



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11)

EP 1 378 463 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:

07.01.2004 Bulletin 2004/02

(51) Int Cl.7: **B65F 3/04**

(21) Application number: **03014034.7**

(22) Date of filing: **23.06.2003**

(84) Designated Contracting States:

**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IT LI LU MC NL PT RO SE SI SK TR**

Designated Extension States:

AL LT LV MK

(72) Inventor: **Balestreri, Gianpaolo**
27029 Vigevano (Pavia) (IT)

(74) Representative: **Fioravanti, Corrado et al**
Jacobacci & Partners S.p.A.,
Corso Regio Parco 27
10152 Torino (IT)

(30) Priority: **05.07.2002 IT TO20020588**

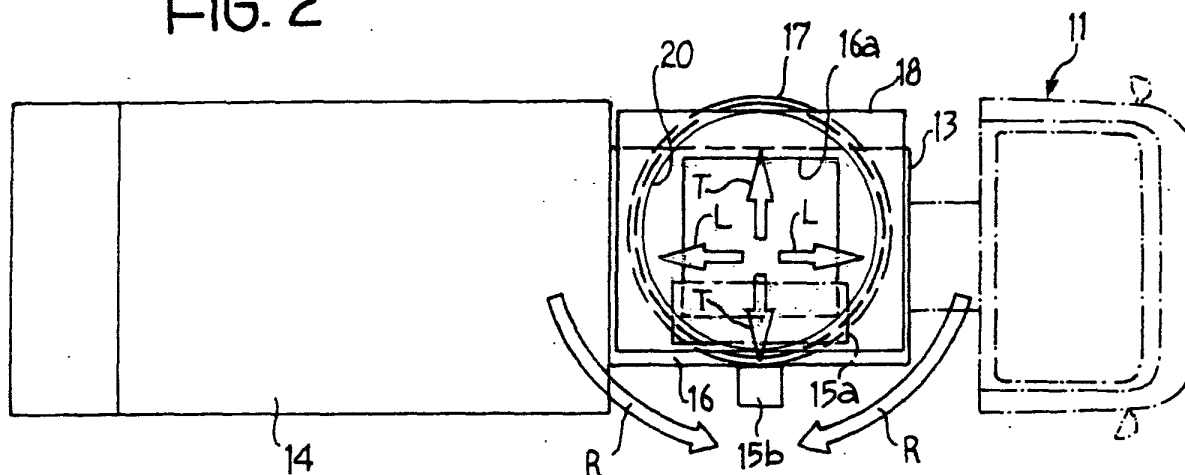
(71) Applicant: **FARID INDUSTRIE S.p.A.**
Localita' Tetti Caglieri, 10048 Vinovo (Torino) (IT)

(54) **A refuse collection vehicle**

(57) A refuse collection vehicle of the type comprises a frame (12), a container (13) fixed onto the frame and having an upper aperture (16a) for introducing refuse into the container (13), and a single lateral loading mechanism (15) for lifting and emptying refuse bins (C) into the aperture (16a). The mechanism (15) is rotatably mounted in a horizontal plane with respect to the

frame by means of a thrust bearing (17) so as to alternatively reach two loading positions on two different sides of the vehicle. The thrust bearing (17) is connected to a support assembly (18) movable to and from the right side and the left side of the vehicle, whereby at each of these sides of the vehicle the mechanism (15) is capable of reaching a respective lateral position falling within the shape of the vehicle.

FIG. 2



EP 1 378 463 A1

Description

[0001] The present invention refers to a refuse collection vehicle of the type defined in the preamble of claim 1.

[0002] There are known refuse collection vehicles equipped with lateral loading mechanisms for lifting refuse bins picked up from either the left or the right side of the vehicle and emptying the refuse from the bin into a loading aperture obtained in the roof of the storage body of the vehicle. A vehicle of this type is capable of collecting refuse from bins located on both the right and left sides of a one way street.

[0003] European Patent Application EP-0 728 684-A1 discloses a refuse collection vehicle equipped with two distinct loading mechanisms mounted one on the right side and the other on the left side of the vehicle.

[0004] From German utility model DE-297 23 035-U1 there is known a refuse collection vehicle equipped with a single loading mechanism for lifting and tilting refuse bins and emptying the content thereof into an aperture formed in the rear part of the roof of the storage body of the vehicle. In order to pick up alternately refuse bins from two different sides of the vehicle, i.e. the back or one of the longitudinal sides of the vehicle, the loading mechanism is mounted on a thrust bearing (or fifth wheel) located on the storage body roof around the loading aperture.

[0005] The present invention intends to make use of a single loading mechanism rotatably mounted on a rotatable thrust bearing in a horizontal plane in order to pick up alternatively refuse bins from the left and right sides of the vehicle.

[0006] It is therefore an object of the present invention to provide a refuse collection vehicle of the type specified above, mainly addressing the problem of optimizing the operation of the loading mechanism and reducing the bulk of such a mechanism, especially during the transfer of the vehicle.

[0007] Another object of the invention is to be applicable also onto storage bodies of existing vehicles without requiring any modification to the storage body and possibly the pressing device which is usually fitted within the storage body underneath the refuse loading aperture and used for compacting refuse towards the rear of the storage body or into another adjacent container.

[0008] A further object of the invention is to provide a vehicle of high efficiency capable of handling big capacity refuse bins.

[0009] These and other objects and advantages which will be better understood in the following, are achieved according to the invention by a refuse collection vehicle as defined in claim 1. Preferred embodiments of the invention are defined in the dependent claims.

[0010] The constructional and functional features of a few preferred but not limiting embodiments of a refuse collection vehicle according to the invention will now be described, reference being made to the accompanying drawings, in which:

Figure 1 is a schematic side elevational view of a first embodiment of a refuse collection vehicle according to the present invention;

Figures 2, 3 and 4 are schematic top views of the vehicle of figure 1 in three different operational positions;

Figures 5 and 6 are schematic transversal, vertical sectional views of the vehicle in the positions of figures 2 and 4, respectively;

Figure 7 is a schematic elevational front view, to an enlarged scale, of some details of figure 1 in accordance with a first embodiment of the invention;

Figure 8 is a schematic elevational front view, to an enlarged scale, of some details of figure 1 in accordance with a second embodiment of the invention; and

Figures 9, 10 and 11 are a side, top and vertical transversal sectional view, respectively, of a third embodiment of the invention.

[0011] Referring initially to figure 1, a refuse collection vehicle according to the invention is indicated overall 10. Throughout the present description and the claims, terms and expressions indicating positions and orientations are to be interpreted as referred to a condition mounted on board of the vehicle. The expression "longitudinal" therefore indicates a direction parallel to the longitudinal axis x of the vehicle and the expression "transversal" indicates a direction transversal to the axis x. Similarly, the expression "inner side" designates a side facing the centre line of the vehicle and the expression "outer side" designates a side facing a longitudinal lateral edge of the vehicle.

[0012] The vehicle 10 comprises a cabin 11 and a frame 12 on which there are fixed a front loading container 13 and a rear container or storage body 14. Within the loading container 13 there is provided a press device (of known kind and not shown) for pressing refuse into the rear storage body 14. Schematically designed 15 is a loading mechanism for lifting and tilting refuse bins to empty the content thereof into an aperture 16a (not shown in figure 1) formed in the roof 16 of the front container 13.

[0013] The constructional and operation features of the loading mechanism 15 (which may be of any known kind) are not *per se* relevant for the understanding of the invention and will not therefore be described in detail herein. Suffice it here to say that the mechanism 15 is provided with pick-up arms for hooking the refuse bins and actuating means for lifting the pick-up arms along vertical lifting guides. The mechanism 15 is capable of assuming, according to re-

quirements, different operational positions, such as for examples an upper operational position indicated in dotted line at 15a and/or a lower operational position 15b. Furthermore, the pick-up arms may be extended and retracted sideways autonomously with respect to the remaining part of the mechanism 15 through an actuating device (not shown) in order to bring them near to the bin to be loaded and withdraw them back towards the inside of the vehicle at the end of the loading and emptying cycle.

[0014] The loading mechanism 15 is rotatable about a vertical axis y by means of a thrust bearing 17 mounted on a mobile support assembly 18 for displacing the loading mechanism transversally with respect to the vehicle, and, according to a different embodiment, also longitudinally, as will be described in detail in the following.

[0015] In the embodiment shown in figures 1 to 5, the loading mechanism 15 is fixed on a hopper 20 rotatably mounted on the thrust bearing 17. The hopper 20 of a generally cylindrical or truncated cone shape, has inner walls inclined or vertical or curved 21 converging towards a lower aperture 22 (figure 7) facing the upper aperture 16a of the front container 13 to convey therein the refuse coming out of a bin (not shown) tilted above the hopper.

[0016] As shown in figures 2, 3 and 4, by combining the rotary movement (indicated by arrows R) of the hopper 20 about the vertical axis of the thrust bearing 17 with the transversal translational movement (indicated by the arrows T) of the thrust bearing 17 and the hopper on the mobile support 18, the loading mechanism 15 can alternatively reach two opposite lateral positions, to the right side (figure 2) and the left side (figure 4) of the vehicle 10. In these positions, the loading mechanism 15 falls within the shape of the vehicle.

[0017] As can be seen in figure 3, where the transversally translating elements are in an intermediate position between those of figures 2 and 4, the transversal movement of the mobile support 18 can be advantageously exploited for

- moving the loading mechanism 15 outwardly and bringing it near to a refuse bin C to be picked-up and loaded, and
- maintaining the loading mechanism 15 within the clearance gauge (or shape) of the vehicle, with the possibility of mounting a thrust bearing 17 and a hopper 20 of greater diameter, as will be explained herein after.

[0018] The movements of rotation of the hopper on the thrust bearing 17 and translation of the mobile support 18 are preferably controlled by electric or hydraulic motors or fluid actuating devices that are known in the art and do not need to be described herein. Rotation of the hopper is effected for example by means of a hydraulic motor with a geared motor and a pinion meshing with a toothed wheel secured to the hopper 20 or the rotatable part of the thrust bearing 17.

[0019] As shown schematically in figure 7, the hopper 20 is fixed to the rotatable part 17a of the thrust bearing 17. The non-rotatable part 17b of the thrust bearing is transversally slideable on the roof 16 of the container 13 by means of the mobile support assembly 18. The assembly 18 in this example comprises a pair of rectilinear and parallel transversal guides 184, 185 fixed to the non-rotatable part of the thrust bearing and coupled to roller members or sliding blocks 183 mounted on the roof 16. The transversal translation movement of the unit consisting of the thrust bearing 17, the rotatable hopper 20, and the loading mechanism 15 is provoked for example by a transversal actuator (not shown) or a driving assembly of other kind, for example an electric motor and an associated rack interposed between the guides 184, 185 and the front container 13 or another member fixed to the vehicle frame 12.

[0020] Operation of the vehicle according to the invention is as follows.

[0021] Assuming the loading mechanism 15 is initially located on a side of the vehicle opposite to the side of the street where a bin to be emptied is located, the rotation of the hopper 20 about the thrust bearing 17 is controlled so as to bring the mechanism 15 to face the refuse bin to be emptied. Simultaneously or after the rotation movement, the assembly thrust bearing-hopper-loading mechanism can be translated by means of the transversal guides 184, 185 towards the outside of the vehicle to bring the mechanism 15 near the refuse bin to be emptied (figure 3). As an alternative or in addition to this transversal translational movement of the aforesaid assembly, the pick-up arms of the loading mechanism 15 may be controlled to extend sideways if the arms have an independent driving device that allows to increase the reach of the loading mechanism.

[0022] Then, the loading mechanism 15 is operated. This mechanism grasps, lifts and tilts the refuse bin above the hopper. Conveyed by the hopper, the refuse falls through the loading aperture 16a in the container 13 and is pressed and compacted into the rear storage 14 by means of the above mentioned pressing device.

[0023] After having brought the empty bin onto the ground, the assembly thrust bearing-hopper-loading mechanism is translated by means of the transversal guides 184, 185 towards the inside of the vehicle. The loading mechanism does not protrude out of the shape of the vehicle and this may be advanced to reach other refuse bins located further on along the road.

[0024] It will be appreciated that, owing to the fact that the thrust bearing and the hopper are transversally movable, the hopper may have a bigger size with respect to the case in which it were mounted onto a fixed thrust bearing. A fixed thrust bearing would in fact require to reduce the size of the hopper such that the loading mechanism does not protrude laterally out of the contour or shape of the vehicle while travelling. According to the invention, when the vehicle has to be moved, the hopper is transversally displaced towards the side opposite to that where the loading mechanism

is located, whereby neither the hopper nor the loading device projects from the shape of the vehicle while this is travelling. The maximum diameter of a transversally mobile hopper according to the invention may be increased of about 400 mm or more with respect to the case in which the hopper were transversally fixed. By way of indication, the vehicle according to the invention may be equipped with hoppers having a diameter approaching the transversal dimension of clearance gauge of the vehicle. Those skilled in the art will appreciate that a wider hopper allows to handle easily also big capacity refuse bins without the risk of pouring their content outside of the loading aperture. To this end, the loading aperture 16a of the container 13 and the lower aperture of the hopper will be suitably sized of as to result in being essentially facing one another and communicating to allow the passage of refuse from the hopper to the container 13 also when the hopper is slightly eccentric with respect to the loading aperture 16a.

[0025] It will further be appreciated that the invention is also applicable to existing vehicles, and therefore can increase their efficiency without requiring structural modification to the front container nor the storage body and neither the press inside the front container.

[0026] Schematically shown in figure 8 is another embodiment of the support assembly 18 which advantageously allows to combine the transversal movement of translation of the assembly consisting of the thrust bearing 17, the rotatable hopper 20 and the loading mechanism 15, with a longitudinal translation movement (as shown by arrows L in figures 2-4).

[0027] The transversal guides 184, 185 fast with the non-rotating part of the thrust bearing are slidably supported (as in figure 7), through roller elements or sliding blocks 183.

[0028] These are in turn secured to further roller elements or sliding blocks 186 slidably engaging or translating along a pair of rectilinear and parallel guides 181, 182 which extend in the longitudinal direction and are fixed to the roof 16. Only one (181) of these longitudinal guides is visible in figure 8.

[0029] The translational movements in the longitudinal and transversal directions are provoked by respective longitudinal and transversal actuators (not shown), preferably idraulic actuators, mounted on the roof 16 of the container 13. By suitably controlling the extension and retraction movements of these actuators with the rotary movements of the hopper 20 it is possible to make the mechanism 15 pass around the front part of the front container 13 in the gap behind the cabin 11 so as to make the mechanism 15 follow a semi-elliptical trajectory flattened in the longitudinal direction. As an alternative to the above described arrangement with rectilinear and perpendicular pairs of guides, the same movement of the loading mechanism and its supporting members may obviously be accomplished through supporting and guiding means of different kinds, for examples guides suitably curved or disposed at an angle or through an articulated linkage capable of determining a combined rotary-translational movement equal or equivalent in a horizontal plane.

[0030] The embodiment of figure 8 is preferred for vehicles with loading mechanisms located in the position indicated at 15b.

[0031] In a further variant of the invention, schematically shown in figures 9 to 11, the thrust bearing 17 and the mobile support assembly 18 can be mounted onto the frame 12 beneath the front container 13. In this variant, the loading mechanism 15 (schematically shown in three different positions) is not carried by the hopper 20 but a horizontal arm 23 secured to the rotating part of the thrust bearing and projecting beyond the base of the front container 13.

[0032] It is to be understood that the invention is not limited to the embodiments here described and shown, which are to be considered as implementing examples of the refuse collecting vehicle. The invention may instead undergo modifications as to the shape and location of parts, and constructional and functional details. Particularly, the members of the mobile supporting assembly may be arranged and located differently from what is shown by way of not limiting example in the drawings, provided the relative translational movement or movements as described above is/are allowed. For example, in a further possible variant (not shown) it is possible to mount the thrust bearing 17 directly on the roof 16 of the container 13 and connect the hopper 20 to the thrust bearing interposing the mobile supporting assembly 18.

Claims

1. A refuse collection vehicle of the type comprising:

- a frame (12),
- a container (13) fixed onto the frame and having an upper aperture (16a) for introducing refuse into the container (13),
- a single lateral loading mechanism (15) for lifting and emptying refuse bins (C) into the aperture (16a), the mechanism (15) being rotatably mounted in a horizontal plane with respect to the frame by means of a thrust bearing (17) so as to alternatively reach two loading positions on two different sides of the vehicle,

characterised in that the thrust bearing (17) is connected to support means (18) movable to and from the right side and the left side of the vehicle, whereby at each of these sides of the vehicle the mechanism (15) is capable of reaching a respective lateral position falling within the shape of the vehicle.

- 5 **2.** A vehicle according to claim 1, **characterised in that** the thrust bearing (17) and the support means (18) are located above the loading container (13).
- 10 **3.** A vehicle according to claim 2, **characterised in that** the loading mechanism (15) is mounted fast for rotation with a hopper (20) of a generally cylindrical or truncated cone shape rotatably mounted on the thrust bearing (17), the hopper (20) having a lower aperture (22) facing the aperture (16a) of the container (13) for conveying refuse into it.
- 15 **4.** A vehicle according to claim 2, **characterised in that** the hopper (20) has inner inclined, vertical or curved walls (21) converging towards the lower aperture (22).
- 20 **5.** A vehicle according to claim 1, **characterised in that** the support means (18) include guide means (184, 185) extending in a direction (T) essentially transversal with respect to the longitudinal axis (x) of the vehicle.
- 25 **6.** A vehicle according to claim 5, **characterised in that** the guide means (184, 185) are associated with first drive means for selectively displacing the thrust bearing (17) from and towards the left and right sides of the vehicle.
- 30 **7.** A vehicle according to claim 1, **characterised in that** the means (18) supporting the thrust bearing are so arranged as to allow to move the rotatable thrust bearing (17) with respect to the vehicle frame combining a transversal movement of translation with a longitudinal (L) movement of translation.
- 35 **8.** A vehicle according to claim 7, **characterised in that** the support means (18) include:
 - first guide means (184, 185) extending in a direction essentially transversal with respect to the longitudinal axis of the vehicle, and
 - second guide means (181, 182) extending in a direction essentially parallel to the longitudinal axis of the vehicle.
- 40 **9.** A vehicle according to claim 8, **characterised in that** the first guide means (184, 185) are mounted so as to be capable of translating along the second guide means (181, 182) or vice versa.
- 45 **10.** A vehicle according to claim 8, **characterised in that** the first guide means (184, 185) and the second guide means (181, 182) are associated with respective first and second drive means for accomplishing said combined movement.
- 50 **11.** A vehicle according to claim 7, **characterised in that** said container (13) is located behind the vehicle cabin (11) and that the means (18) supporting the thrust bearing are capable of being controlled co-ordinately with the rotation of the thrust bearing (17) so as to make the mechanism (15) pass around the front part of the container (13) in the gap at the back of the cabin (11) and making the mechanism (15) follow a semi-elliptical trajectory flattened in the longitudinal direction.
- 55 **12.** A vehicle according to claim 1, **characterised in that** the thrust bearing (17) and the support means (18) are located underneath the loading container (13).
- 13.** A vehicle according to claim 12, **characterised in that** the loading mechanism (15) is carried by a horizontal arm (23) secured to a rotating part of the thrust bearing (17) and projecting beyond the base of the container (13).
- 14.** A vehicle according to claim 1, **characterised in that** the mobile support means (18) are interposed between the thrust bearing (17) and a fixed part (16, 13) of the vehicle.
- 15.** A vehicle according to claim 1, **characterised in that** the thrust bearing (17) is interposed between the mobile support means (18) and a fixed part (16, 13) of the vehicle.

FIG. 1

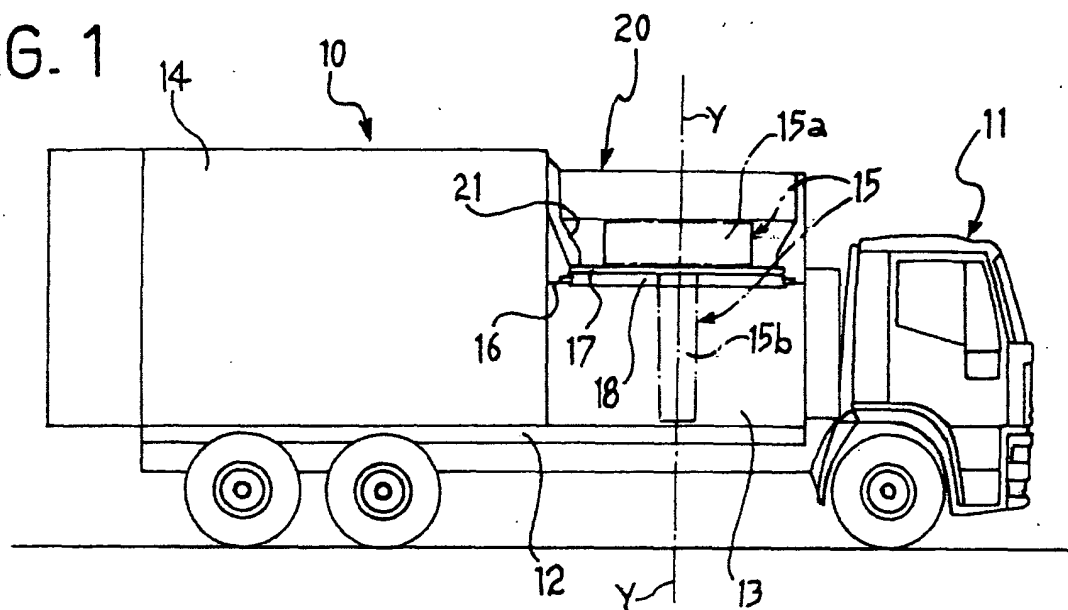


FIG. 5

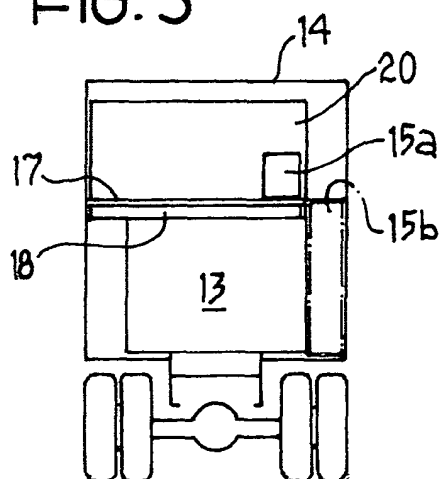


FIG. 6

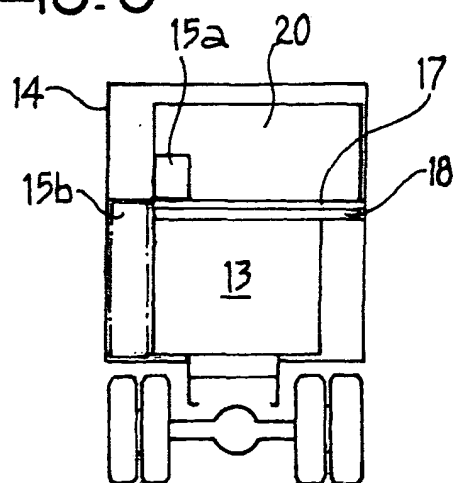


FIG. 2

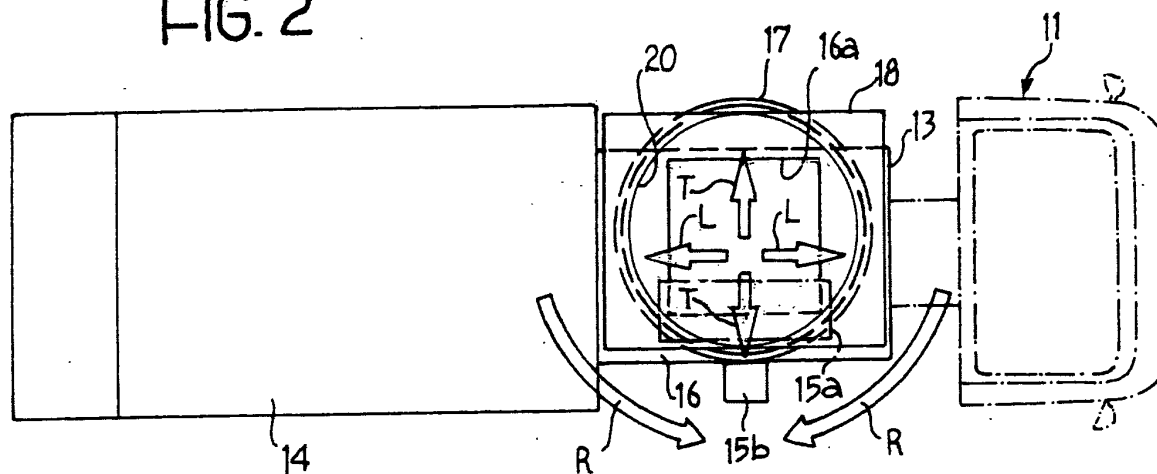


FIG. 3

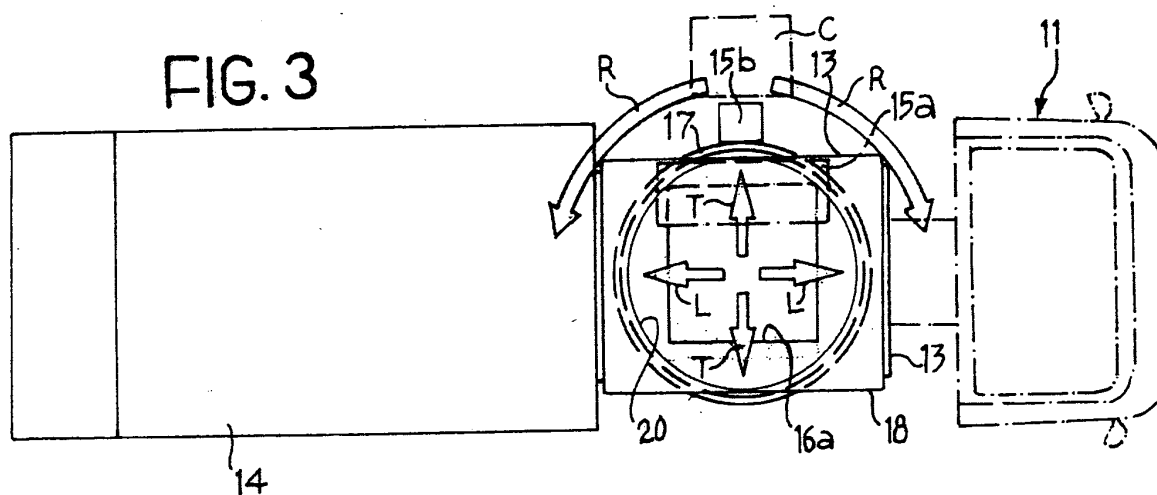


FIG. 4

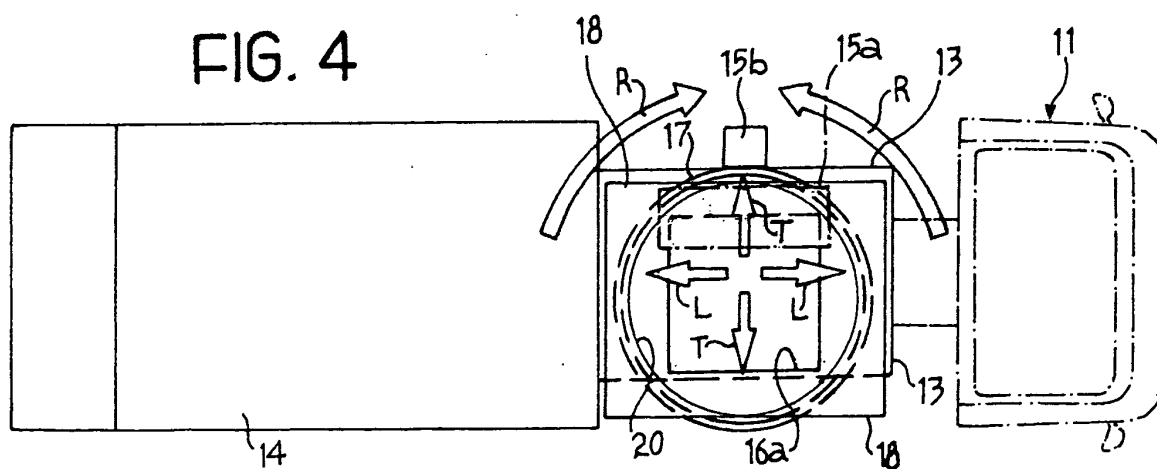


FIG. 7

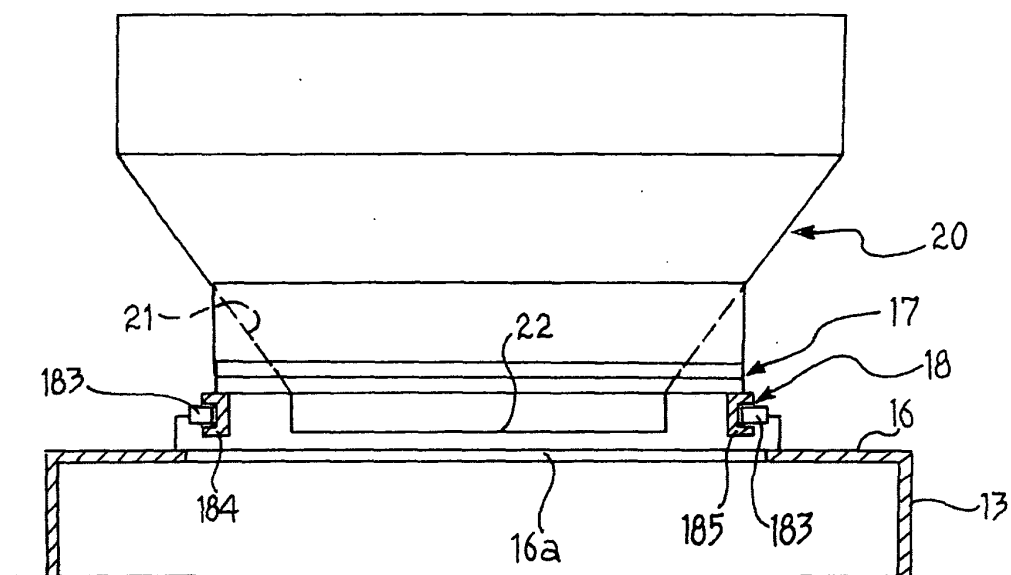


FIG. 8

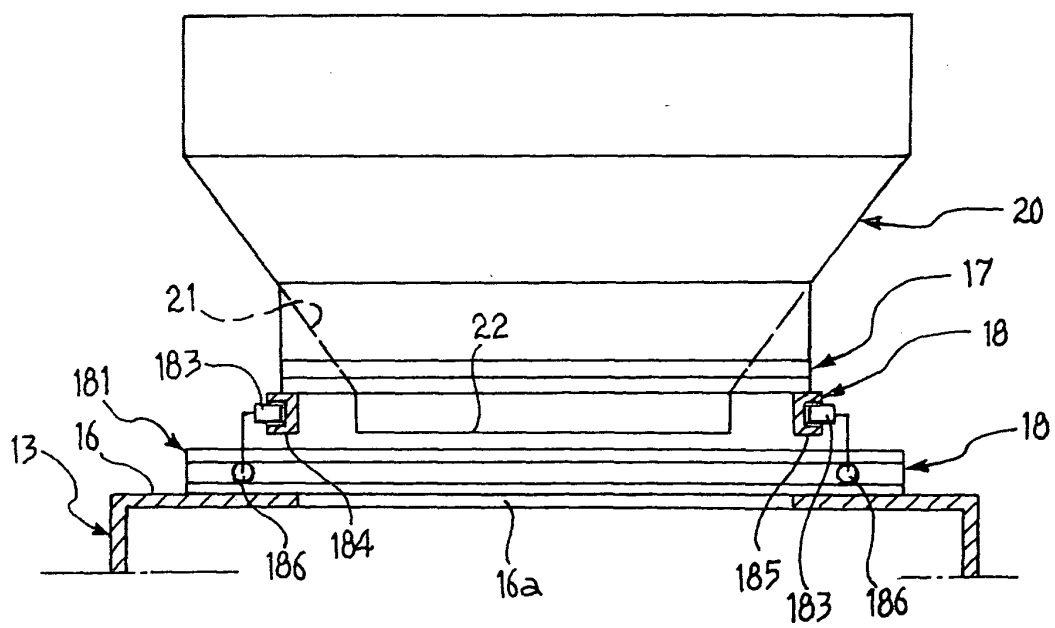


FIG. 9

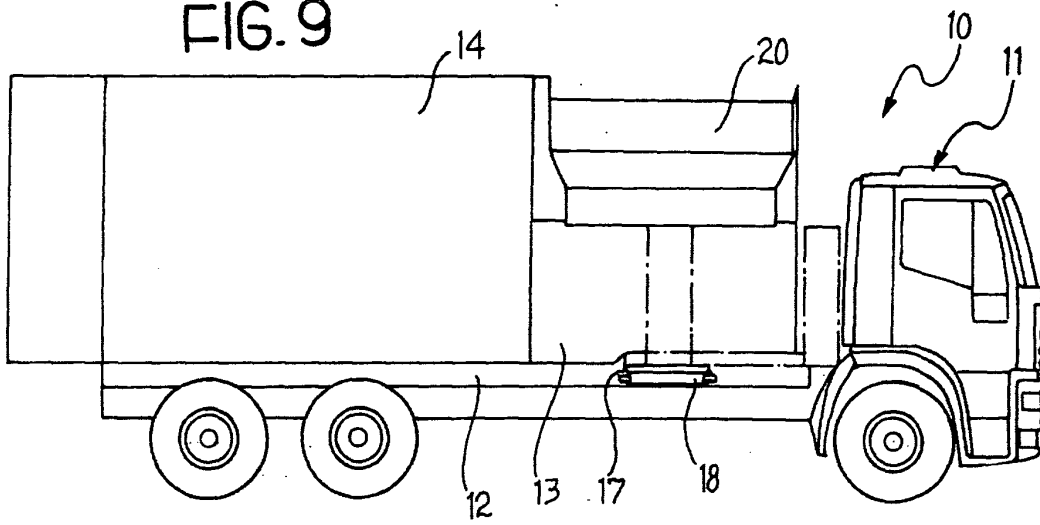


FIG. 10

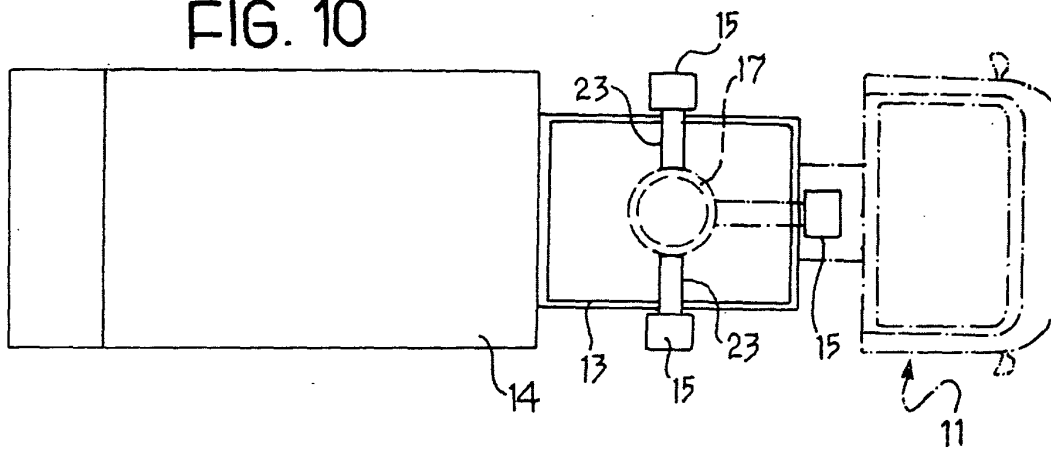
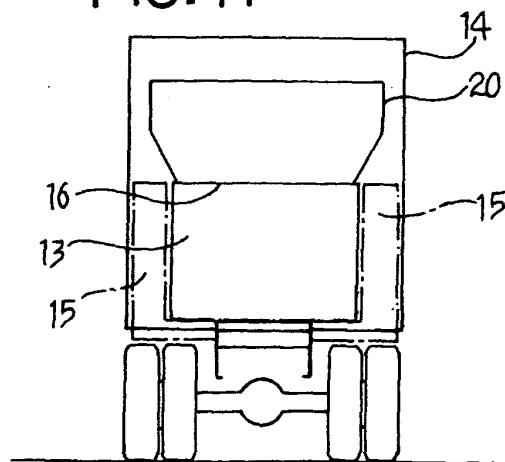


FIG. 11





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 03 01 4034

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.7)
X	US 5 769 594 A (J. KALUA) 23 June 1998 (1998-06-23) * column 3, line 60 - column 4, line 23 * * column 5, line 14 - line 25 * * figures 1,6 *	1,5,6,14	B65F3/04
A	DE 39 17 307 C (U. SCHÄFER) 26 April 1990 (1990-04-26) * the whole document *	1,2, 5-10,14	
D,A	DE 297 23 035 U (J. VOGLER) 19 February 1998 (1998-02-19) * the whole document *	1	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			B65F
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
THE HAGUE		11 September 2003	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)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 03 01 4034

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
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

11-09-2003

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 5769594	A	23-06-1998	NONE	
DE 3917307	C	26-04-1990	DE 3917307 C1	26-04-1990
DE 29723035	U	19-02-1998	DE 29723035 U1	19-02-1998

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82