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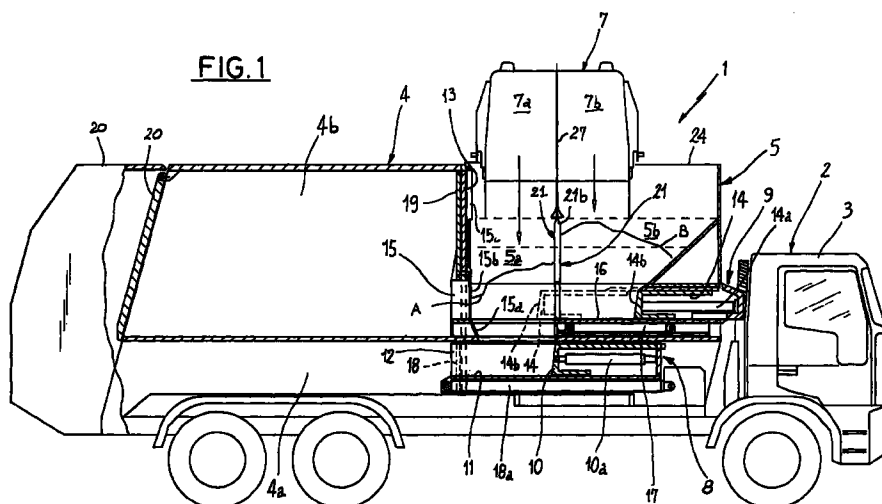
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(71) Applicant: **O.M.B. BRESCIA S.p.A.**
25135 Brescia (IT)

(72) Inventor: **Bragadina, Giovanni**
25060 Collebeato (Brescia) (IT)
(74) Representative: **Sutto, Luca**
Bugnion S.p.A.,
Viale Lancetti, 19
20158 Milano (IT)

(54) **Hopper of a refuse collecting vehicle for the separate collecting of refuse**

(57) A dividing baffle (21) delimits in a loading hopper (5) a first and a second chamber (5a, 5b), consecutively set side by side away from a body (4) of a vehicle (2). The dividing baffle, able to collimate at the top with a dividing wall of a container upset above the hopper (5), presents a lower edge (21a) movable vertically to open and shut communication between the collection chambers (5a, 5b). A first waste received in the first chamber (5a) falls onto a fixed bottom (11) to be trans-

ferred into a lower compartment (4a) of the body (4). A second waste received in the second chamber (5b) is transferred into an upper compartment (4b) of the body (4) after a movable bottom (16) is distended in the hopper (5) and the lower edge (21a) is raised to allow the passage of a thruster (14) underneath the dividing baffle (21).



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Description

[0001] The present invention relates to a device for the reception and selective conveyance of waste for vehicles used for the differentiated collection of waste, of the type comprising the characteristics expressed in the preamble to claim 1.

[0002] As is well known, the state of the art includes several types of vehicles specifically set up to perform the differentiated collection of waste, in particular solid urban waste.

[0003] A vehicle of this kind, recalled here as a more pertinent example of the state of the art, is described in European patent no. EP 718217 in the name of the same Applicant. Such vehicle presents a holding body divided into a lower compartment and an upper compartment set to be filled with a first and a second type of waste through respective access openings connected to a loading hopper positioned between the body and the driver's cab of the vehicle.

[0004] On a side of the vehicle, in proximity to the hopper, is mounted a lifting and upsetting device which is able to pick up from the ground a waste container to empty it above the hopper and subsequently place it back on the ground.

[0005] The hopper is internally fitted with transfer means able to convey the waste selectively into the lower or upper compartment of the body according to the type of waste. More specifically, the conveyance of the waste into the lower compartment takes place thanks to a first thruster element movable on the bottom of the hopper towards the first opening ending in the lower compartment itself.

[0006] To convey the waste into the upper compartment, instead, before the waste itself is emptied from the container, in the hopper a movable bottom located immediately above the space dedicated to the motion of the first thruster is distended. The waste of the second type therefore falls on the movable bottom to be conveyed into the upper compartment through the action of a second thruster movable on the movable bottom itself towards the respective top opening.

[0007] One of the prerogatives presented by the solution described above with respect to other known solutions is that of being able to operate both on single-material containers, containing waste of one or the other type, and on bi-material containers, i.e. subdivided longitudinally into two separate chambers, containing respectively waste of different types. However, emptying bi-material containers, market demand for which is very strong, requires longer times for the execution of the emptying cycle.

[0008] To prevent the two types of waste from mixing together it is necessary for the second waste, destined to be sent into the upper compartment, to be withheld in the container by means of an auxiliary lid while the first waste is emptied and until its level in the hopper has been lowered sufficiently to allow the movable bottom to

be distended.

[0009] The object of the present invention is to overcome the problems of the prior art, realising a device able simultaneously to empty different types of waste from the same container, as well as to position the waste itself in respective compartments provided in the body of a vehicle, without thereby entailing any risk of mixing between different types of waste.

[0010] Another object of the invention is for such device to retain the ability to empty indifferently single-material and multi-material containers.

[0011] These objects and others besides which shall be made clearer in the course of the present description, are essentially reached by a device comprising the characteristics expressed in the characterising part of claim 1.

[0012] Additional features and advantages shall become more readily apparent from the detailed description of a preferred but not exclusive embodiment, of a device for the reception and selective conveyance of waste emptied from a container, for vehicles used for the differentiated collection of waste, according to the present invention.

[0013] Such description shall be provided hereafter with reference to the accompanying drawings, provided solely by way of non-limiting indication, wherein:

- Figure 1 shows a partial cross section of a vehicle for the differentiated collection of waste, provided with a device according to the invention, as it empties a container holding two types of waste.
- Figure 2 is an enlarged section with respect to Figure 1, showing in greater detail the subject device while it empties the container holding a first and a second type of waste;
- Figure 3 shows the device in Figure 2 in a subsequent operating phase;
- Figure 4 shows the device as it empties a container holding exclusively waste of the first type;
- Figure 5 shows the device functioning according to a different operating mode, as it empties a container holding exclusively waste of the first type;
- Figure 6 shows the device as it empties a container holding exclusively waste of the second type;
- Figure 7 shows the device in a different operating mode for emptying a container holding exclusively waste of the second type;
- Figure 8 is a section performed along the trace VIII - VIII of Figure 6, highlighting the structure of a dividing baffle provided in the hopper of the device according to the invention.

[0014] With reference to the mentioned figures, the number 1 indicates in its entirety a device for the reception and selective transfer of waste emptied from a container, for vehicles used for the differentiated collection of waste, according to the present invention.

[0015] The device 1 is suitable for being associated to

a vehicle 2 used for waste collection, comprising a driver's cab 3 and a holding body 4 internally subdivided into a lower compartment 4a and an upper compartment 4b respectively used to receive a first and a second type of waste, respectively indicated as "A" and "B" in Figure 1. The device 1 comprises a hopper 5 interposed between the driver's cab 3 and the body 4 and set to receive the waste of the first and of the second type emptied from a container 7, brought in an upset position above the hopper 5 by the action of a lifting and upsetting apparatus 6 operating on a side of the vehicle 2.

[0016] More in particular, the lifting and upsetting apparatus 6, only partially shown since it is known in itself and not relevant for the purposes of the invention, picks up from the ground a container after the vehicle has been parked at the side of the container itself, to lift it and empty it by upsetting it above the hopper 5 and place it back on the ground as soon as the emptying operation is complete.

[0017] Inside the hopper 5 operate first and second transfer means 8, 9 set respectively to transfer the waste of the first and of the second type into the lower compartment 4a and into the upper compartment 4b of the body 4.

[0018] The first transfer means 8 comprise for this purpose a lower thruster 10 which, upon the command of at least a respective actuator 10a, is activated with alternating rectilinear motion on a bottom wall 11 of the hopper 5, in the direction of a lower opening 12 obtained in correspondence with a rear wall 13 which separates the hopper 5 from the inner compartments 4a, 4b of the body 4.

[0019] The second transfer means 9 comprise in turn an upper thruster 14 which, upon the command of at least a respective actuator 14a, is activated with alternating rectilinear motion in the direction of an upper opening 15 also associated to the rear wall 13, in raised position with respect to the aforesaid lower opening 12 and preferably provided with a shutter element 15b able to be opened upon the command of an actuator 15c.

[0020] The upper thruster 14 slides over a movable bottom wall 16 which under the action of a respective actuator 17 is suitable for being selectively translated in a horizontal plane between a closed position wherein, as shown in Figure 3, it extends above the bottom wall 11 and the first transfer means 8, acting with its own terminal edge 16a in contact relationship with a lower border portion 15a of the upper opening 15, and an open condition wherein it is retracted away from the lower border portion 15a to clear the access of the waste to the bottom wall 11, as shown in Figure 2.

[0021] In the embodiment shown, the lower opening 12 and upper opening 15 are obtained respectively in a lower expulsion bulkhead 18 and an upper expulsion bulkhead 19 normally close to the rear wall 13 and able to translate upon the command of respective expulsion actuators 18a (whereof only one is visible in the Figure)

to expel the waste from the respective holding compartments 4a, 4b, after the opening of one or more doors 20 provided to the rear of the body itself.

[0022] For the purposes of the present invention, the rear wall 13 of the hopper 5 can be constituted by the upper and lower expulsion bulkheads 18 and 19 themselves, when they are placed in the rest position.

[0023] In accordance with the present invention, inside the hopper 5 is operatively provided at least a dividing baffle 21 which delimits in the hopper itself a first and a second collection chamber 5a, 5b consecutively set side by side away from the rear wall 13.

[0024] To the dividing baffle 21 are operatively associated closure means 22 set to enable and inhibit selectively the communication between the first loading chamber 5a and a lower part of the second loading chamber 5b, for purposes which shall become more readily apparent hereafter.

[0025] In a preferential embodiment, the closure means 22 provide for the dividing baffle 21 to comprise at least a main portion 23 engaged between two side walls 24 of the hopper 5 and a closure portion 25 slidably engaged to the main portion 23 and defining a lower edge 21a of the dividing baffle.

[0026] The main portion 23 and the closure portion 25 can be for instance mutually connected by means of a telescoping engagement, with the closure portion 25 able to be inserted slidably into the main portion 23. Between the main portion 23 and the closure portion 25 operate one or more vertical motion actuators 26, by the action whereof the closure portion 25 translates vertically. In this way the dividing baffle 21 is selectively brought between a closed condition wherein it acts with its lower edge 21a in proximity to the movable bottom wall 16 and an open condition wherein the lower edge 21a is distanced from the movable bottom wall itself, according to a measure sufficient to enable the passage of the upper thruster 14.

[0027] Alternatively to the solution described, the dividing baffle 21 can present a monolithic structure slidably guided between the side walls 24 of the hopper 5 and the vertical motion actuator or actuators 26 can act between the hopper 5 and the dividing baffle itself to obtain the translation between the closed condition and the open condition. In an additional possible embodiment variation the closure means 22 can comprise the upper thruster 14 itself, able to be positioned if need be with its thrust surface 14b flush with the dividing baffle 21 in such a way as to shut off communication between the second chamber 5b and the first chamber 5a.

[0028] As Figure 2 clearly shows, the first and the second collecting chambers 5a, 5b of the hopper 5 are suitable for receiving respectively a first and a second waste simultaneously emptied from the container 7, upset above the hopper by the action of the lifting and upsetting apparatus 6. When the container 7 is in the upset position above the hopper 5, an upper edge 21b of the dividing baffle 21 is positioned in essential colli-

mation with a terminal edge 27a of a dividing wall 27 provided inside the container 7 to define therein a first and a second containment chambers 7a and 7b used respectively to receive the first and the second type of waste.

[0029] In order further to limit the risk of partial mixing between the waste of the first and of the second type while they are being emptied, it can be advantageously provided for the upper edge 21b of the dividing baffle 21 not to present a rectilinear profile, but to be counter-shaped according to the profile of the container, as well as according to the movements made by the different components thereof during the upsetting phase. As Figure 8 clearly shows, the upper edge 21b of the dividing baffle 21 can for that purpose present an intermediate portion 28 projecting with respect to a first and a second lateral portions 29a 29b which present a lowered profile respectively not to interfere with the trajectories described by the edges of the container 7 and by a closure lid 30 conventionally associated thereto.

[0030] To provide a further guarantee of the perfect separation between the first and the second type of waste, the dividing wall 27 can be realised as described in European patent application no. 98830254.3 in the name of the same Applicant.

[0031] As Figure 2 shows, during the emptying process of the first and of the second type of waste from the container 7, the dividing baffle 21 is kept in a closed condition with its own lower edge 21a in contact on the movable bottom wall 16, which in turn is retracted in the open position. The upper opening 15 is preferably closed by the possible shutter element 15b. In this situation, the first waste coming from the first chamber 7a of the container 7 falls directly onto the bottom wall 11 of the hopper 5, whilst the second waste, coming from the second chamber 7b, is conveyed into the second collection chamber 5b of the hopper 5 accumulating on the movable bottom wall 16, delimiting the lower part of the second chamber itself. Immediately after the simultaneous emptying of the wastes of the first and of the second type into the respective chambers 5a and 5b of the hopper 5, the container 7 can be placed back on the ground by the apparatus 6 and, in the meantime, the lower thruster 12 is activated to transfer, with one or more forward and back strokes, the waste of the first type into the lower compartment 4a of the body 4. As soon as the level of the first waste inside the first collection chamber 5a has dropped below the plane whereon the movable bottom wall 16 lies and moves, the bottom wall is translated to the closed position, whereupon the dividing baffle 21 is brought to the open condition by lifting the closure portion 25.

[0032] In this situation whilst the lower thruster 10 effects the last forward and back strokes to complete the transfer of the first waste through the lower opening 12, the shutter 15b is raised and the upper thruster 14 is activated to thrust the waste of the second type along the movable bottom wall 16 thereby to transfer it into the

upper compartment 4b through the upper opening 15. If the closure means associated to the dividing baffle 21 comprise the upper thruster 14 itself, as described above, the waste of the second type emptied into the second collection chamber 5b is initially accumulated above the thruster itself, placed in the intermediate position of collimation with the dividing baffle 21.

[0033] After the movable bottom wall 16 is brought into the closure position, the waste contained in the second collection chamber 5b will be let fall thereon as a result of a translation of the upper thruster 14 away from the rear wall 13 of the hopper 5, to allow the waste itself to be transferred into the upper compartment 4b in a manner identical to the one described above.

[0034] Advantageously, the device according to the invention is able to convey the entire quantity of waste emptied from the container 7 exclusively into the lower compartment 4a or into the upper compartment 4b, in such a way as to manage also emptying containers containing exclusively materials of one or of the other type.

[0035] As shown in Figure 4, the container 7 containing exclusively material of the first type, whether the dividing wall 27 is present or not, is emptied maintaining the shutter element 15b in closure condition and setting the dividing baffle 21 into the open condition with the movable bottom wall also in open position.

[0036] In this situation, also the waste upset into the second collection chamber 5b, with the aid of the upper thruster 14, shall be conveyed into the first collection chamber 5a to fall onto the bottom wall 11 and to be transferred into the lower compartment 4a by the action of the lower thruster 10.

[0037] In order to prevent residue of waste of the first type from dirtying the surfaces of the second collection chamber 5b, thereby contaminating the waste of the second type subsequently emptied from another container, the dividing baffle can advantageously be hinged according to a horizontal axis X-X (Figure 8) between the side walls 24 of the hopper 5 in such a way as to be able to be oriented, by the action of an orienting actuator 31, around its own hinge axis X-X.

[0038] More in particular, the dividing baffle 21 is able to be selectively oriented between a position of normal utilisation, wherein it is vertically positioned to collimate by means of its own upper edge 21b with the dividing wall 27 of the container 7, and a first deviated position wherein, as shown in Figure 5, it is able directly to channel towards the first collection chamber 5a the entire quantity of waste emptied from the container 7.

[0039] To prevent a part of waste from falling into the second collection chamber 5b, the upper terminal edge 21b of the baffle 21 can conveniently be obtained on an upper extensible portion of the dividing baffle itself, slidably engaged to the aforementioned main portion 23. One or more extension actuators 33 are activated concurrently with the orientation of the dividing baffle 21 in the deviated position, to place the upper extensible portion 32 in an extended condition wherein the upper ter-

minal edge 21b is moved away from the oscillation axis X-X to protrude laterally with respect to the vertical projection of a side wall of the container, as Figure 5 clearly shows.

[0040] In this way, all the waste emptied from the container falls into the first collection chamber 5a, investing the dividing baffle 21, only onto the surfaces facing the first chamber itself.

[0041] The upper thruster can be placed in the intermediate position, essentially in collimation with the lower edge 21a of the baffle 21, to prevent any back surge of material into the second chamber 5b.

[0042] While emptying a container 7 containing exclusively waste of the second type, whether the container is fitted with dividing wall 27 or not, the subject device can advantageously be set as per Figure 6. In this case, the movable bottom wall 16 is set in closed condition and the shutter 15 is lifted into the open condition to clear access to the upper compartment 4b. The dividing baffle 21 is maintained in open condition to allow the passage of the upper thruster 14 underneath it.

[0043] All the waste emptied from the container 7 falls onto the movable bottom wall 16 to be transferred into the upper compartment 4b by the action of the upper thruster 14.

[0044] In this case as well, it may be required for the inner surfaces of the collection chamber 5a not to be excessively dirtied by the waste of the second type.

[0045] To this end, the dividing baffle 21, by the action of the orientation actuator 31, can advantageously be translated from the position of normal utilisation to a second deviated position wherein, as in Figure 7, it is able to convey exclusively into the second collection chamber 5b all the waste emptied from the container 7.

[0046] In this case as well, the extensible portion 32 of the baffle 21 can be placed in distended condition similarly to the description provided with reference to Figure 5, to prevent part of the second waste from falling into the first chamber 5a.

[0047] The invention thereby attains the proposed objects.

[0048] The subject device allows simultaneously to empty two or more types of waste from a container inside the loading hopper, and is able automatically to manage the transfer of the wastes into one or the other compartment of the body of the vehicle.

[0049] The invention therefore allows considerably to reduce the duration of the stops of the vehicle for the execution of the container emptying cycle. The duration of each stop is linked to the time strictly necessary to bring the container to an upset position above the hopper and place it back on the ground after upsetting it, since the subsequent transfer of the wastes into the respective compartments of the body by the thrusters can be performed also with the vehicle in motion.

[0050] The subject device further retains the advantage of being able indifferently to operate also on single-material containers, be they fitted with an internal divid-

ing wall or not, to the advantage of the flexibility of utilisation of the vehicle.

[0051] It should be noted that, although the described embodiment is able to operate on two different types of waste, the device according to the invention can also be adapted to operate on more than two types of waste, providing a suitable number of dividing baffles, as well as movable bottom walls and respective compacting means operating at different levels in the hopper, to transfer the waste into respective compartments of the body

Claims

1. Device for the reception and selective conveyance of waste emptied from a container, for vehicles used in the differentiated collection of waste comprising:

a loading hopper (5) presenting a rear wall (13) where to are associated a lower opening (12) and an upper opening (15) respectively able to be connected with a lower compartment (4a) and an upper compartment (4b) of a body (4) of a vehicle;

first transfer means (8) operating on a bottom wall (11) of the hopper (5) to convey a first waste through the lower opening (12);

a bottom wall (16) movable selectively between a closed position wherein it extends above the bottom wall (11) and the first transfer means (8) acting with its terminal edge (16a) in contact relationship on a lower border portion (15a) of said upper opening (15), and an open position wherein it is retracted from said lower border portion (15a) to clear the passage of the first waste to the bottom wall (11);

second transfer means (9) operating on the movable bottom wall (16) set in the closed position to convey a second waste through said upper opening (15),

characterised in that it further comprises at least a dividing baffle (21) provided in the hopper (5) to delimit therein at least a first and a second collection chamber (5a, 5b) consecutively set side by side away from said rear wall (13),

closure means (22) co-operating with said dividing baffle (21) to enable and inhibit selectively the communication between said first collection chamber (5a) and a lower part of the second collection chamber (5a).

2. Device according to claim 1, wherein said closure means (22) comprise at least a vertical motion actuator (26) associated to the dividing baffle (21) to bring the latter selectively between a closed condition wherein the dividing baffle itself acts with its

lower edge (21a) in proximity of the movable bottom wall (16) to inhibit the communication between said collection chambers (5a, 5b) and an open condition wherein said lower edge (21a) is distanced from the movable bottom wall (16) to enable the communication between the chambers themselves.

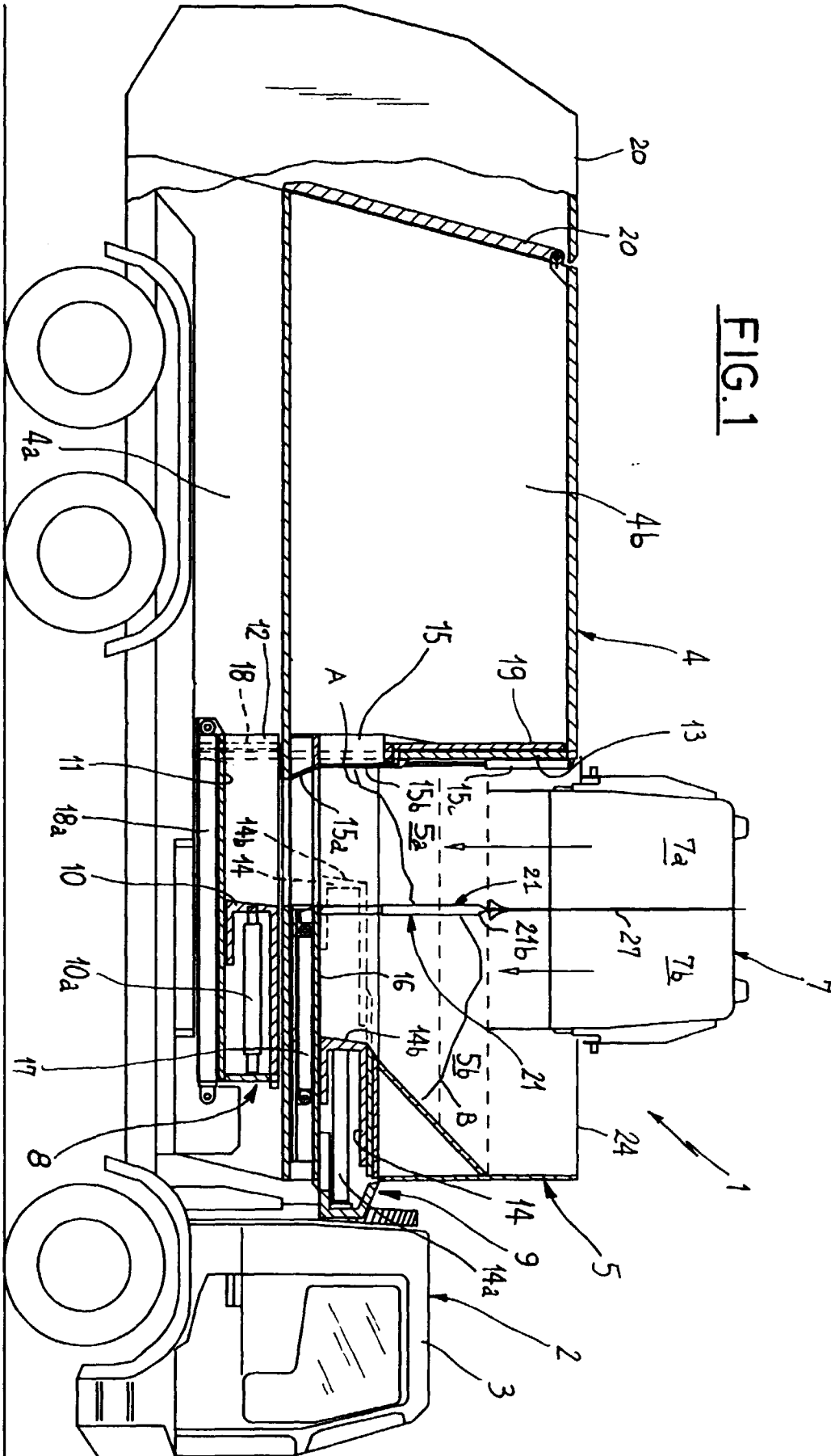
3. Device according to claim 2, wherein said dividing baffle (21) comprises a main portion (23) engaged in the hopper (5) and a closure portion (25) slidably engaged to the main portion (23) and defining the lower edge (21a) of the dividing baffle (21), said at least one vertical motion actuator (26) operating between the main portion (23) and the closure portion (25).
4. Device according to claim 3, wherein said first and second transfer means (8, 9) comprise respectively a lower thruster (10) and an upper thruster (14) able to be activated with alternating motion respectively in the direction of said lower opening (12) and upper opening (15).
5. Device according to claims 2 and 4, wherein the lower edge (21a) of the dividing baffle (21), in the open position, is distanced from the movable bottom (16) according to a measure sufficient to enable the passage of the upper thruster (14) towards the upper opening (15).
6. Device according to claim 1, wherein said dividing baffle (21) presents an upper edge (21b) able to be collimated with a dividing wall (27) presented by a container (7) in upset position above the hopper (5).
7. Device according to claim 6, wherein the upper edge (21b) of the dividing baffle (21) extends according to a profile essentially counter-shaped to a container (7) placed in upset position above the hopper (5).
8. Device according to claim 1, wherein said dividing baffle (21) can be selectively oriented around a horizontal axis of oscillation (X-X) between a position of normal utilisation wherein it is set to collimate with its upper terminal edge (21b) with a dividing wall (27) presented by a container (7) placed in upset position above the hopper (5), and at least a deviated position wherein it is able to convey into one of said first and second chamber (5a, 5b) all the waste emptied from the container (7).
9. Device according to claim 8, wherein said dividing baffle (21) comprises a main portion (23) engaged in the hopper (5) and an upper extensible portion (29) slidably engaged to the main portion (23) and able to be positioned, concurrently with the orientation of the dividing baffle (21) in the deviated position,

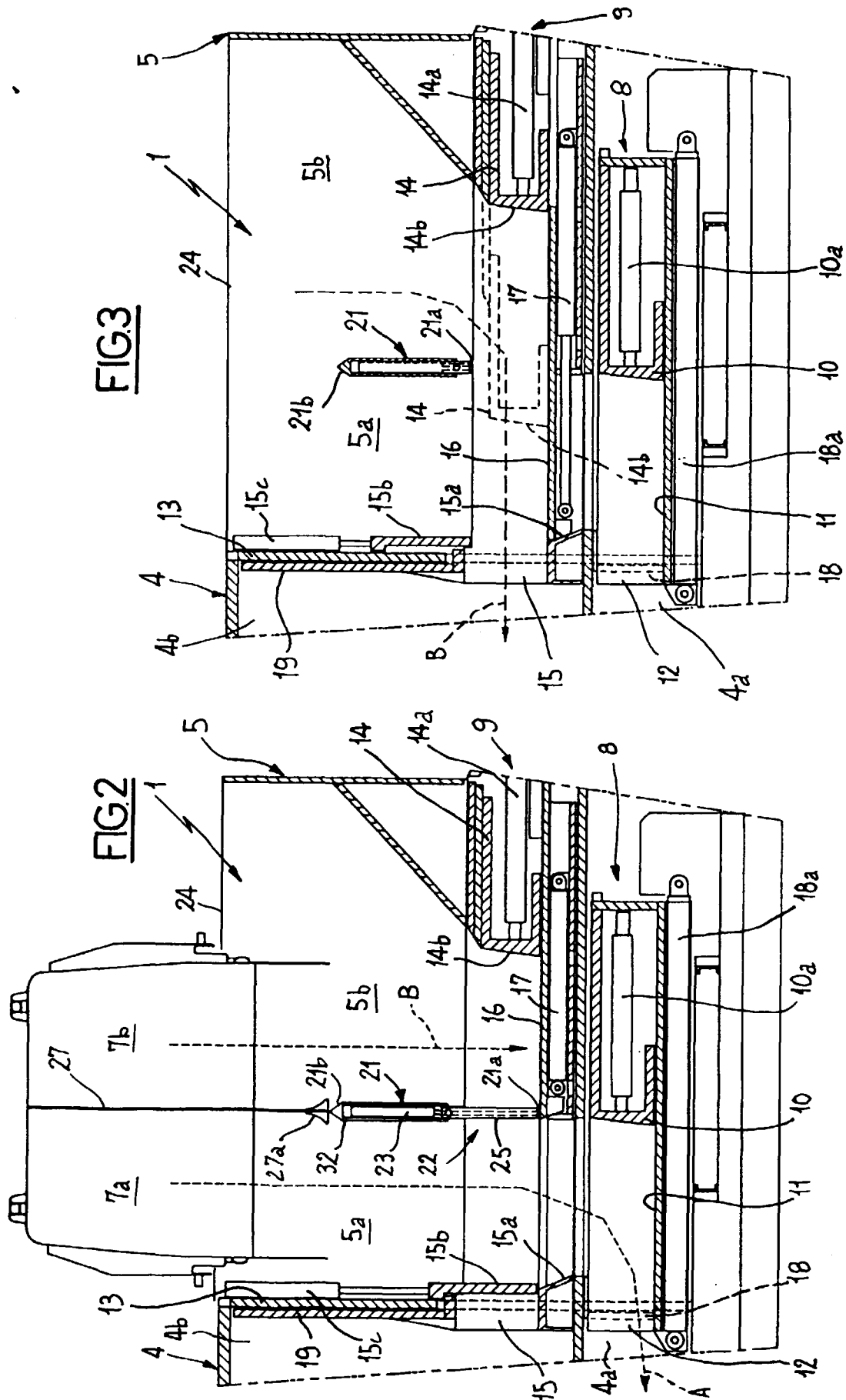
in an extended condition wherein said upper terminal edge (21b) protrudes laterally with respect to a vertical projection of a side wall of a container (7) placed in upset position above the hopper (5).

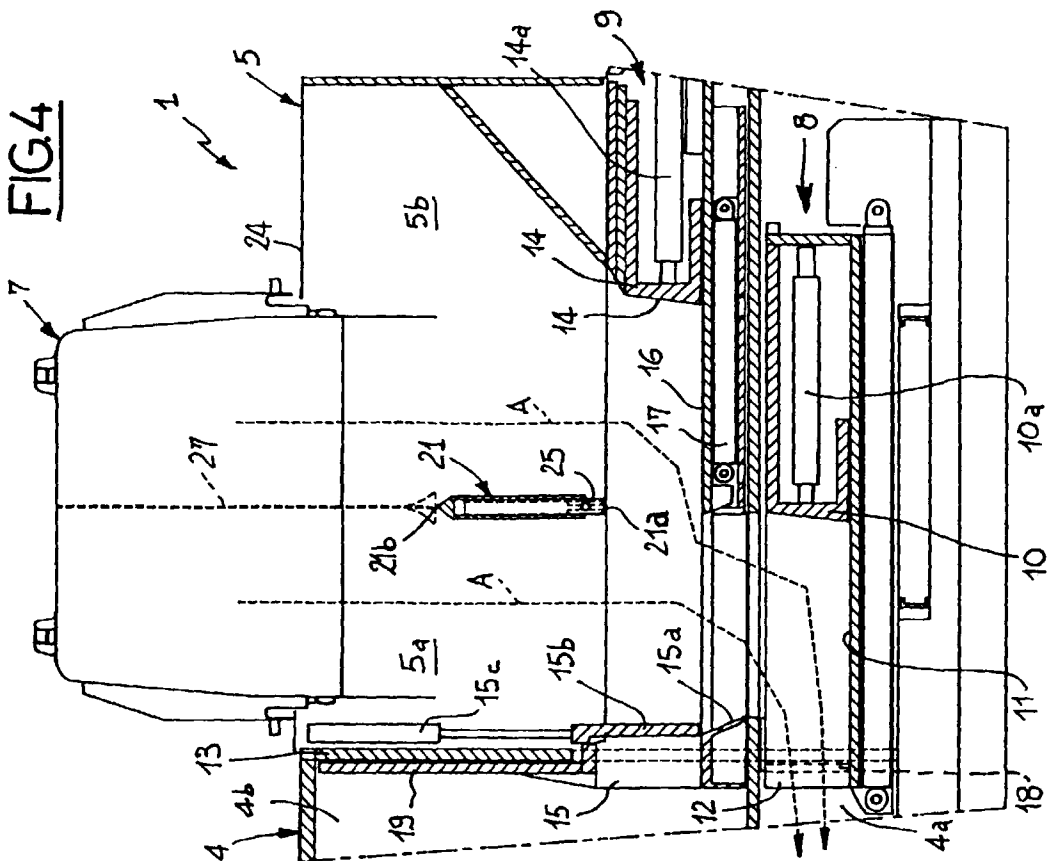
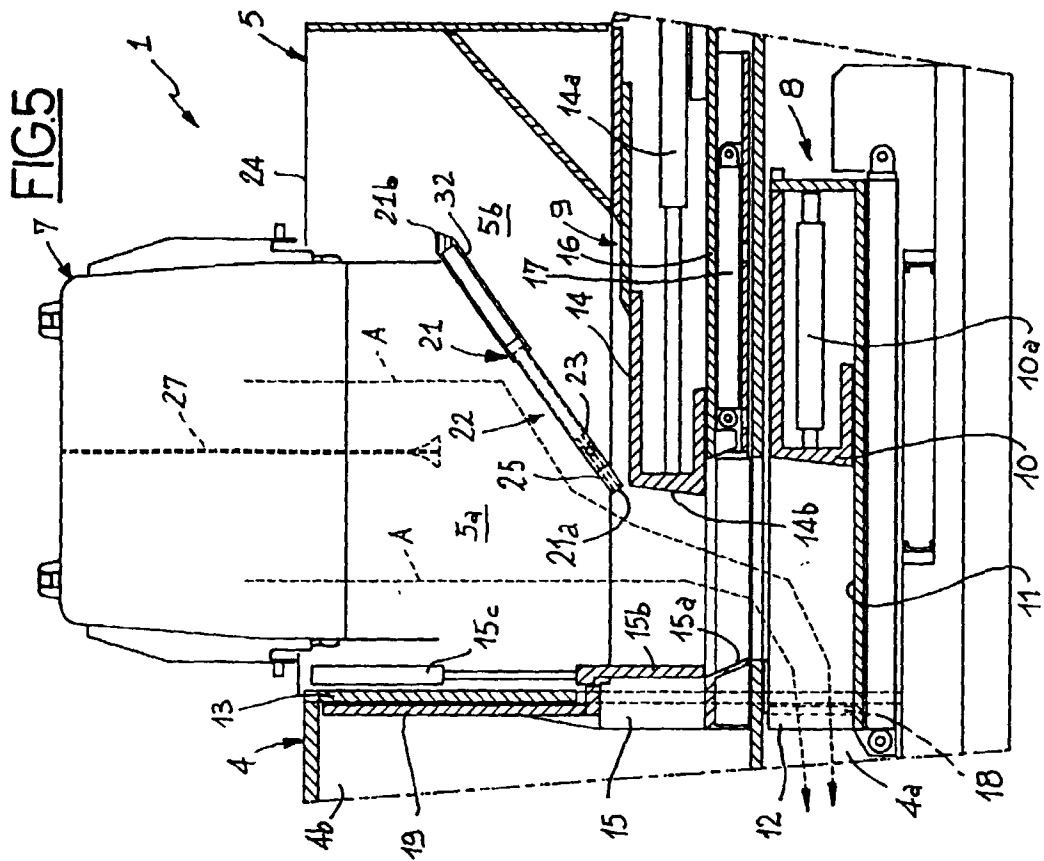
10. Method for the reception and the selective transfer of waste emptied from a container for the differentiated collection of waste comprising the phases of:

simultaneously emptying at least a first and a second waste respectively into a first and a second collection chamber (5a, 5b) delimited by a dividing baffle (21) in a hopper (5) and consecutively set side by side away from a rear wall (13) of the hopper itself;
 accumulating the first waste on a fixed bottom wall (11) of the hopper (5) and the second waste on a movable bottom wall (16) provided in the hopper itself at a higher level with respect to the fixed bottom wall (11);
 transferring the first waste through a lower opening (12) provided in the rear wall (13) of the hopper (5);
 extending the movable bottom wall (16) horizontally in the hopper (5) bringing its terminal edge (16a) in contact relationship with a lower border portion (15a) of an upper opening (15) provided in said rear wall (13);
 lifting a lower edge (21a) of the dividing baffle (21) with respect to the movable bottom wall (16) to place in communication the second collection chamber (5b) with the first collection chamber (5a);
 transferring the second waste from the second collection chamber (5b) through said upper opening (15) making it slide on the movable bottom wall (16).

FIG. 1







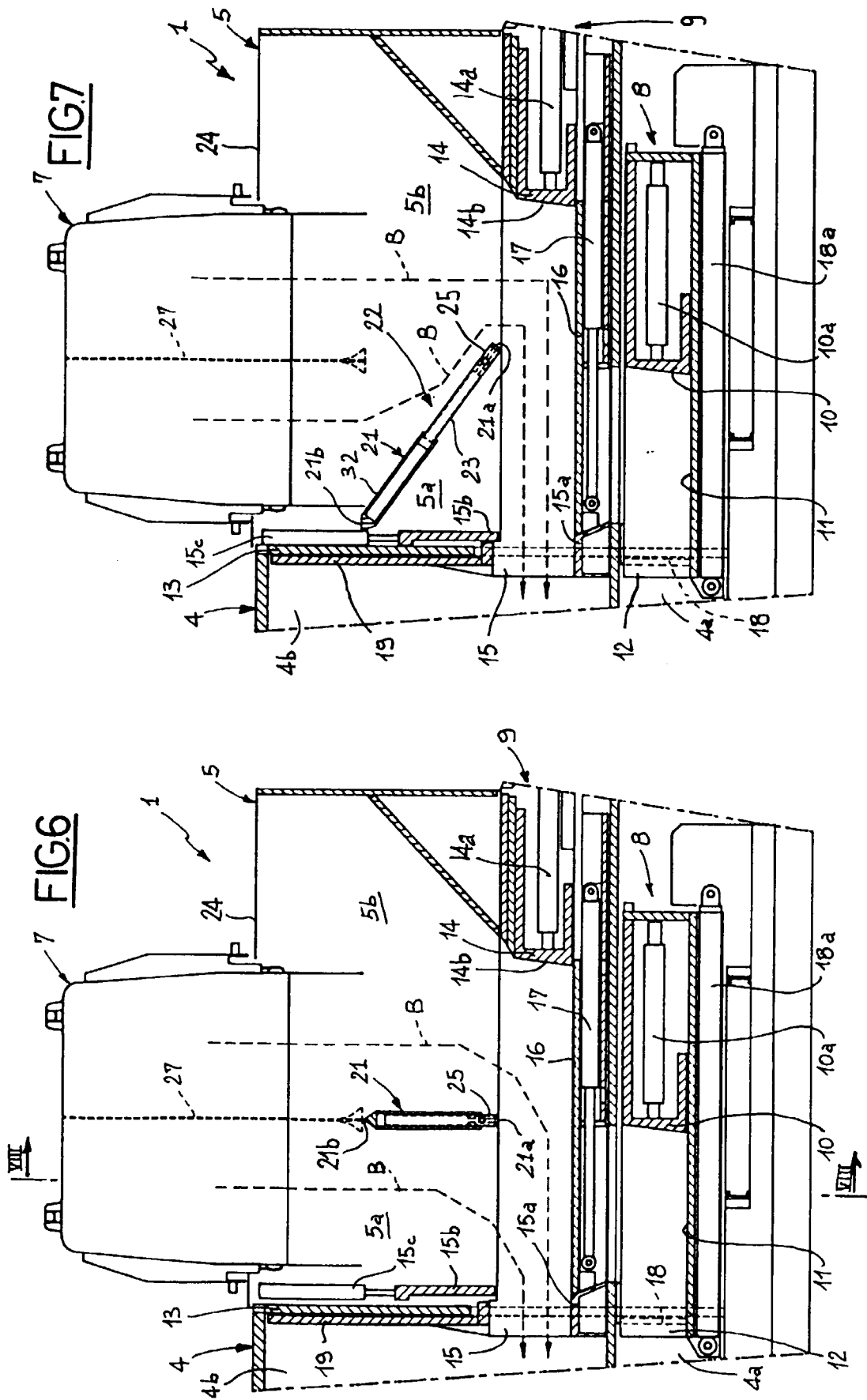
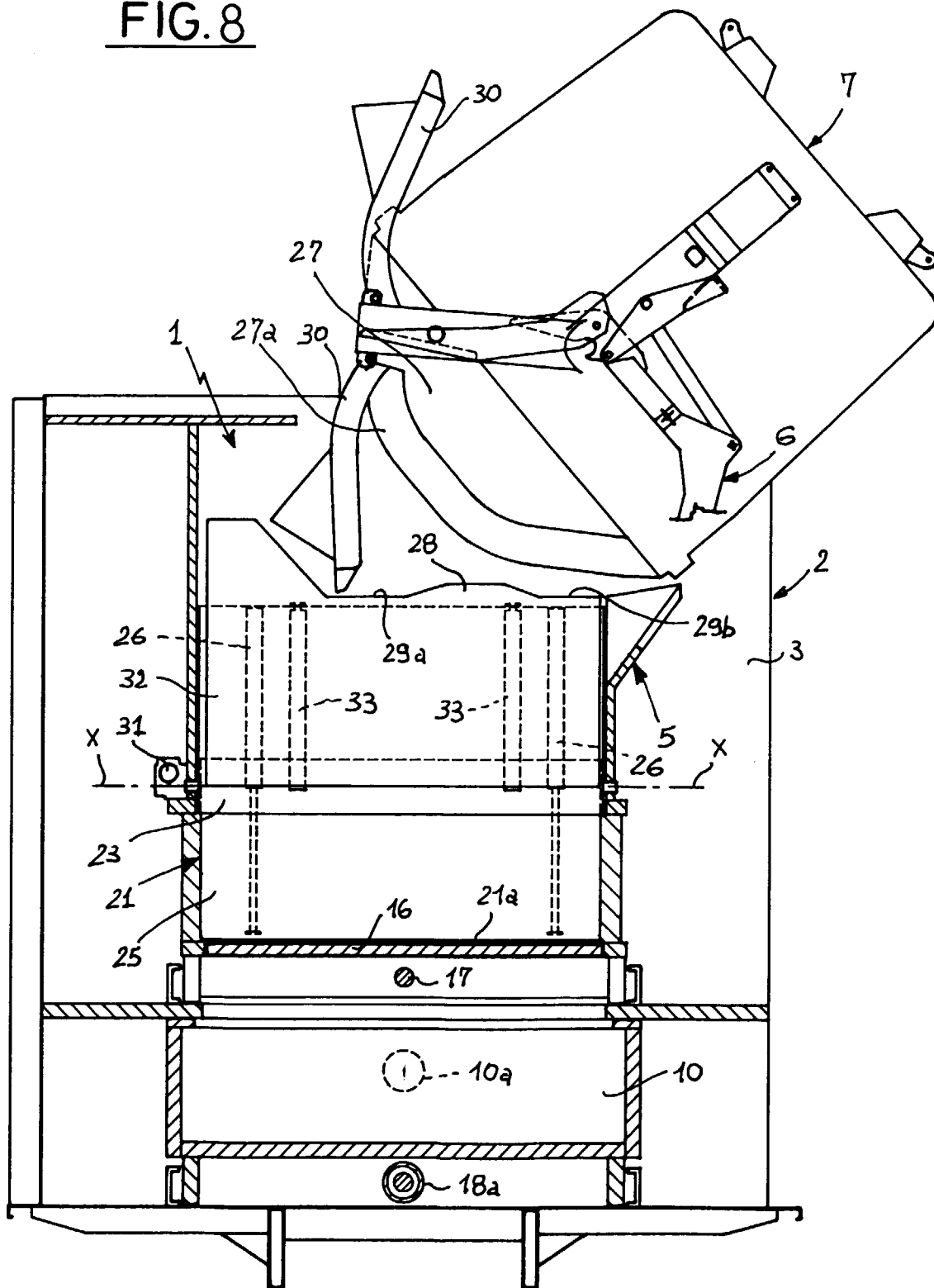


FIG. 8





European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 98 83 0287

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
D,A	EP 0 718 217 A (O.M.B. BRESCIA SRL) 26 June 1996 * column 5, line 51 - column 6, line 5 * * column 6, line 41 - column 7, line 46 * * column 8, line 37 - column 9, line 30 * * figures 1-9 * ---	1,10	B65F3/00 B65F3/20
A	EP 0 356 833 A (OTTO LIFT-SYSTEME GMBH) 7 March 1990 * column 5, line 4 - column 8, line 50 * * figures 1-3 * ---	1,6-10	
A	DE 37 03 557 A (MEHRKAMMER-MÜLL-SYSTEM) 18 August 1988 * column 10, line 55 - column 12, line 50 * * column 14, line 15 - column 15, line 3 * * figures 1-3,7,8 * ---	1,6-10	
A	US 5 599 071 A (D. KANN ET AL.) 4 February 1997 * column 4, line 57 - column 5, line 57 * * column 8, line 26 - line 45 * * figure 2 * ---	1,6,7,10	TECHNICAL FIELDS SEARCHED (Int.Cl.6) B65F
A	US 5 584 642 A (R. HUNTOON) 17 December 1996 * column 5, line 32 - line 54 * * column 7, line 66 - column 9, line 7 * * figures 1-3 * ---	1,6,7,10	
A	WO 93 22227 A (MANCO ENGINEERING GROUP) 11 November 1993 * page 9, line 28 - page 10, line 18 * * figure 6 * -----	1,6,8,10	
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 2 October 1998	Examiner Smolders, R
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			

EPO FORM 1503 03/82 (P04C01)