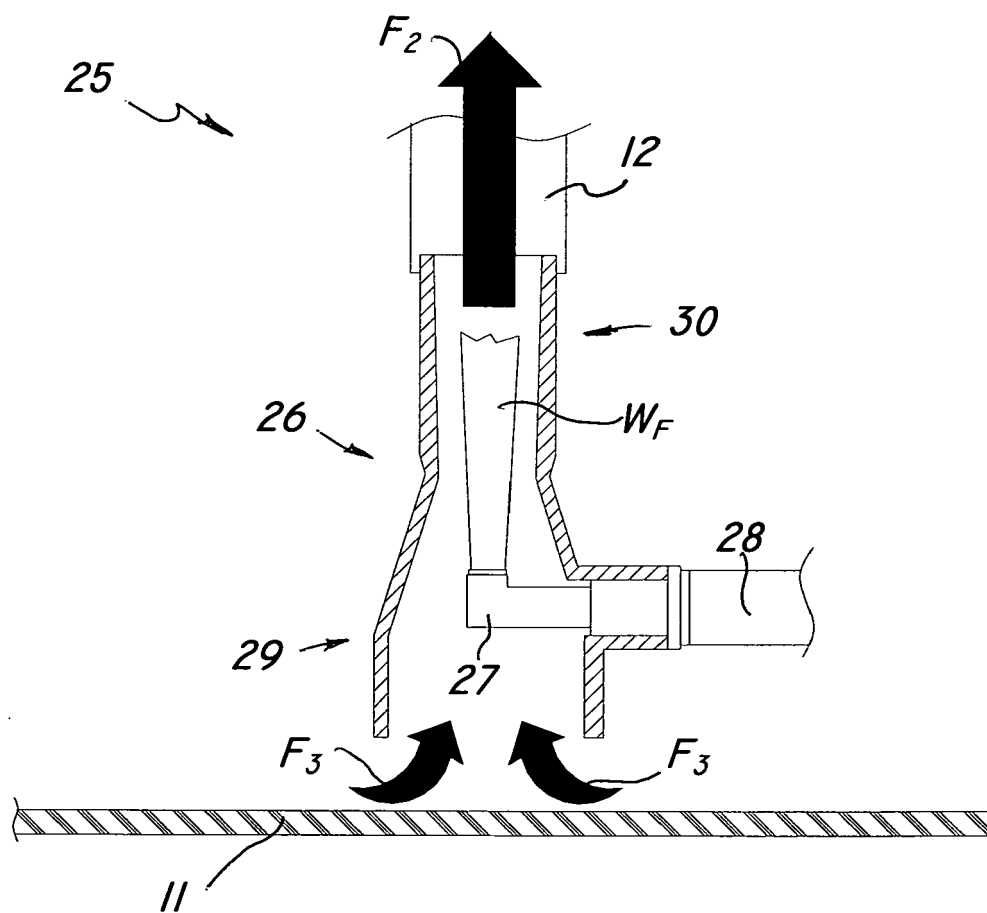


FIG. 7



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Office

EUROPEAN SEARCH REPORT

Application Number
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Place of search The Hague		Date of completion of the search 21 March 2007	Examiner Smolders, Rob
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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