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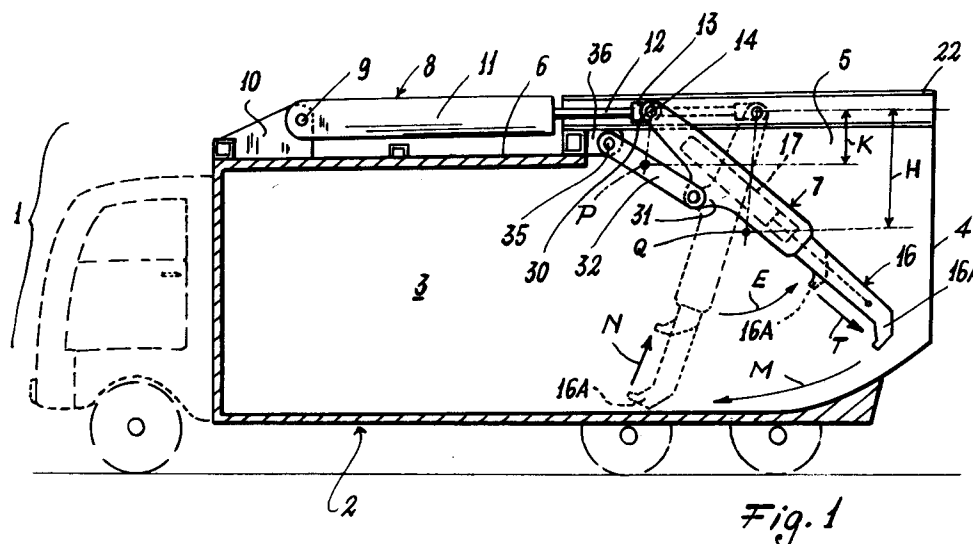
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I-20129 Milano (IT)**(54) **Refuse compactor for a refuse collection vehicle.**

(57) A refuse compactor device in a refuse collection vehicle, this latter comprising a body (2) in which refuse is deposited after its collection, a first movable compactor member (7) comprising a second member (16) movable relative to the first (7), and actuator means (8) for moving said first member (7) which are associated with the vehicle body (2) and act via hinges (14) on one end (30) of said member (7), said device comprising means (22) for guiding

the movement of said end (30) relative to the vehicle body (2) and connection means (32) for indirectly connecting said first member (7) to said body (2), said connection means (32) being hinged at a first end (at 35) to the vehicle body (2) and at the second end to a region (31) of said first member (7) distant from that end (30) of this latter which is connected to the actuator means (8) for moving it.

*Fig. 1***EP 0 659 659 A1**

This invention relates to a device in accordance with the introduction to the main claim.

In a refuse collection vehicle, the first compacting member (or first compacting blade) is known to be hinged to one or more actuators, for example hydraulic, which themselves are hinged upperly to the vehicle body.

Each hydraulic actuator can rotate about its retaining hinge until its longitudinal axis is in a position inclined to the top of the vehicle body such as to enable the blade to be raised to expose in the vehicle body a usual aperture through which the refuse is loaded into the body, for expulsion therefrom by the movement of a known expulsion plate which expels the refuse. The blade is also hinged directly to the vehicle body in a region distant from that end hinged to the hydraulic actuator.

The hydraulic actuator, the first compacting member and the second member associated with this latter and movable with it define a known refuse compactor device within the vehicle body. Although this device is simple, it has various drawbacks, one of primary importance being the fact that the force exerted by the blades or compacting members on the refuse after its collection within the vehicle body is considerably limited by the direct connection of the first compacting blade to the vehicle body. Because of this connection the action of each actuator, which generates the movement of the first compacting blade (and consequently that of the second blade connected to the first) and which results in compaction of the refuse within the vehicle body is of low efficiency (compared with the power generated by the actuator), the compaction being penalized by the limited arm of the force generated by each actuator on the blade. In this respect, this arm, measured as the distance between the centre of rotation of each blade-actuator system (corresponding to the point at which the blade is connected to the vehicle body) and the line of action of the force generated by the actuator, is reduced during the final travel of the movable part (piston) of the actuator. There is a consequent reduction in the thrust which the blade exerts on and transmits to the refuse with the result that its compaction is only partial, as stated. The volume occupied by the refuse in the vehicle body is hence disproportionate to the actual refuse volume.

In addition, the connection (by hinge) of each actuator to the vehicle body can result in problems related to possible knocking of the actuator against the vehicle body at the hinge, which can also create problems for the action of the compacting blades on the refuse.

An object of the present invention is to provide a compactor device associated with a refuse col-

lection vehicle which overcomes the drawbacks of known and analogous devices of the state of the art.

A particular object of the invention is to provide a device of the stated type which, for equal installed power, is able to generate a compacting force greater than that generated by analogous known devices of the state of the art.

A further object of the invention is to provide a device of the stated type which allows considerable refuse compaction within the body of its collection vehicle, so better utilizing the available vehicle volume.

These and further objects which will be apparent to the expert of the art are attained by a device in accordance with the characterising part of the main claim.

The present invention will be more apparent from the accompanying drawing, which is provided by way of non-limiting example and in which:

Figure 1 is a schematic side view in partial longitudinal section, with some parts omitted for greater clarity, showing a refuse collection vehicle comprising the device according to the invention;

Figure 2 is a rear view of the vehicle of Figure 1; Figure 3 is a view of the vehicle of Figure 1 from above;

Figure 4 is a view analogous to that of Figure 1 but with the device of the invention in a raised position to allow unloading of the refuse collection vehicle;

Figure 5 is a view similar to Figure 1 but showing a modified embodiment of the device according to the invention;

Figure 6 is a view similar to Figure 4, of the modified embodiment of the device shown in Figure 5; and

Figure 7 is a partial rear view of the vehicle of Figure 1 provided with the modified embodiment of the device shown in Figure 5.

With reference to Figures 1 to 4, a refuse collection vehicle is indicated overall by 1 and comprises a usual body 2 provided with a refuse collection compartment 3. This compartment is open at 4 at the rear of the vehicle body, to enable refuse to be loaded into it. It is also open at 5 at the roof 6 of the vehicle body 2 to allow movement of a first compacting blade 7 operated by usual actuators (for example hydraulic) 8 positioned on the roof 6 of the vehicle body 2. Each actuator is hinged at 9 to projections 10 rising from the vehicle body 2 and comprises a usual cylinder 11 (connected to the vehicle body), relative to which there moves a piston 12 the end 13 of which is hinged at 14 to the compacting blade 7. Associated with this latter but movable relative thereto, there is provided a second compacting blade 16 operated by an

actuator (for example hydraulic) 17 hinged in known manner at 18 to the top of the blade 7. At the roof 6 there is provided a cross-member 19 with its axis X perpendicular to the longitudinal axis Y of the vehicle 1 (and hence of the vehicle body 2), which connects the actuators 8 to the first blade (via pins, not shown, rigid with the cross-member (19), and about which this latter is able to rotate.

With the cross-member 19 there are associated end pins 20 connected to a usual member 21 (for example rollers or the like) movable within guides 22 provided on the body roof 6 in proximity to the body sides 25 and 26 and having their longitudinal axes Z perpendicular to the axis X of the cross-member 19.

Distant from that end 30 thereof hinged to the actuator 8, the first blade 7 comprises two projections 31 hinged to the respective rectilinear arms 32 of a frame 33 hinged at 35 to projections 36 rigid with the vehicle body 2. This frame indirectly connects the first blade 7 to the vehicle body. Preferably the frame 33 has a structure comprising crossed arms 38 for mechanical stiffening purposes, and is positioned in correspondence with the aperture 5 in the roof 6 of the vehicle body 2.

Within the compartment 3 of the body 2 there is also provided an expulsion plate 40 having an end 41 associated in known manner with members (not shown) slidable within upper guides 42 (with reference to Figure 4) positioned longitudinally on the sides 25 and 26 of the vehicle body. This plate has its other end 45 associated with a member 46 rigid with wheels 47 slidable along a lower guide 48 which follows the form of the vehicle body 2. This member is subjected to the action of an actuator, preferably hydraulic, hinged at its ends 51 and 52 to the member 46 and to the end wall 53 of the vehicle body 2 respectively.

The compactor device is used as follows: on feeding each actuator 8 in any known manner, the members 21 slide in the guides 22, along which there consequently slides the end 30 of the blade 7. Simultaneously with the commencement of movement of said blade the frame 33 rotates about the hinges 35. With these movements the blade 7 rotates about its centre of instantaneous rotation indicated by P in Figure 1. The force generated by the actuator 8 then has an arm indicated by K in Figure 1. As the movement of the blade 7 continues, the centre of instantaneous rotation of the blade (or rather of each system comprising a blade 7 and actuator 8) shifts until at the end of travel it reaches the position indicated by Q in Figure 1. In this case, the force generated by each actuator 8 on the blade 7 presents an arm H greater than the arm K and in any event decidedly greater than the arm of the corresponding force generated by an actuator for moving the first compacting blade in a

vehicle with a known compactor device.

As the blade 7 slides along the guide 22, and by virtue of its connection to the vehicle body 2 via the arms 32, said blade rotates together with the blade 16 within the compartment 3 (arrow M in Figure 1) to compact the refuse present in it. This movement is defined in Figure 1 by an initial position of the blades 7 and 16 (shown by full lines) and an intermediate position (shown by dashed lines) within the compartment 3.

When refuse compaction is complete, the actuator 17 is fed and the blade 16 moves relative to the blade 7. The blade 16 moves to retract into this latter (arrow N in Figure 1) and by means of its end part or toe 16A it lifts whatever is present in the compartment 3 towards the roof 6 of the vehicle body 2 to also fill the top of this latter.

At this point the piston 12 of each actuator 8 is hydraulically retracted into the relative cylinder 11, the members 21 slide in the corresponding guides 22 and the blades 7 and 16 return to the position shown by full lines in Figure 1, but with the blade 16 inserted in the blade 7. The blades 7 and 16 again rotate (arrow E in Figure 1) by virtue of the arms 32 hinged to the blade 7 and to the vehicle body 2.

The blade 16 is then extracted (arrow T in Figure 1) from the blade 7 and returns to its initial position for further compaction of the refuse which was fed into the vehicle body 2 when the blades 7 and 16 were in or were moving into their internal position within the compartment 3.

When the compartment 3 of the vehicle body is to be emptied (for example by partially overturning the body in known manner), the piston 12 of each actuator 8 is made to completely retract into the relative cylinder, the blade 7 rising relative to the vehicle body as shown in Figure 4. The actuator 50 is then operated with the result that the expulsion plate 40 passes from the position shown by full lines in Figure 4 to the position shown by dashed lines. The refuse collected by the vehicle body is expelled by the partial overturning of the body and the movement of the plate 40 along the guides 42 and 48. The movements of each actuator 8 and 18 are controlled sequentially for example by a control unit preferably of known microprocessor type, such as to achieve the desired compaction of the refuse within the compartment 3 of the vehicle body 2. Usual control and safety devices (not shown) are provided for correct movement of the blades 7 and 16. This known control unit also controls the refuse expulsion by the expulsion plate 40 and actuator 50.

Figures 5 and 6 show a modified embodiment of the device according to the invention. In these figures, parts corresponding to those of the already described figures are indicated by the same refer-

ence numerals. In the figures under examination, each end pin 20 of the cross-member 19 is pivoted in a corresponding end 100 of an arm 101 positioned laterally to the vehicle body 2 along its sides 25 and 26 respectively. At its other end 103 the arm 101 is hinged to this side at 104 in any known manner. During the use of the vehicle comprising the modified embodiment shown in the figures, on feeding each actuator 8 in known manner, its cylinder 11 rotates about the corresponding hinge 9 which connects it to the relative projections 10 and it separates from the roof 6 of the vehicle body to lie inclined to this latter. This is achieved by virtue of the arms 101 hinged to the vehicle body at 104, which act as push rods on the end 13 of the pistons of the actuators 8 to cause these to rise relative to said roof 6. The blade 7 also tends to move away from the body 2, however such a movement is opposed by the arms 32 connected to said body at 35, their action on the blade causing it to rotate within the compartment 3 in the direction of the arrow M of Figure 5. Hence in the embodiment shown in Figures 5-7 the end 30 of the blade 7 moves in a guided manner to describe an arc of circumference L as shown in Figure 5, and in an entirely equivalent manner (not shown) the centre of instantaneous rotation (not shown) of each blade 7-actuator 8 system moves to pass from a point close to the roof 6 of the vehicle body 2 to a point increasingly more inwards within the compartment 3. Consequently, as already described in relation to Figures 1-4, the force generated by each actuator 8 on the blade 7 presents an ever increasing arm, this resulting in a better compacting action by the blades 7 and 16 on the refuse present in the compartment 3 and hence optimum utilization of the vehicle 1.

Different embodiments of the invention have been described. Further embodiments are however possible (such as one in which the rectilinear arms 32 do not form part of a frame but are independently connected to the blade 7, or one in which only one guide 12 is provided on the roof of the vehicle body, or alternatively several guides are provided thereon), falling within the scope of the present invention.

Claims

1. A refuse compactor device in a refuse collection vehicle, this latter comprising a body in which refuse is deposited after its collection, a first movable compactor member comprising preferably a second member movable relative to the first, and actuator means for moving said first member which are associated with the vehicle body and act via hinges on one end of said member, said device being characterised

by comprising means (22) for guiding the movement of said end (30) relative to the vehicle body (2) and connection means (32) for indirectly connecting said first member (7) to said body (2), said connection means (32) being hinged at a first end (at 35) to the vehicle body (2) and at the second end to a region (31) of said first member (7) distant from that end (30) of this latter which is connected to the actuator means (8) for moving it.

2. A device as claimed in claim 1, characterised in that the guide means are at least one guide (22) provided on the roof (6) of the vehicle body (2), with said guide there cooperating at least one slidable element (21) operationally associated with the end (30) of the first compactor member (7), this end moving parallel to the vehicle body (2).

3. A device as claimed in claim 2, characterised in that the slidable element (21) is fixed onto at least one connection element (19) having its axis (X) at an angle to the longitudinal axis (Y) of the vehicle body (2) and connecting at least part of the actuator means for moving the first compactor member (7).

4. A device as claimed in claim 2, characterised in that the guide means are two guides (22) positioned in proximity to the vehicle body sides (25, 26) and having their axes (Z) parallel to the longitudinal axis (Y) of this latter, in said guides there sliding members (21) supported by pins (20) associated with a cross-member (19) connecting the actuator means (8) to the first compactor member (7), about said cross-member (19) there rotating said compactor member (7).

5. A device as claimed in claim 1, characterised in that the connection means are at least one rectilinear arm (32).

6. A device as claimed in claim 5, characterised in that each rectilinear arm (32) forms part of an interconnection frame (38) indirectly connecting the first compactor member (7) to the vehicle body (2).

7. A device as claimed in claim 6, characterised in that the interconnection frame (38) is positioned in correspondence with a usual aperture (5) in the roof (6) of the vehicle body (2).

8. A device as claimed in claim 1, characterised in that the guide means are at least one arm (101) hinged (at 104) at its first end (103) to

the vehicle body (2), its other end (100) being operationally connected to that end (30) of the first compactor member on which the actuator means act.

9. A device as claimed in claim 8, characterised in that the arm (101) is hinged to a side (25, 26) of the vehicle body and is pivoted on pins (20) associated with a connection element (19) connecting at least part of the actuator means for moving the first compactor member.

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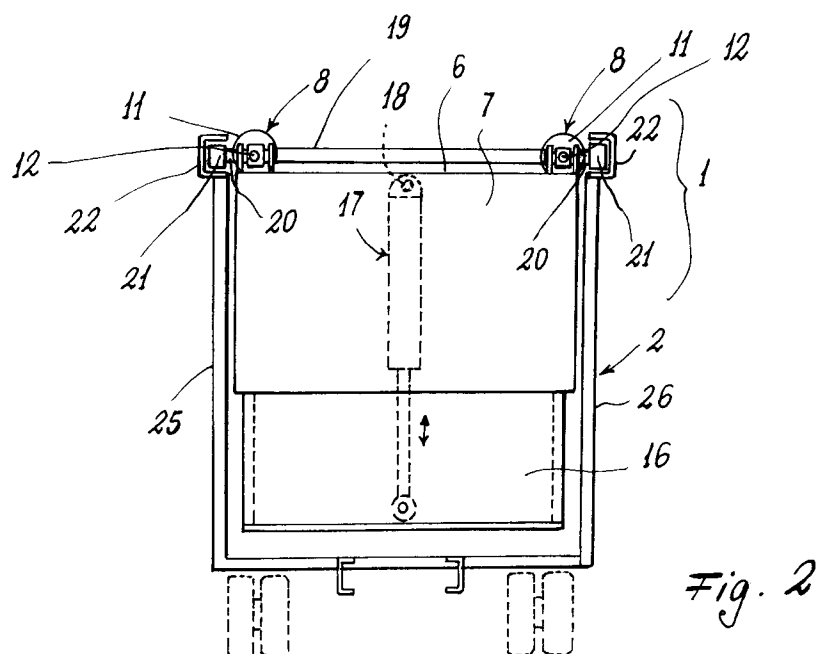
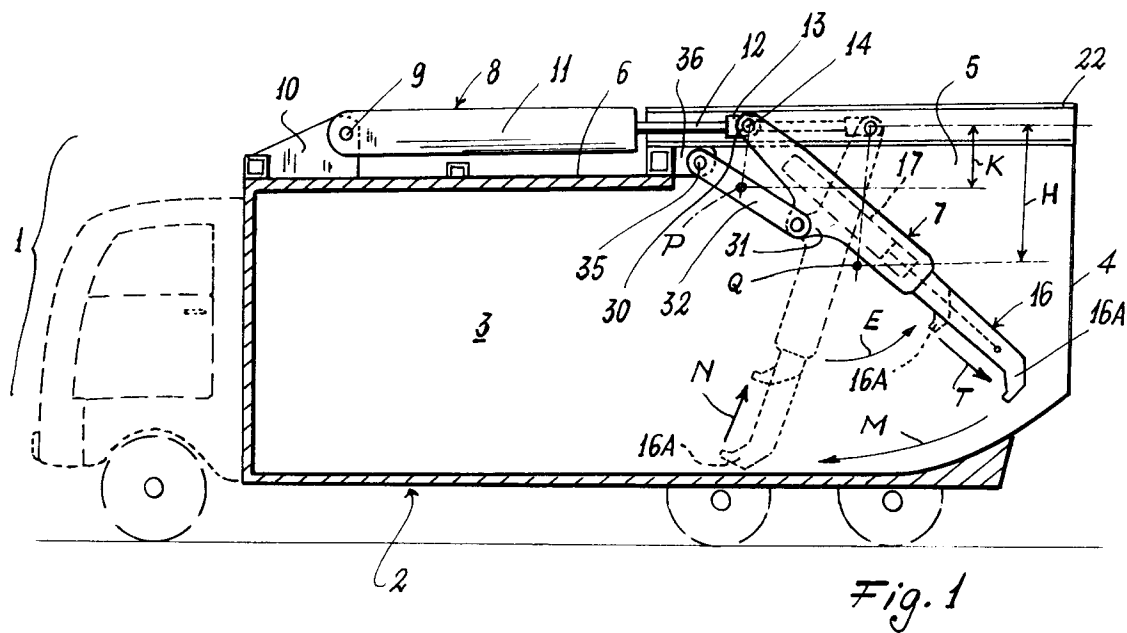
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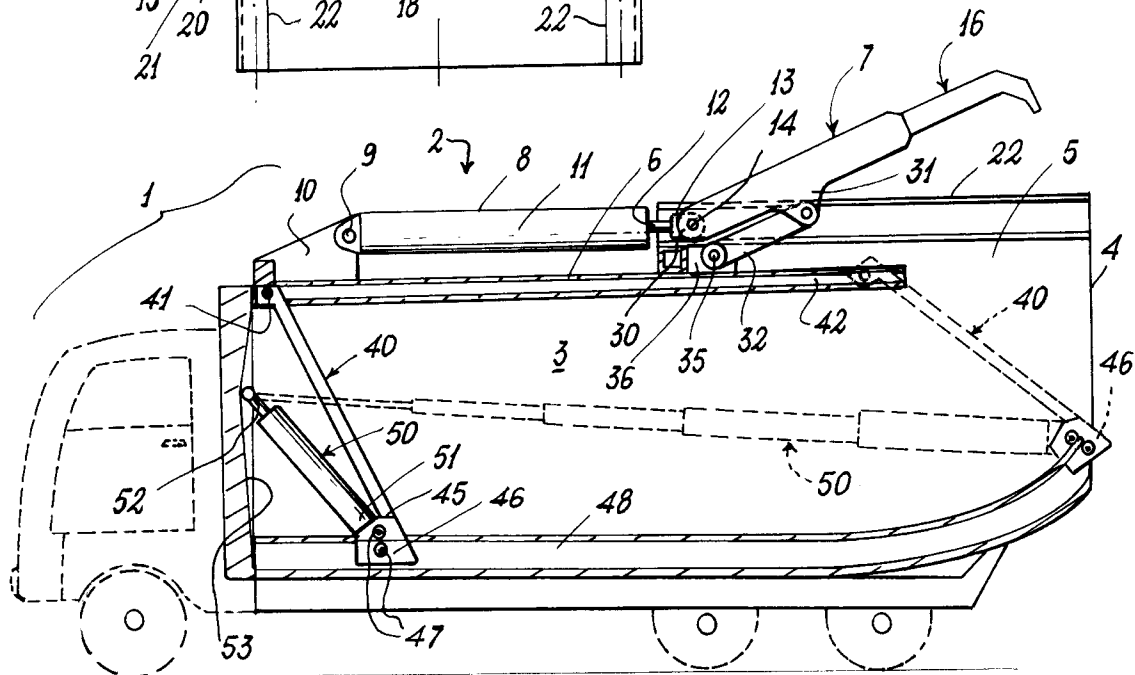
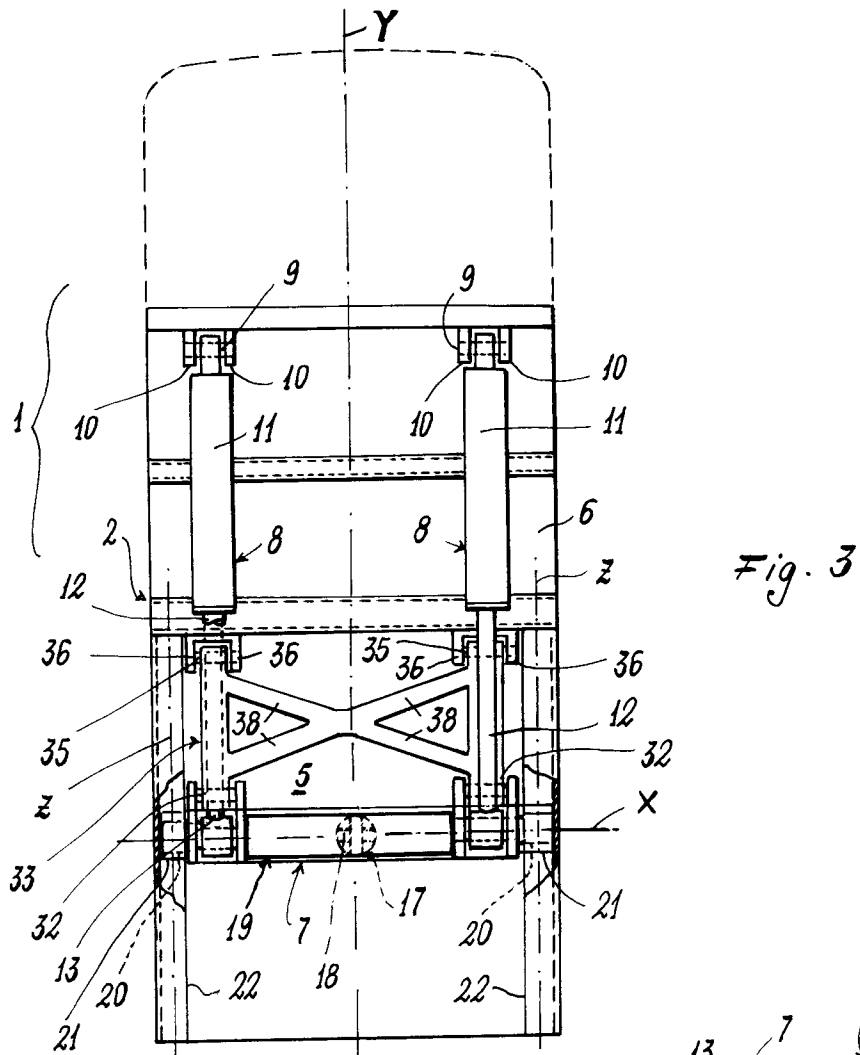
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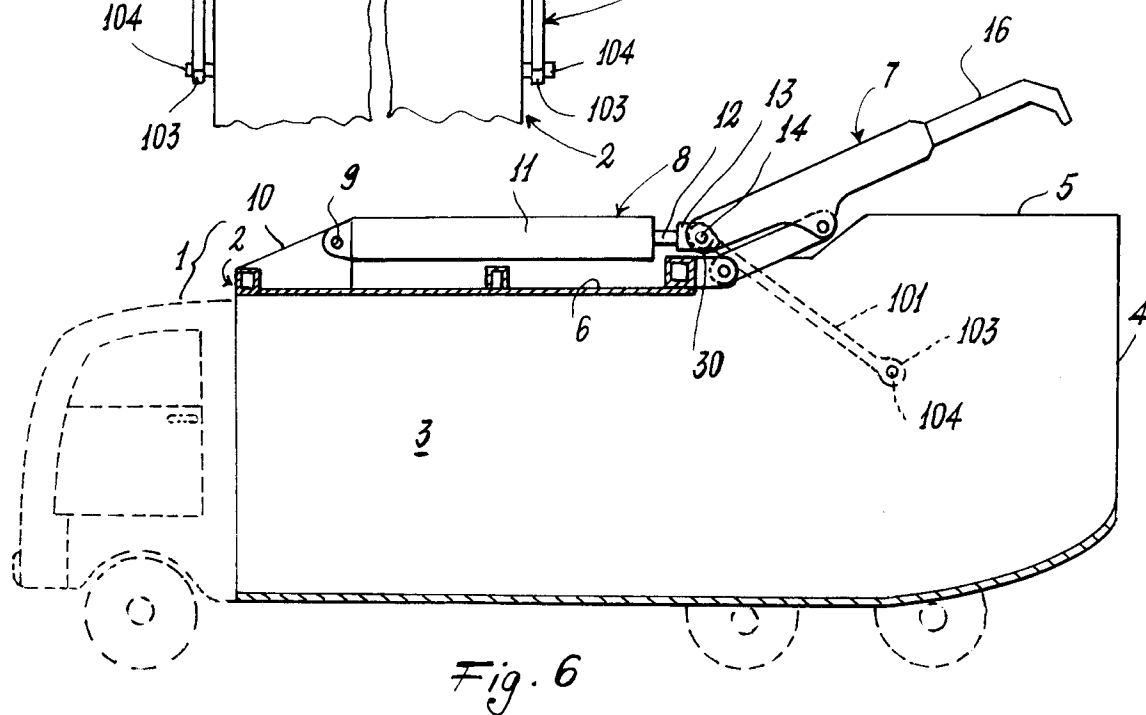
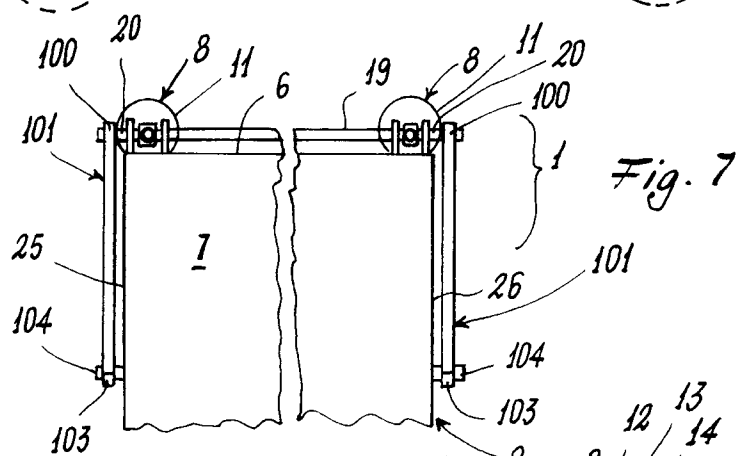
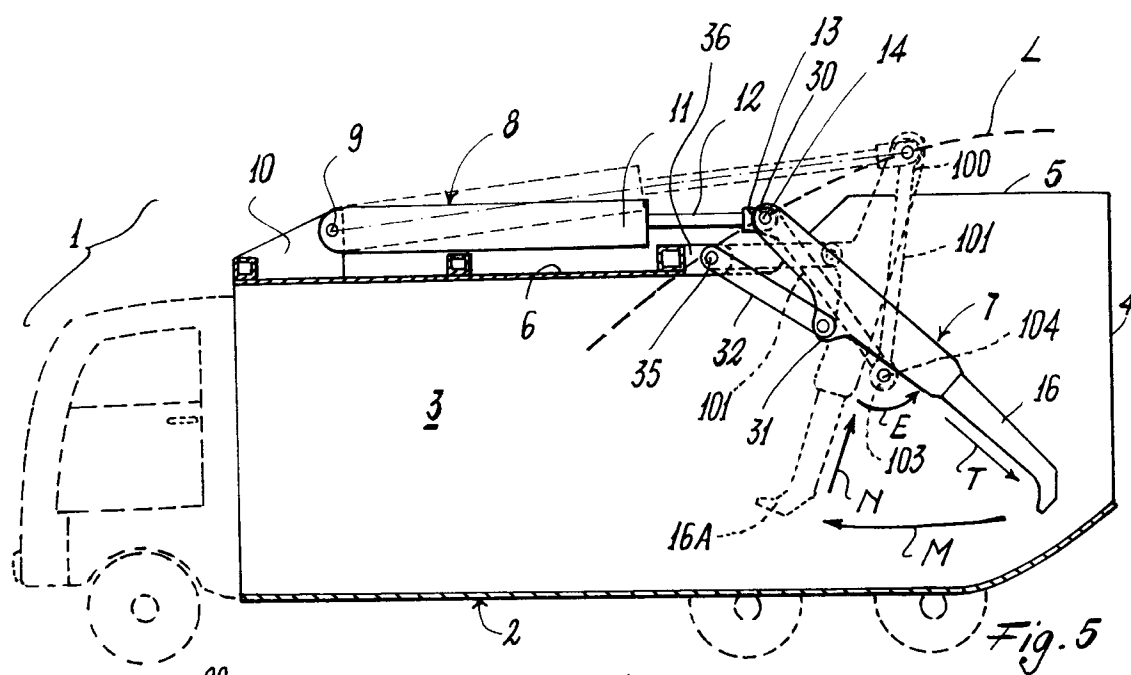
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EUROPEAN SEARCH REPORT

Application Number
EP 94 11 9817

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)
Y	FR-A-1 050 393 (SOCIÉTÉ SOVEL (VÉHICULES ÉLECTRIQUES INDUSTRIELS)) * page 2, left column, line 16 - right column, line 52; figures 1,2 *	1-5,8,9	B65F3/20
Y	FR-A-2 430 905 (CHAUDRONNERIE TOLERIE INDUSTRIELLE D'ANGERVILLE CTIA) * page 2, line 39 - page 4, line 3 * * figure *	1-5	
Y	US-A-3 682 336 (J. WIESCHEL ET AL.) * column 3, line 14 - column 4, line 10 * * column 4, line 33 - column 5, line 21 * * figures 3,5,6 *	1,8,9	
A	US-A-3 759 406 (R. NICKEL) * column 3, line 10 - column 5, line 48 * * figures 1-3 *	1	
A	EP-A-0 514 355 (FARID S.P.A.) * figure 2 *	1	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			B65F
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 27 March 1995	Examiner Smolders, R
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