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(54) Refuse collection vehicle provided with safety means

(57) A refuse collection vehicle comprising a chassis (1), a body (2) mounted on the chassis and a loading device for emptying refuse containers into the body, the vehicle (4) being provided with protective means for the prevention of unsafe situations. The protection means comprise at least one contactless detection element (7) which is connected to control means of the refuse collection vehicle. The detection element is arranged on a movable part of the loading device (4) and is designed to scan a two- or three-dimensional scanned area (7a) (window). The detection element (7) is in particular connected to control means of the loading device (4) and is designed to protect the working area of the loading device. In this case, the scanned area (7a) of the detection element (7) corresponds to at least part of the working area of the loading device (4). The detection element may furthermore also be connected to other protective systems of the vehicle.

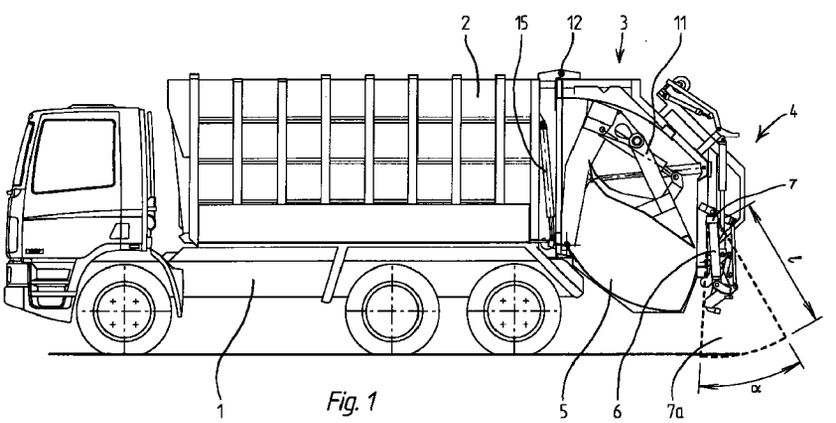

Fig. 1

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Description

The invention relates to a refuse collection vehicle comprising a chassis, a body mounted on the chassis and a loading device for emptying refuse containers into the body, the vehicle being provided with protective means for the prevention of unsafe situations, the protective means comprising at least one contactless detection element which is connected to control means of the refuse collection vehicle.

A refuse collection vehicle of this type is known from DE 94 12 508 U. This known refuse collection vehicle is provided with an automatic loading device. The working area of the loading device is screened by means of photoelectric detection elements arranged on fixed parts of the vehicle. The photoelectric detection elements are connected to the control means of the loading device, such that, if a person or object or the like is signalled by the detection element at least during part of the movement cycle of the loading device, the movement of the loading device is prevented or interrupted.

The object of the invention is to provide a refuse collection vehicle having improved protective means which are such that the working area of movable parts of the vehicle is optimally protected, such that unsafe situations cannot occur.

This object is achieved according to the invention with a refuse collection vehicle of the type mentioned at the outset in that the detection element is arranged on a movable part of the loading device and is designed to scan a two- or three-dimensional scanned area (window).

This measure makes the area of the loading device optimally protected at all times, so that whenever a person or object or the like is situated within the scanned area of the detection element, moving parts of the vehicle can be stopped, so that hazardous situations do not arise.

Preferred embodiments of a refuse collection vehicle according to the invention are defined in the dependent claims.

The invention will be explained in more detail in the following description of an exemplary embodiment of the invention with reference to the drawing, in which:

Fig. 1 is a side view of a refuse collection vehicle according to the invention, of the rear loader type,
Fig. 2 depicts the rear section of the refuse collection vehicle of Fig. 1, with the loading device situated in the position in which a refuse container held in the loading device is being emptied,
Fig. 3 is a side view of a refuse collection vehicle of the side loader type, and
Fig. 4 is a rear view of the refuse collection vehicle of Fig. 3.

Fig. 1 depicts a side view of a refuse collection vehicle of the rear loader type. The vehicle comprises a chassis 1 and a body 2 mounted on the chassis. A rear loader 3, which is pivotably connected at the points 12 to the body 2, is mounted on the body. The rear loader 3 can be pivoted by means of cylinders 15, which are arranged between the body 2 and the rear loader 3.

A loading device 4 is fastened to the rear loader 3, by means of which loading device refuse containers can be emptied by pouring their contents into a trough 5 of the rear loader 3. Refuse can also be thrown manually into the trough 5. The rear loader 3 is provided with a compression mechanism 11, by means of which the refuse is pressed out of the trough 5 into the body 2.

The working area of the loading device 4, in particular of the moving parts thereof, should be protected, in the sense that unsafe situations cannot occur if a person, object or the like is situated in this working area. The loading device 4 is then unable to move. The working area of the loading device is to be understood as meaning the area within which the movable parts of the loading device can move, but also the area situated around this which is to be free of persons, objects or the like, in order to be able to ensure safe movements of these parts. The working area of the loading device 4 is situated at the rear of the vehicle. In order to screen this area at the side, a contactless detection element 7 is arranged on the left-hand and right-hand lifting arm 6 of the loading device 4. The detection element 7 is adjusted and directed such that a two- or three-dimensional scanned area or window 7a can be scanned, as depicted in Fig. 1 by dashed lines, with a window length 1 and a window angle α. This window 7a laterally screens both the loading device and a refuse container to be handled by the loading device. If any part of the body of a person passes into the window 7a during the (automatic) movement of the loading device, the loading device 4 will stop moving, so that there is no danger. Since there are no barrier elements present, a loader is not impeded when transporting refuse containers to and from the loading device 4 from the side, as is the case in the known refuse collection vehicle.

It can be seen in Fig. 2 that fastening the detection elements 7 to the lifting arms 6 has the advantage that since the detection elements 7 are moved along together with the lifting arms 6, the actual, ever changing working area of the loading device 4 with container 16 is protected. This is in contrast to the protection by means of barrier elements as in the known refuse collection vehicle. When, in the known vehicle, the loading device is moved to above the barrier element, the barrier element no longer completely screens the loading device, and it is possible to come into contact with the moving loading device.

Another advantage of the design according to the invention is that the correct operation of the detection element 7 can be checked each time the movement cycle of the loading device 4 is started. In the lowest position of the loading device 4, the detection element 7 is directed towards the ground (see Fig. 1). If the detec-

tion element 7 then fails to signal the ground, this automatically means that the detection element 7 is defective, and the loading device 4 is placed out of operation. In the lower course of the movement of the loading device 4, the detection element 7 should thus act differently on the control means than in the rest of this course, namely should switch off the loading device if nothing is signalled and enable the movement thereof if something is signalled. The above-described protective means is then temporarily inactive. This is acceptable in safety terms in the lower movement course of the loading device, since the course is short and the speed of the loading device in this course is extremely low, in order to be able to receive a refuse container correctly.

Fig. 2 likewise depicts a preferred position for at least one other detection element 8, having a scanned area which extends rearwards substantially in the horizontal direction. By providing one or more detection elements 8, the rear of the vehicle can be covered over its complete width by a scanned area or window 8a. The detection elements 8 are fastened to the underside of the trough 5 at a height which is such that the window 8a does not touch the ground. If a person passes into the window 8a covered by the detection elements 8, the automatic movement of the loading device will stop. Inter alia, this prevents anyone from being able to pass from the rear into the hazardous working area of the loading device. One advantage of this is also that small (crawling) children can also be signalled, due to the fact that the window 8a can be adjusted so as to reach as far as just above the ground. By using a detection element 8 of a specific type and having a window 8a whose limits are situated a safe distance beyond the two sides and the rear of the working area of the loading device, it is even possible to omit the detection elements 7 on the loading device 4 itself.

By positioning the detection elements 8 such that loading device 4, in its lowest position, is situated in the window 8a, which situation, however, is not depicted in the drawing, the correct operation of the detection elements 8 can be checked each time the movement cycle of the loading device 4 is started. If the detection elements 8 fail to signal the loading device in its lowest position, this automatically means that they are defective and the loading device 4 is placed out of operation. As described above with reference to the detection elements 7, the detection elements 8 also act differently on the control means in the lower movement course of the loading device 4.

Other protective features can also be realized by means of the detection elements 8. A compression mechanism 11, which is situated in the rear loader 3, is accessible from the rear of the rear loader for the purpose of tipping refuse into the trough 5. However, as a result the compression mechanism 11 is also accessible to people. Due to the fact that the area behind the vehicle is covered by the detection elements 8, the hazardous automatic movement of the compression mechanism 11 is protected. If anyone passes into the area 8a covered by the detection elements 8, the movement of the compression mechanism 11 will stop, so that hazardous situations are prevented.

It can be seen in Fig. 3 that detection elements 8 may also be positioned on the rear, such that it is also signalled whether anyone is standing on a footboard 9. The safety of the vehicle can then be improved further by limiting the speed of the vehicle or preventing the vehicle from being able to be driven backwards when it is signalled that someone is standing on the footboard 9. Obviously, a footboard may also be provided in a similar manner in the case of the embodiment of Fig. 2.

It is also possible, by means of the positioning of the detection elements 8 in accordance with Figs. 2 and 3, to achieve total protection against driving in reverse. If, when the vehicle is being driven in reverse, a person or object or the like comes into the area covered by the detection elements 8, driving in reverse is prevented.

The maximum opening angle of the rear loader 5 can also be protected by means of the detection elements 8. This is because the rear loader 5 can rotate upwards, by operating the cylinders 15, for the purpose of emptying the body 2. The rear loader 3 then pivots about the points 12. When the body 2 is being emptied in a building, the detection elements 8 can be used to stop the opening before the rear loader 3 comes into contact with the roof of the building.

Figs. 3 and 4 depict a refuse collection vehicle of the side loader type with a side loading device 10. This loading device 10 is a variant on the above-described loading device 5 of Figs. 1 and 2, which is situated at the rear of the vehicle. The side loading device 10 can be used, for example, to empty containers positioned on the pavement automatically from the side of the vehicle by driving the vehicle passed the containers. Compared to the above-described loading device 4 at the rear, there is then a greater risk of people coming into contact with the moving loading device 10, due to the fact that the moving side loading device 10, together with the container to be emptied, projects beyond the contours of the vehicle at right angles to the direction of travel. The working area of the side loading device 10 is protected by means of detection elements 13 and 14. The detection elements 13 then screen the working area of the loading device 10 at the front and rear, in a manner similar to the screening by means of the above-described detection elements 7, which screen the loading device 4 from the sides. The detection elements 14 protect the working area next to the side loading device 10, in a similar manner to the protection by means of the detection elements 8, which screen the area behind the loading device 4.

As depicted in Figs. 3 and 4, the detection elements 13 are arranged on the fixed part of the side loading device 10. These detection elements 13 can be used to cover a limited scanned area or window 13a. However, if the side loading device 10 is able to extend over a rel-

atively large distance, the window 13a should extend over this relatively large distance. This may have the drawback that if the side loading device 10 is not extended far the window 13a extends unnecessarily far and the loading device 10 is switched off unnecessarily if a person moves into the excessively broad window 13a. It is then better to replace the detection element 13 with two detection elements. One detection element, with a limited window 13a, should then be mounted on the fixed part of the side loading device 10, and the second detection element should then be fastened on a movable (extendable) part, so that the extent of the window 13a is adjusted to the degree of extension of the side loading device 10.

By placing the detection elements on the laterally movable part of the side loading device 10, the side loading device can automatically extend to just in front of a container to be received, as a result of which the device can function completely automatically.

Fig. 3 also shows that detection elements 8 may also be arranged at the rear of a refuse collection vehicle of the side loader type.

Contactless detection elements which can be used in a refuse collection vehicle according to the invention are known in the prior art and may be of various types.

In the case of a sonar-type detection element, a person or object is signalled by the reflection of sound. In this case, depending on the intended application, sound at a frequency of about 100 to 500 kHz is used.

There are also opto-electrical detection elements which operate by reflecting light. In this case, light having a frequency of about 10^{12} to 10^{14} kHz (infrared) is generally used.

A particular form of opto-electrical detection element is a detection element which can be used to scan a predetermined area by means of a laser beam. A sector of, for example, 180° can be covered by emitting the laser beam at angular intervals of, for example, 0.1°. Since the scanned area of the laser beam can be changed rapidly, the scanning distance for each transmission angle or emission of a laser beam can be adjusted and preset. By allowing the laser beam to scan at a transmission angle of 0° at a distance of 1 metre, then allowing the scanning distance to increase to $\sqrt{5}$ metres at a transmission angle of about 63.5°, then allowing the scanning distance to fall to 2 metres at a transmission angle of 90°, and then allowing the scanning distance to increase and fall again at transmission angles of 116.5° and 180°, as described above, it is possible to protect a square area of 2 by 2 metres.

It is also possible to use an image-recognition camera, in which case a person or object is signalled at the instant that the image perceived by the camera is equated to a preset image.

Claims

1. Refuse collection vehicle comprising a chassis, a body mounted on the chassis and a loading device for emptying refuse containers into the body, the vehicle being provided with protective means for the prevention of unsafe situations, the protective means comprising at least one contactless detection element which is connected to control means of the refuse collection vehicle, characterized in that the detection element (7) is arranged on a movable part of the loading device and is designed to scan a two-or three-dimensional scanned area (window) (7a).

2. Refuse collection vehicle according to claim 1, characterized in that the detection element (7) is connected to control means of the loading device (4; 10) and is designed to protect the working area of the loading device (4; 10), and in that the scanned area (7a) of the detection element (7) corresponds to at least part of the working area of the loading device (4; 10).

3. Refuse collection vehicle according to claim 1 or 2, characterized in that a detection element (7) is arranged on either side of the loading device (4; 10), on a movable part thereof, the scanned area (7a) of which detection element always extends from the detection element in the direction of an area within which at least part of a refuse container held by the loading device may be situated.

4. Refuse collection vehicle according to anyone of claims 1 to 3, characterized in that at least one other detection element (8; 14) is arranged on a fixed part, situated at a low level, of the vehicle, the scanned area (8a; 14a) of which detection element extends from the detection element substantially in a horizontal direction.

5. Refuse collection vehicle according to claim 4, characterized in that the other detection element (8; 14) is arranged beneath the loading device (4; 10) and the scanned area (8a; 14a) extends towards the side of the loading device.

6. Refuse collection vehicle according to anyone of claims 1 to 5, characterized in that the detection elements (7; 8; 14) are arranged both on either side of the loading device (4; 10) and beneath the loading device.

7. Refuse collection vehicle according to anyone of claims 1 to 6, characterized in that at least one of the detection elements (7; 8; 14) is provided with means for checking that the said detection element is operating correctly, prior to a movement cycle of the loading device (4; 10).

8. Refuse collection vehicle according to claim 4 or 5,

characterized in that the scanned area (8a) of the other detection element (8) is situated at least partially above a footboard (9) arranged on the vehicle.

9. Refuse collection vehicle according to claim 4 or 5, characterized in that the other detection element (8) forms part of a reverse-driving protection means.

10. Refuse collection vehicle according to claim 4 or 5, characterized in that the other detection element (8) is connected to control means of a refuse compression mechanism (11) present in the vehicle.

11. Refuse collection vehicle according to claim 4 or 5, characterized in that the other detection element (8) is connected to control means for opening the rear loader (3).

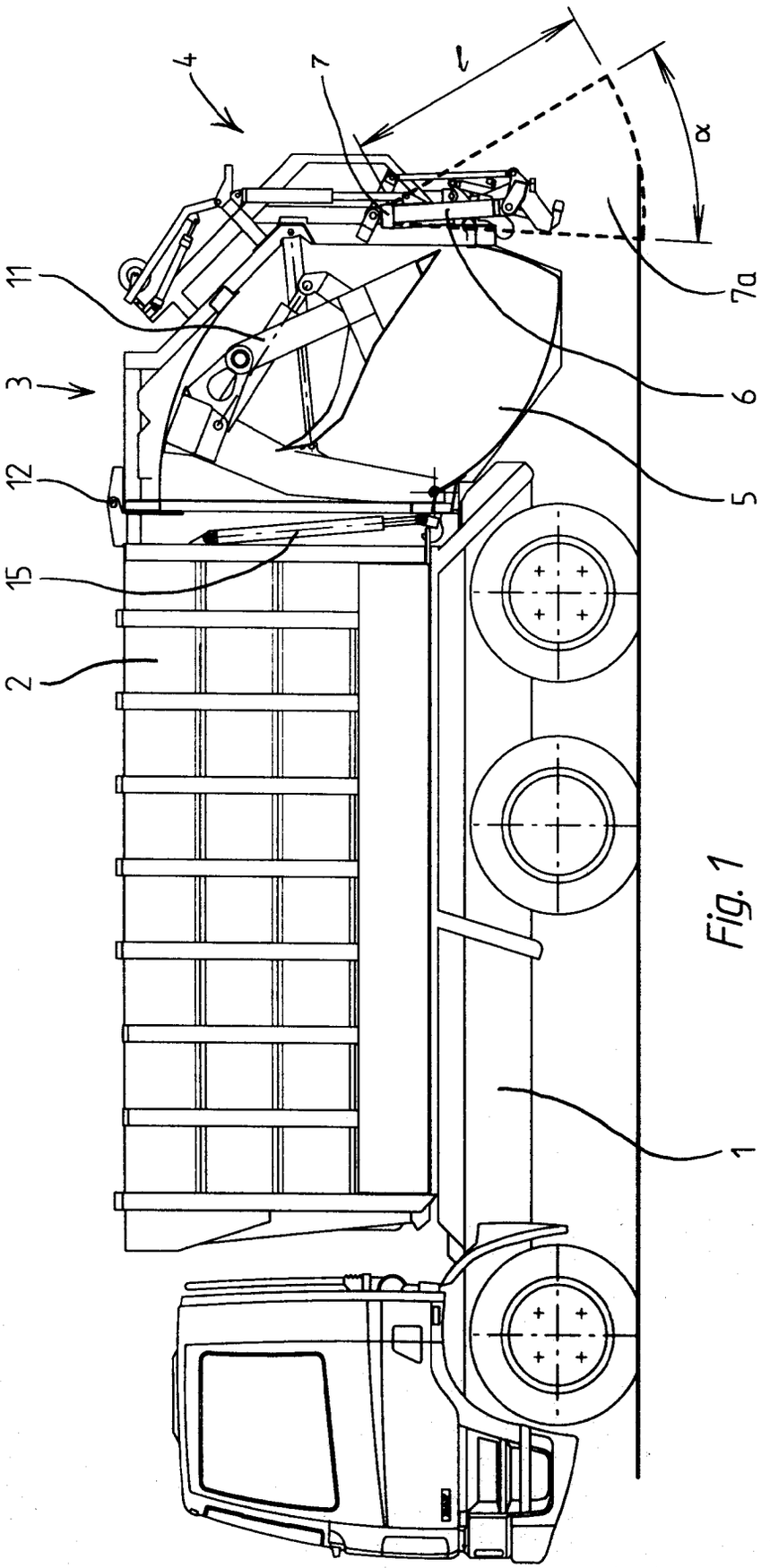

Fig. 1

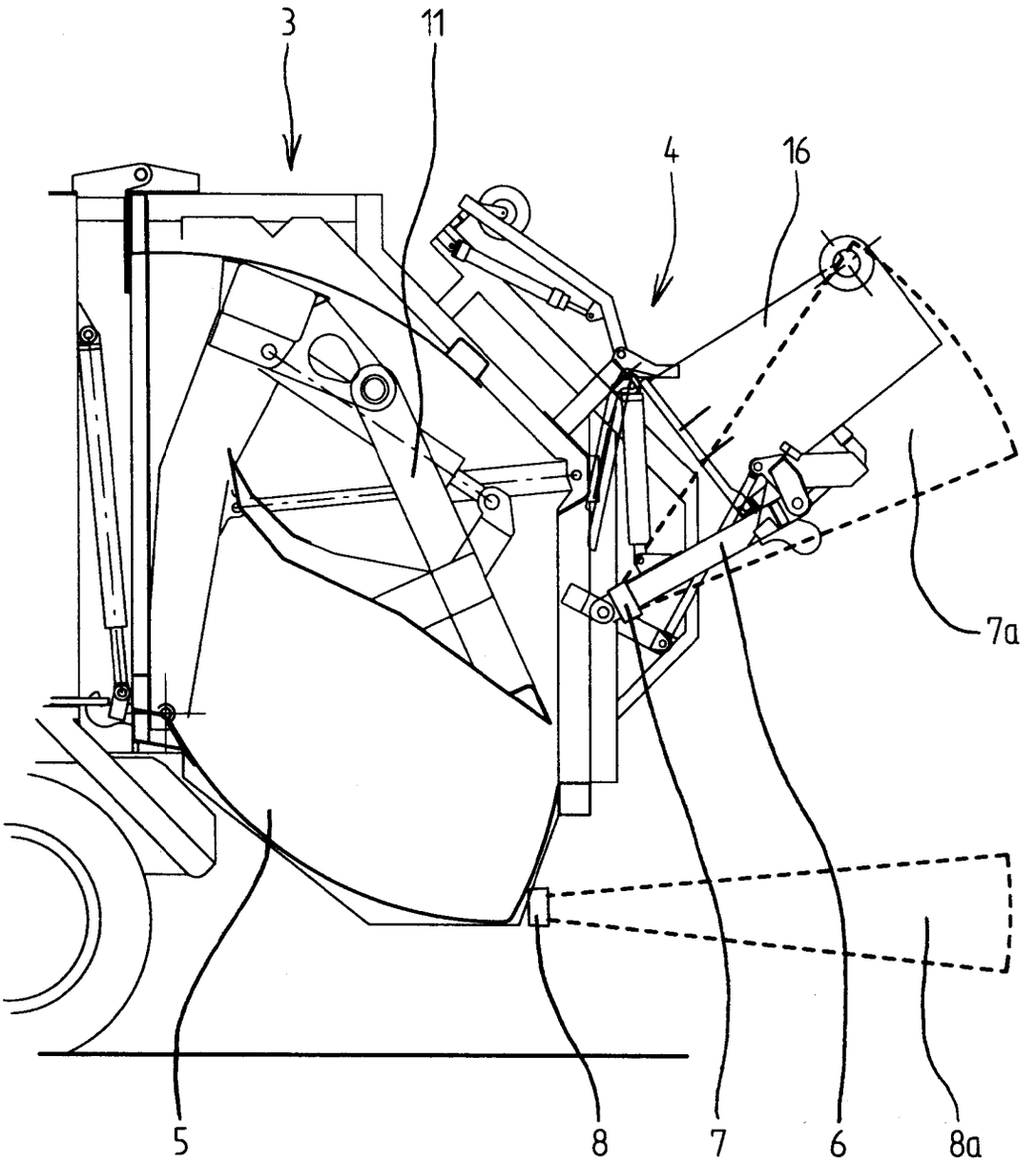

Fig. 2

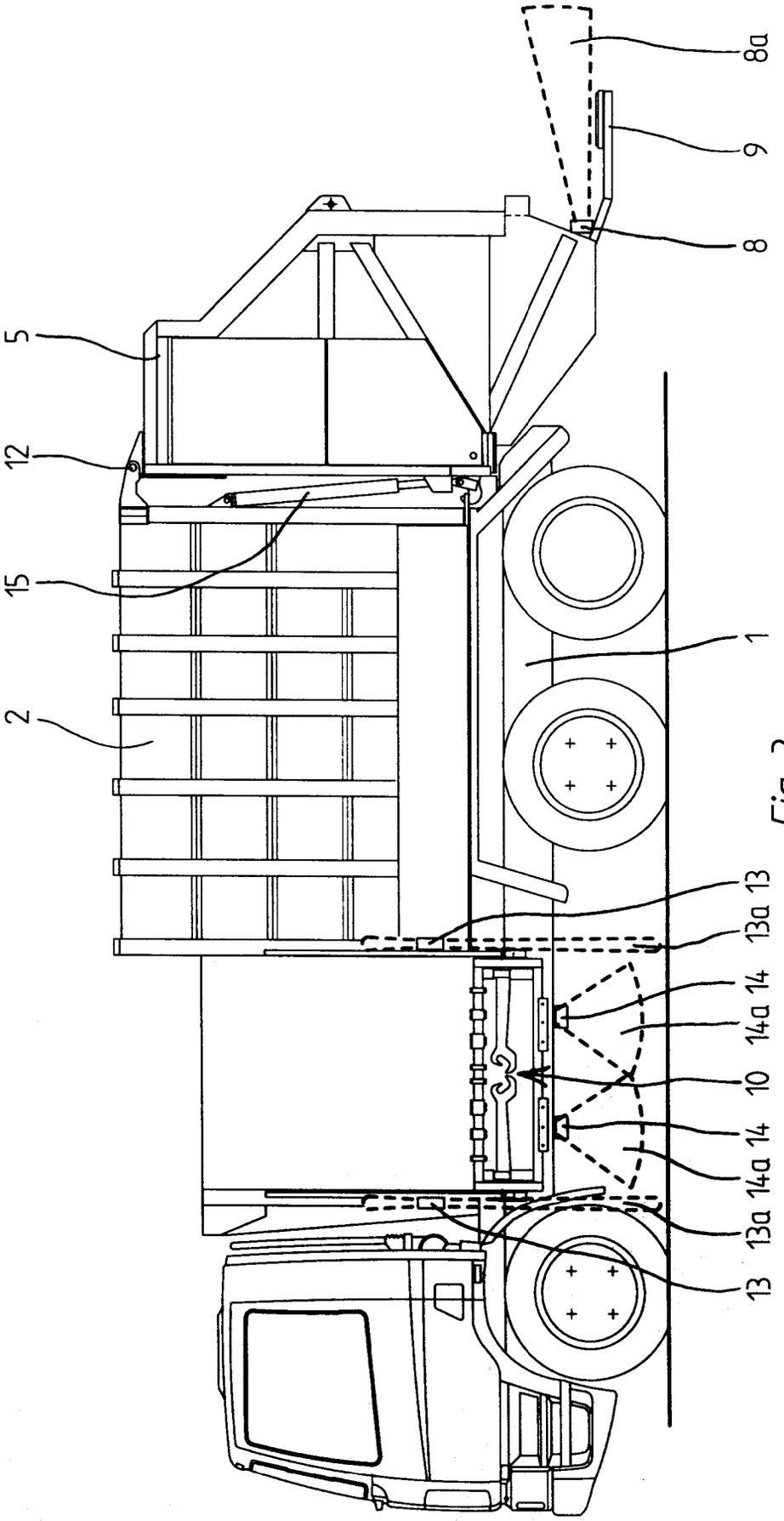

Fig. 3

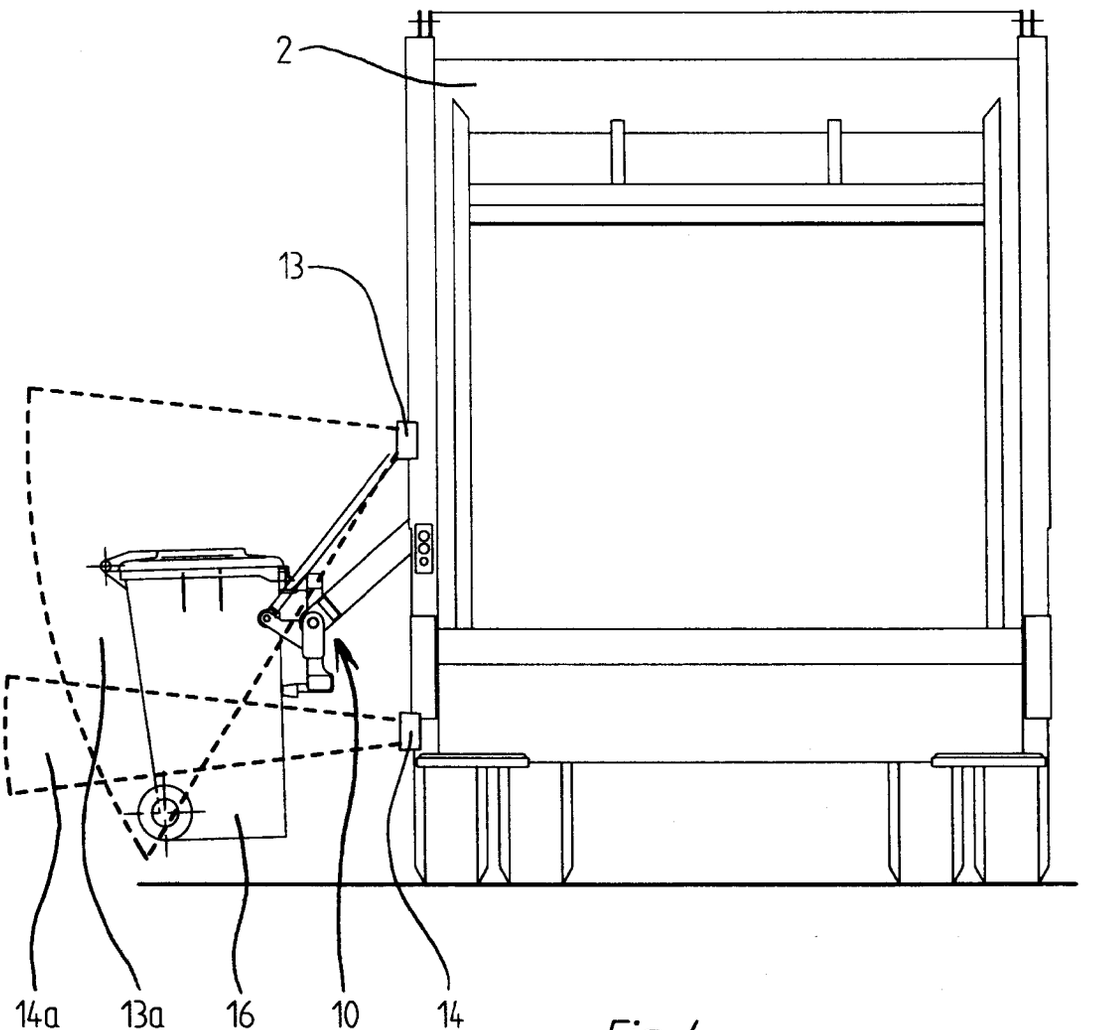

Fig. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 97 20 2069

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	DE 94 12 508 U (SCHÜBLER FAHRZEUGTECHNIK) 6 October 1994 * page 10, line 28 - page 12, line 25; figures 1-5 *	1-10	B65F3/00
A	DE 43 43 811 C (SUTCO MASCHINENBAU GMBH) 16 March 1995 * column 7, line 15 - line 22 * * column 8, line 27 - line 33 * * figure 3 *	1,2	
A	DE 44 30 833 C (ZÖLLER-KIPPER GMBH) 23 November 1995 * column 1, line 1-5 * * column 3, line 52-58 *	1,7	
A	US 3 942 601 A (F. SMITH) 9 March 1976 * column 3, line 36 - column 4, line 39 * * figures 1,3 *	1,10	
A	US 4 074 787 A (R. CUNNINGHAM ET AL.) 21 February 1978 * column 6, line 6 - line 14 *	1,11	TECHNICAL FIELDS SEARCHED (Int.Cl.6) B65F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	8 October 1997	Smolders, R

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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