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## (54) Refuse collection vehicle

(57) Refuse collection vehicle (1) comprising an essentially box-shaped loading container (3) having a loading opening at the rear of the vehicle, a loading device (5) adjoining the loading container at the rear and provided with a collecting trough (6) and a compression mechanism for moving the waste deposited loosely in the collecting trough into the loading container and simultaneously compressing said waste.

At the rear of the vehicle a funnel (13) is attached to the collecting trough. The height of the upper limit edge (20) of the rear wall (15) of the funnel is variable between a plurality of positions. The vehicle is also designed for emptying hopper bins (12).

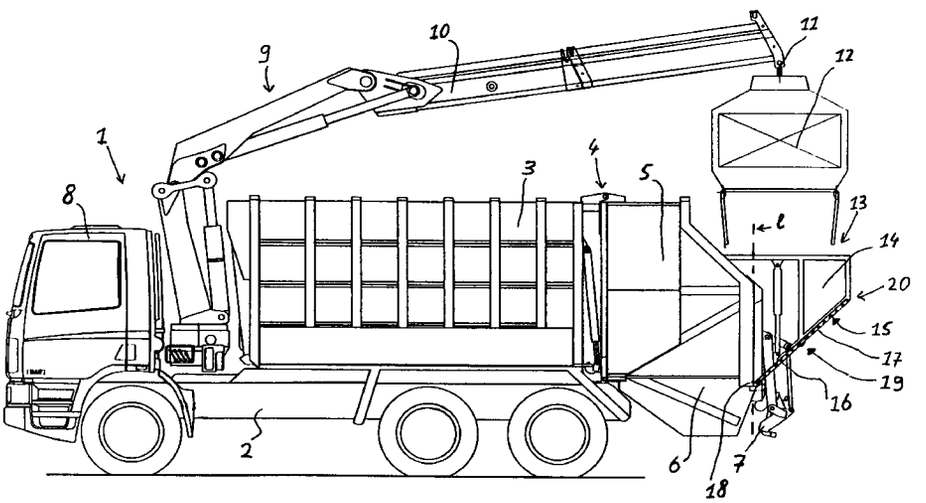


Fig. 1.

EP 0 763 487 A1

## Description

The present invention relates to a refuse collection vehicle according to the preamble of claim 1.

A refuse collection vehicle of this kind is known from DE-GM-91 07 172. The known vehicle is provided with a mechanized bin handling device, by means of which refuse bins, for example of the generally known type with wheels and a pivoting lid, in particular on the top side, can be raised and then tilted, so that the refuse falls out of the bin into the collecting trough.

In order then to move the refuse deposited in the collecting trough into the container, the known vehicle is provided with a compression mechanism, for example of the generally known "mechanical compression type". In the latter type, a compression plate is moved by hydraulic piston/cylinder assemblies such that the refuse is pressed into the container and compressed in order to reduce the volume of refuse.

The present invention aims to extend the number of ways of loading the known refuse collection vehicle, as a result of which the vehicle can be more widely used and the collection of refuse, in particular by a municipal sanitation department, can be carried out more efficiently.

This object is achieved by a refuse collection vehicle according to claim 1. In the context of the present application, "hopper bin" denotes a bin which is designed such that the refuse leaves the bin via its underside when such a bin is emptied. The hopper bin can, for example, be a bin with filling openings on the top side and with one or more flaps which can close or open a discharge opening in the bottom of the bin. In another generally known embodiment, the hopper bin consists of two halves which adjoin one another in the vertical mid-plane of the bin and at the top side of the bin are coupled together pivotably. If the two bin halves are pivoted apart, the refuse pours out of the bin at the bottom.

According to the present invention the height of the upper limiting edge of the rear wall of the funnel can be set to a plurality of positions. This can be effected, for example, such that the height of the upper limiting edge of the rear wall of the funnel can be set to a first, highest position for emptying hopper bins and a lower second position for emptying refuse bins with a discharge opening at the top and/or for depositing refuse in the collection trough manually.

The vehicle therefore can be used for the normal collection of domestic waste in (wheeled) bins and manually and also for emptying hopper bins which are present on the collection route.

The funnel adjoins the collecting trough and the volume of the collecting trough is in fact increased by this funnel in order to be able to receive the refuse from a hopper bin without spillage.

Further advantageous embodiments of the vehicle are described in the claims and the description below, in which the invention is to be explained in more detail with reference to exemplary embodiments of the refuse collection vehicle according to the invention which are depicted in the drawing, in which:

Fig. 1 shows a diagrammatic side view of a first exemplary embodiment of the refuse collection vehicle according to the invention during the emptying of a hopper bin,
Fig. 2 shows the refuse collection vehicle shown in Fig. 1 during the emptying of a wheeled bin,
Fig. 3 shows the refuse collection vehicle shown in Fig. 1 in the configuration in which it is possible to load the vehicle manually,
Fig. 4 shows a diagrammatic side view of a second exemplary embodiment of the refuse collection vehicle according to the invention during the emptying of a hopper bin,
Fig. 5 shows a diagrammatic side view of a third exemplary embodiment of the refuse collection vehicle according to the invention during the emptying of a wheeled bin,
Fig. 6 shows the vehicle depicted in Fig. 5 during the emptying of a hopper bin.

Figures 1-3 show a refuse collection vehicle of the rear-loader type according to the invention which is designated overall by reference number 1. The vehicle comprises a chassis 2 on which a container 3 is placed. The container 3 is of a design which is known per se and has an essentially closed box shape, the rear of the container being open.

A loading device 5 is arranged on the container 3 so as to pivot about a horizontal shaft 4. The loading device 5 comprises a collecting trough 6, which is situated transversely behind the container 3. In the position of the loading device 5 which is shown, the bottom of the collecting trough 6 adjoins the bottom of the container 3.

The refuse deposited in the collecting trough 6 is pushed out of the trough 6 using a known compression mechanism, preferably a mechanical compression mechanism, which is not shown in the figure, and is compressed, reducing the volume in the container 3 considerably.

The refuse collection vehicle 1 shown in Figures 1-3 is provided at the rear with a bin handling device 7 known per se for handling (wheeled) bins and the like. The device 7 will be explained in more detail with reference to Fig. 2.

A hydraulic crane 9 is fastened to the chassis 2 between the driver's cab 8 of the vehicle 1 and the container 3. A hopper bin 12 can be raised and held above a funnel 13 which is present at the rear of the vehicle 1 by the crane 9, which has a telescopically extendable jib 10 and a gripper 11.

The funnel 13 is essentially formed by two side walls 14 and a rear wall 15 and is open at the top. Side walls 14 each lie essentially in line with the corresponding side wall of the container 3 and form part of the pivotable loading device 5. In fact, the essentially triangular

side walls 14 of the funnel 13 which are provided according to the invention form a rearward extension of the side walls 3 which are present on either side of the collecting trough 6 and whose rear, essentially vertical limiting edge (line "l" in Fig. 1) virtually lies in the same vertical plane as the rear edge of the collecting trough 6.

The rear wall 15 of the funnel 13 is in this exemplary embodiment formed by two essentially plate-shaped panels 16, 17, which are the lower panel and the upper panel, respectively. Each panel 16, 17 extends between the two side walls 14 of the funnel 13. The lower panel 16 is fastened to the loading device 5, in particular to the rear edge of the collecting trough 6, so as to be pivotable about horizontal pivot shaft 18. Furthermore, the upper panel 17 is hingedly fastened to the upper edge of the lower panel 16, so that panel 17 can move hingedly about horizontal pivot shaft 19 with respect to the lower panel 16.

For emptying a hopper bin, for example the hopper bin 12 which is shown in Figure 1 and known per se, the panels 16 and 17 are moved into the position shown in Figure 1 using, for example, hydraulic means (not shown) and are fixed there. The hopper 13 now increases the volume of the collecting trough 6 in such a manner that the contents of the hopper bin 12 can be emptied without spillage.

In Figure 2, the upper panel 17 is released from its position shown in Figure 1 and folded down. As a result, the upper limiting edge 20 of the rear wall 15 of the funnel 13 is now considerably lower than the position shown in Figure 1. In this position, the bin handling device 7 can be used for emptying a wheeled bin 22 which is known per se. The bin handling device 7 which is known per se is designed to lift one or more (wheeled) bins 22 from the ground and then to tilt them over forwards so that the refuse falls into the collecting trough 6 of the loading device 5 through the discharge opening present on the top of a wheeled bin of this kind.

In the position of the rear wall 15 shown in Fig. 2, the extendable jib 10 of the crane 9 is retracted and lowered to just above the container 3, as a result of which the crane 9 is not in the way of a bin 22 which is to be emptied. Furthermore, in this position of the crane 9, the height of the refuse collection vehicle 1 is low, in order in this way to be able to drive the vehicle 1 without problems.

In Figure 3, the two panels 16 and 17 are both pivoted downwards, so that the upper limiting edge 20 of the rear wall 15 is situated in its third and lowest position. In this third position, the height of the rear wall 15 is such that manual loading of the collecting trough 6 is possible without problems and the height of the edge 20 in the third position preferably corresponds to the height of the rear edge of the collecting trough of refuse collection vehicles of the rear-loader type which are already known and are intended for manual loading.

Figure 4 shows a refuse collection vehicle according to the invention which is designated overall by reference number 40. Like the vehicle 1, the vehicle 40 is of the rear-loader type and comprises a chassis 42, a container 43 positioned thereon, and a loading device 45 which is fastened to the container 43 so as to be pivotable about pivot shaft 44.

The loading device 45 has a refuse collecting trough 46 which extends transversely behind the container 43.

The vehicle 40 is provided with means for forming a funnel 47, which funnel 47 makes it possible to empty hopper bins. The funnel 47 has two side walls 48, each essentially in line with the corresponding side wall of the container 43. Furthermore, the funnel 47 has a rear wall 49, the design of which is different from the design of the refuse collection vehicle shown in Figs. 1-3.

In Figure 4, the rear wall 49 of the funnel 47 comprises a bottom panel 50 which extends between the side walls 48 and which is fastened to the rear edge of the collecting trough 46 with its lower edge so as to be pivotable about a horizontal pivot shaft 51. Furthermore, the rear wall 49 comprises a sliding panel 53 consisting of two pivotably coupled panels 30 and 52. These panels 30, 52 also extend between the two side walls of the funnel 47. On their sides located along the side walls 48, the panels 30 and 52 are provided with guide rollers 54 which roll over guide tracks 55 arranged on the side walls 48. The sliding panel 53 can thus adopt the position denoted by "A", in which the upper edge of the panel 52 forms the upper limiting edge 32 of the rear wall 49 of funnel 47, or the position denoted by "B", in which the upper edge of the panel 50 forms the upper limiting edge 33 of the rear wall. In position "A" of the sliding panel 53, the funnel 47 is sufficiently large to cope with a hopper bin, while in position "B" the bin handling device 7 for (wheeled) bins and the like can be used, in accordance with the representation in Fig. 2. If the panel 50 is pivoted down, the refuse can also be deposited manually in the collecting trough 46 without problems.

For displacing the movable panel 53 between the position "A" and "B", a hydraulic piston/cylinder assembly 31, which engages on an associated pivot arm 56, is present for example on each side wall of the funnel. Each pivot arm 56 is at its one end fastened pivotably to the loading device 45 and at its other end coupled to the sliding panel 53, for example by the mortice-and-tenon connection shown in Fig. 4.

A further important difference from the vehicle 1 shown in Figures 1-3 is the position and design of the crane for raising the hopper bin. This crane 58, which is intended for raising hopper container 59, is in this case arranged on the loading device 45. The advantage of this is that the crane 58 can be of a more simple type than the crane 9 in Figures 1 and 2, since the length of the crane jib can be noticeably shorter. Since part of the crane jib can be dispensed with, the weight of the crane is lower, which is beneficial for the loading capacity of the vehicle. Although this cannot be seen in Figure 4, in the folded-up position the smaller crane 58 also takes up less height above the container 43 than the crane 9

in Figure 2. It is also advantageous that the crane 58 takes up no space between the container and the driver's cab, so that the available length of the chassis of the vehicle can be used optimally for the loading capacity of the vehicle.

The position of the crane 58 shown in Figure 4 also has the advantage that the loading device 45 can easily be made sufficiently sturdy to absorb the loads of the crane 58, while the remainder of the vehicle 40 does not have to be modified to accommodate the crane. In this way, therefore, it is easily possible to make existing refuse collection vehicles suitable for handling hopper bins.

In the refuse collection vehicle 60 according to the invention which is shown only partially in Figures 5 and 6, means are provided at the rear of the vehicle for forming a funnel 61 which is suitable for receiving refuse from a hopper bin which is held above the funnel 61. The funnel 61 has two side walls which are essentially in line with the side walls of the container of the vehicle and each comprise a side wall part 63 which is firmly connected to the collecting trough 62 and a side wall part 65 which is connected to the side wall part 63 so as to be pivotable about a horizontal pivot shaft 64. The two pivotable side wall parts 65 are rigidly connected to one another by a rear wall part 66 of the funnel 61 extending between them.

Means (not shown), for example hydraulic piston/cylinder assemblies, are provided for pivoting the unit formed by the wall parts 65 and 66 of the funnel 61 upwards and downwards about the pivot shaft 64.

A movable panel 67 extends between the fixed side wall parts 63 of the funnel 61, which panel 67 is connected to the collecting trough 62 so as to be pivotable at one of its transverse edges about horizontal pivot shaft 68.

In the position shown in Figure 5, (wheeled) bins and the like can be emptied using bin handling device 69. In the position shown in Figure 6, hopper bins 71 held above the funnel 61 by crane 70 can be emptied. If, in the position shown in Figure 5, the panel 67 is also pivoted downwards, refuse can be deposited in the collecting trough 62 manually.

In the position in Figure 6 the upper limiting edge of the rear wall part 66 defines the highest position of the upper limiting edge of the funnel 61 as a whole. In Figure 5 the panel 67 defines the intermediate height of the upper edge of the rear wall of funnel 61. When the panel 67 is folded downwards, its edge 68 defines the lowermost position of the rear wall of the funnel 61, which position allows for the depositing of refuse bags manually into the collecting through 62.

## Claims

1. Refuse collection vehicle (1; 40; 60) comprising an essentially box-shaped container (3; 43) having a loading opening at the rear of the vehicle, a loading device (5; 45) adjoining the container (3; 43) at the rear and provided with a collecting trough (6; 46; 62) and a compression mechanism for moving waste which has been deposited in the collecting trough into the container (3; 43) and simultaneously compressing said waste, the loading device being adapted for depositing waste in the collecting trough with the aid of a mechanized bin handling device (7; 69) arranged on the loading device, the refuse collection vehicle also being adapted for emptying hopper bins (12; 59; 71), the vehicle being provided with means for forming a funnel (13; 47; 61) at the rear of the vehicle, which funnel adjoins the collecting trough, the vehicle further being provided with lifting means (9; 58; 70) for raising hopper bins (12; 59; 71) above the funnel and emptying the hopper bins (12; 59; 71) into the funnel, the funnel comprising side walls (14; 48; 63, 65) and a rear wall (15; 49; 66, 67) which extends between the side walls of the funnel and whose underside adjoins the collecting trough (6; 46; 62), the vehicle being characterized in that the height of the upper limiting edge (20; 32; 33) of the rear wall (15; 49; 66; 67) of the funnel (13; 47; 61) is variable between a plurality of positions.

2. Refuse collection vehicle according to claim 1, wherein the height of the upper limiting edge (20; 32; 33) of the rear wall of the funnel (13; 47; 61) can be set to a first position for emptying hopper bins (Fig.1; Fig. 4 in position A; Fig. 6), a lower second position for emptying other refuse bins using the bin handling device (Fig. 2; Fig. 4 in position B; Fig. 5), and a lowest third position for depositing refuse (Fig. 3) in the collecting trough manually.

3. Refuse collection vehicle according to claim 1 or 2, the rear wall (15; 49) of the funnel (13; 47) comprising at least one movable wall part (16, 17; 53, 50) which spans the side walls (14; 48) of the funnel.

4. Refuse collection vehicle according to claim 3, the rear wall of the funnel comprising a lower wall part (16), which is fastened to the collecting trough (6) so as to be pivotable about an essentially horizontal pivot shaft (18), and an upper wall part (17), which is fastened to the lower wall part (16) so as to be pivotable about an essentially horizontal pivot shaft (19).

5. Refuse collection vehicle according to claim 4, the rear wall of the funnel (47; 61) comprising a lower wall part (50; 67) and an upper wall part (53; 66), which can be moved between a lower position (Fig. 4 at position A; Fig. 6), in which the lower edge of the upper wall part (53; 66) essentially adjoins the upper edge of the lower wall part (50; 67), and a higher position (Fig. 4 in position B; Fig. 5), in which an opening is present between the two wall parts (50, 53; 66, 67).

6. Refuse collection vehicle according to claim 5, the lower wall part (50; 67) being fastened to the collecting trough (46; 62) so as to be pivotable about an essentially horizontal pivot shaft (51; 68).

7. Refuse collection vehicle according to claim 5 or 6, the side walls (48) and the upper wall part (53) of the funnel (47) being provided with interacting guide means (54, 55).

8. Refuse collection vehicle according to claim 7, the upper wall part (53) comprising a plurality of panels (30, 52) fastened hingedly to one another.

9. Refuse collection vehicle according one or more of the preceding claims, the side walls of the funnel (61) each comprising a part (63) which is fixedly connected to the collecting trough and side wall parts (65) which are pivotable about an essentially horizontal pivot shaft (64), the pivotable side wall parts (65) being connected by an upper wall part (66) of the rear wall of the funnel (61) extending between them.

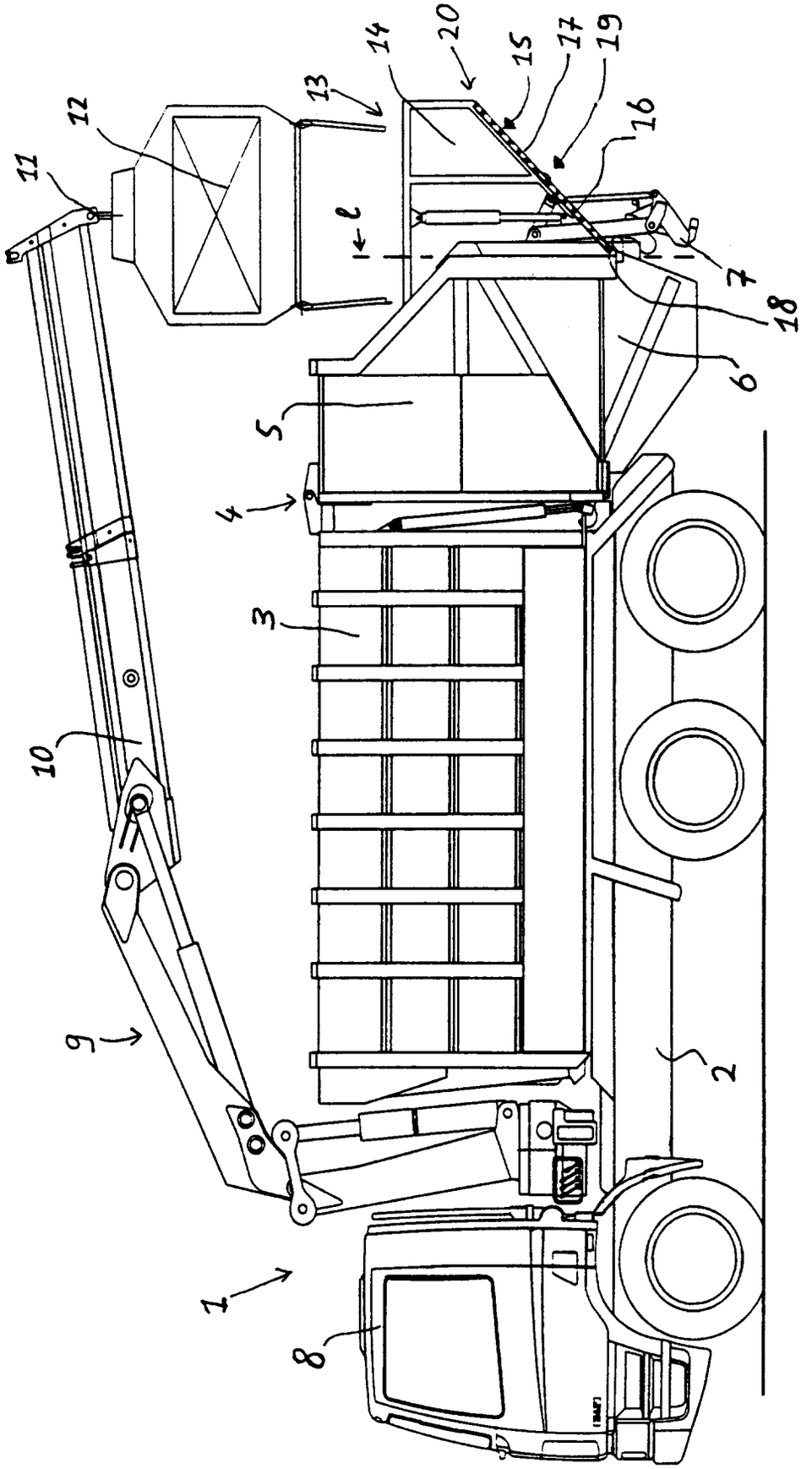


FIG.1.

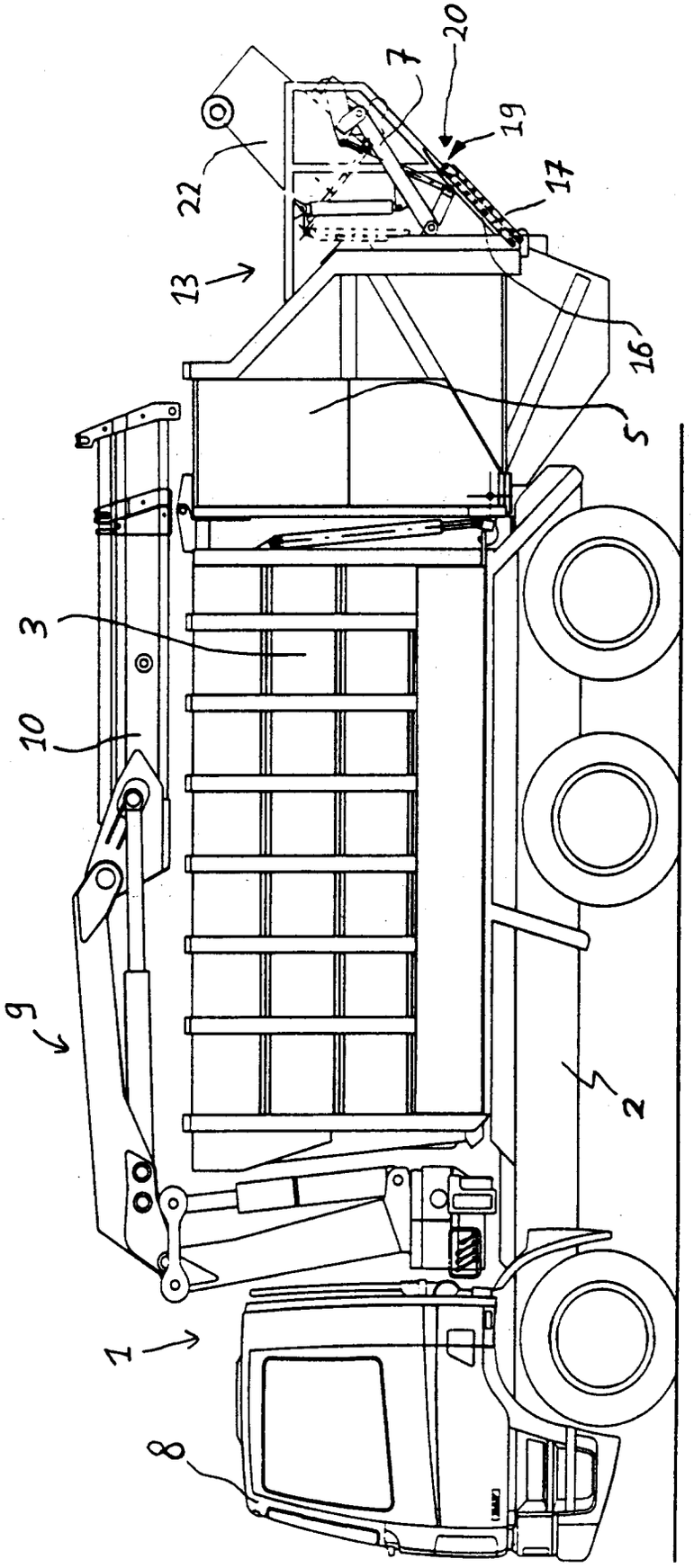


FIG. 2.

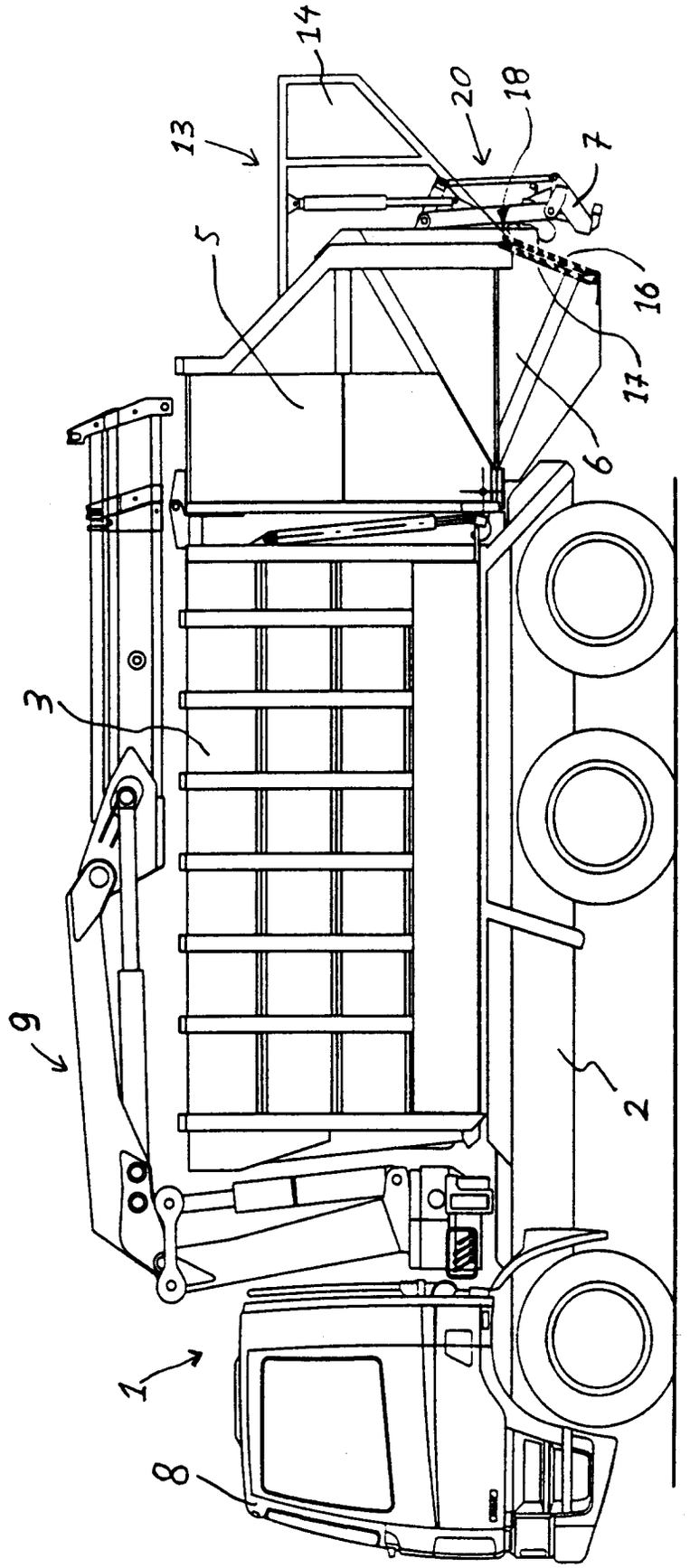


FIG. 5

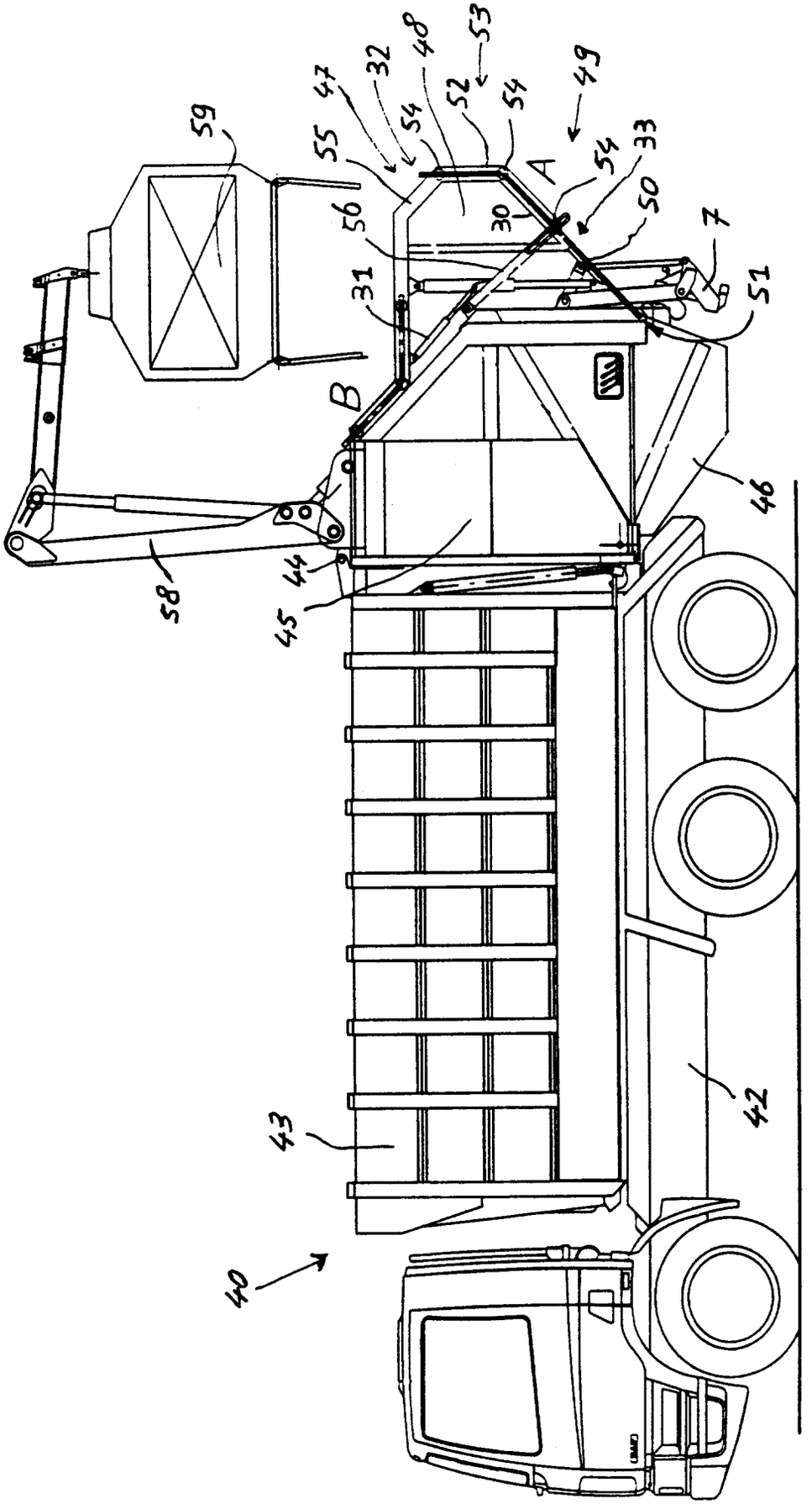
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FIG. 4.

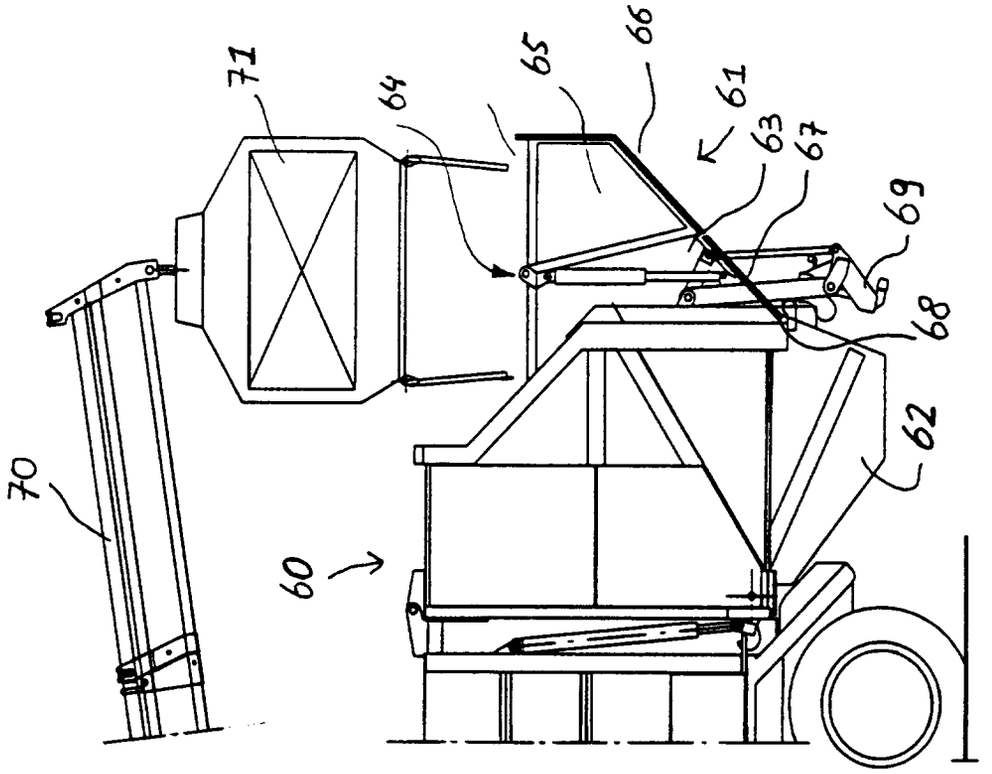


FIG:6.

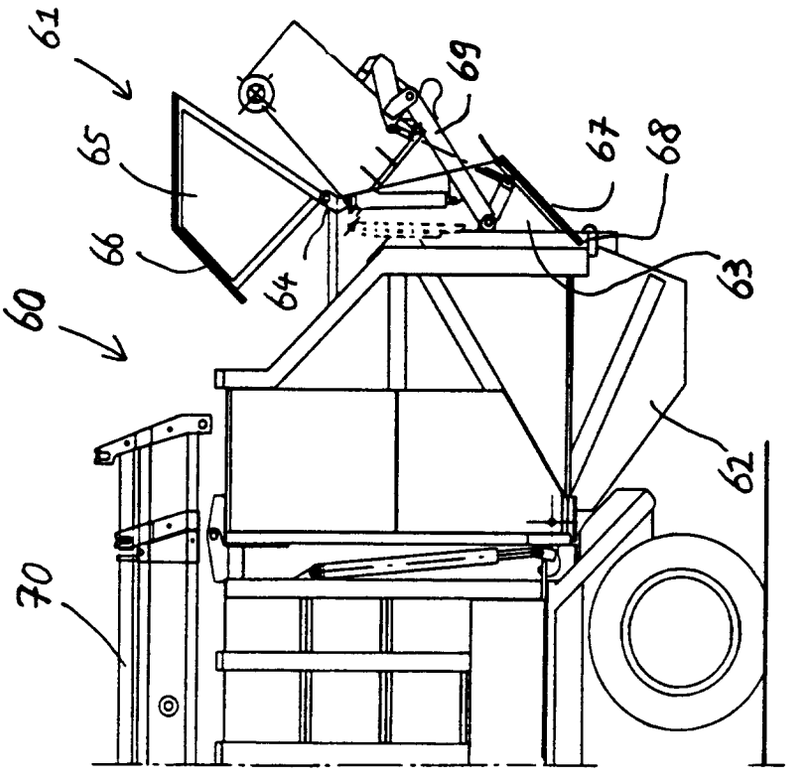


FIG:5.

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# EUROPEAN SEARCH REPORT

Application Number
EP 96 20 2497

## 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 91 07 172 U (F. SCHMÄDEKE)<br>* page 4, line 16 - page 5, line 21; figures 1-4 * | 1 | B65F3/02 |
| A | EP 0 054 463 A (G. DOREY ET AL.)<br>* page 2, line 4 - line 30 *<br>* figure 3 * | 1 | |
| A | DE 38 22 014 C (BERNHARD REILING GLAS-RECYCLING GMBH)<br>* column 2, line 14 - line 33 *<br>* figure 1 * | 1 | |
| | | | TECHNICAL FIELDS SEARCHED (Int.Cl.6)<br>B65F |

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| THE HAGUE | 27 November 1996 | Smolders, R |

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