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(71) Applicant:
ECOLOGY SYSTEM INTERNATIONAL S.R.L.
20121 Milan (IT)

(72) Inventors:
- **Gasparini, Giorgo**
  Milan (IT)
- **Gasparini, Luca**
  Milan (IT)
- **Gasparini, Filippo**
  Milano (MI) (IT)

(74) Representative:
La Ciura, Salvatore
Via Francesco Sforza 3
20122 Milano (IT)

(54) Device for loading and compacting urban solid waste

(57) A device for loading and compacting solid urban waste into vehicles equipped for the collection and the transport of urban solid waste. The device comprises a casing (2) with a hopper (6) having a curved bottom to be coupled to the body (1) of the vehicle, a combination of connecting rods (14), an articulated plate-shovel unit (7,11,12) and pistons (13). The pistons are connected to arms (8) integral with the first plate (7) of the plate-shovel unit to control its rotation around a fixed hinging point (10) on the casing walls thereby causing an upward and downward movement of the plate-shovel unit.

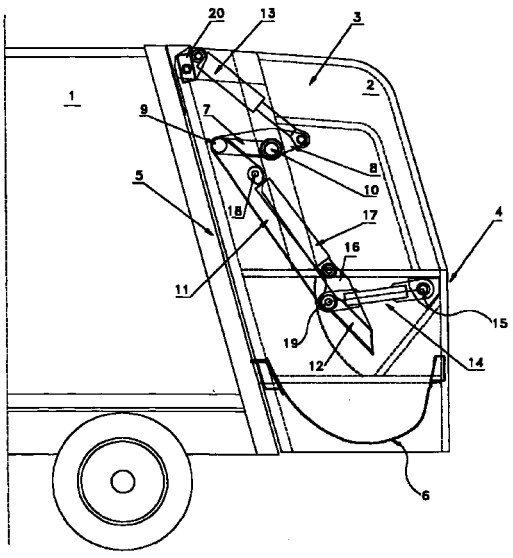

Fig. 1

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Description

[0001] This invention proposes a compaction device for vehicles equipped for the collection and transport of urban solid waste which comprises:

- a casing consisting of two lateral walls, a front face, a rear face for the connection to the body, an arc-shaped face (hopper), means able to convey and compact the waste into the vehicle body, consisting of:
- a first (short) plate hinged (by means of two overhanging pins) in the upper zone of the casing lateral walls, comprising two arms integral with the said plate to control its rotation around the hinging point;
- a second (long) plate hinged upwardly at the lower edge of the first plate which coupled thereto constitutes in this way a long articulated plate;
- a shovel hinged at the lower edge of the second plate;
- a couple of connecting rods hinged from one side in an appropriate recess of the lateral walls, in a point near the front face of the hopper and from the other point on the overhanging extension of the said hinging pin of the shovel at the lower edge of the second plate, so as to lead this lower edge along a curvilinear path during the upward and downward movements of the plate-shovel unit;
- a couple of pistons hinged from one part at the second (long) plate and from the other part at the integral arms of the shovel to control its rotation around the hinging point;
- a couple of pistons housed inside the casing, hinged from one side at a transversal structure connecting the two sides on the upper end of the rear face connecting the casing to the body and from the other side at the two integral arms of the first plate to control its rotation around the hinging point on the casing walls. Compaction systems for the collection and transport of the urban solid waste based on the principle called "articulated single-shovel" are known and diffused.

[0002] It is the matter of a system comprising a plate which hinges at its lower end a shovel which, moved by a couple of pistons, rotates around the hinging point causing its lower end (base) to carry out a circle arc to pass from a position called opened to one called closed.

[0003] All the plate-shovel unit is sliding above from down and vice versa inside the lateral walls of a casing-loading hopper coupled with a body assembled on a truck, usually with a certain forward inclination as regards the vertical of the plane of the said body.

[0004] In all the different existing embodiments, the hinging of the shovel at the plate and its rotation is de facto equal and does not show any substantial difference.

[0005] On the contrary the translation movement of the plate integral with the corresponding plate to convey and compact the waste from the bottom of the hopper to the floor of the body assembled on the vehicle, a floor de facto placed on a level higher than the hopper bottom, the existing embodiments can be basically led to two systems:

a. sliding along the guides taken from the lateral walls of the casing-loading hopper or
b. crank mechanisms which cause this translation to be carried out along circle arcs.

[0006] Everyone of these systems involves advantages and inconveniences, in all the cases the couple of pistons which controls the shifting of the plate-shovel unit above from down and vice versa, is in a position in line with respect to the direction of the plate with the consequence that: in the cases wherein these pistons are placed inside the hopper, they result superimposed to the said plate and therefore are mixed with the waste, further in the translation phase above from down, when there is a necessity of a greater force to convey and compact the waste in the body, the pistons operate in closing phase (with the barrel section reduced of the rod section) therefore with a degree of efficiency reduced with respect to their size; in the cases wherein said pistons are placed out of the casing walls, it is necessary the crossing of the said walls by the pin anchoring at the pistons through slits with the addition of a mobile wall of external protection and the hopper with respect to the body width has to be reduced in order to house said pistons outwardly the said walls.

[0007] Further in all said systems in the translation movement of plate-shovel unit there is the necessity to be obliged to keep between the plate and the front wall of the rear face a contact of partial closure to the body in order to convey the waste in the said body where contrasts and phenomena of blow-by and backup of the waste often take place.

[0008] This invention has the feature to carry out the translation movement of the plate-shovel unit by adopting a particular connecting rods-articulated plate combination, through the utilization of: a couple of connecting rods, anchored from one side at the pin connecting the shovel to the lower edge of the articulated plate and from the other side in an appropriate recess of the casing lateral walls in a point near the front face of access to the hopper and an articulated plate where its upper semiconstituent including two arms integral therewith to control its rotatory movement around the hinging point on the lateral walls of the casing causes the carrying out of the translation movement of the plate-shovel unit above from down and vice versa.

[0009] Another feature of this invention is that the piston couple provided for the translation movement of the plate-shovel unit, placed inside the casing and hinged from one hand at a transversal structure con-

necting the two sides on the upper edge of the rear face connecting the casing to the body and, from the other hand at the two arms integral with the first plate to control its rotation around the hinging point on the casing walls, are in line with the upper lip of the walls of the said casing where they are not mixed with the waste. In this way the hopper room at disposal is optimized without slits on the casing sides and without superimpositions of pistons on the plate. Further with this embodiment, during the translation phase of the plate-shovel unit above from down, where there is the need of a greater push, said pistons, even if placed inside the casing, operate with the total section of the barrel and therefore in conditions of maximum efficiency for the waste compaction. Advantageously this system does not need to keep the contact of partial closure with the front wall towards the body in order to convey the waste into the said body, because this front wall can be of reduced height and a second backward-moved wall placed vertically starting from the hinging point of the first plate up to the roof together with the articulated plate-shovel unit covers all the section of the coupling rear face to the body of the said casing, without a contrast or a back-up of the waste in the conveyance and compaction running in the body can take place.

[0010] At last a further advantage is given by the fact that the hinging on the walls of the casing constituting a fixed anchorage point of all the articulated plate-shovel unit does not allow lateral deviations against the casing walls during the different movement phases as it can take place with the other systems.

[0011] The invention shall be now described in detail, by way of example, with reference to the enclosed figures wherein:

- figures 1 to 4 schematically show, in a side view, the compaction device according to the invention with the different handling mechanisms of the articulated plate-shovel unit, in the different running phases;
- figure 5 shows a front view of the compaction device according to the invention.

[0012] With reference to the figures, reference 1 indicates the body of a vehicle wherein the waste is compacted and collected by means of the compaction device according to the invention. This consists of a casing-hopper indicated in its unit with reference 2.

[0013] This casing shows two lateral walls 3, a front face 4 allowing the entry of waste or garbage cans, a rear face 5 coupling to the body, at last starting from the height of the body plane a curved bottom 6 goes down in the lower part to go up until the access at a certain height of the front face for the waste discharge, defining in this way the base of the loading hopper.

[0014] Inside said casing-hopper the devices which convey and compact the waste into the body consist of:

- a first (short) plate 7 hinged by means of two overhanging pins supported by the appropriate fixed supports 10 on the lateral walls 3 of the hopper, including two arms 8 integral with the plate 7, and which carries out a rotatory movement around the hinging points
- a second (long) plate 11 hinged upwardly at the anchoring points 9 to the first plate 7 which, coupled thereto, constitutes in this way a long articulated plate
- a shovel 12 hinged at the lower edge of the second plate 11 in the points 19.

[0015] The movements of the pistons 17, hinged from one side at the couple of arms 16 integral with the shovel 12 and from the other side at the plate 11 in the point 18, control its rotation around the pins 19 put in correspondence with the lower edge of the long plate 11.

[0016] The pistons 13 anchored from one hand at the transversal connecting structure 20 of the two sides on the upper end of the front face 5 and from the other hand at the two arms 8, integral with the first plate 7, control the rotating movement thereof, impressing an arc trajectory to the upper edge of the long plate 11.

[0017] The lower part of the long plate 11 is driven, in its movement, by a couple of connecting rods 14 which are hinged from one hand at the edge of the said plate and from the other hand at the frame of the lateral walls of the casing-hopper, in a point 15 placed near the front face 4.

[0018] The bottom 6 of the casing-hopper is arc-shaped, so that the lower edge of the shovel during the rotation around the pins 19 and in the translation path of the articulated plate-shovel unit runs across this arc keeping in contact with the hopper bottom, completely conveying in this way the waste to be compacted into the vehicle body.

[0019] The operative sequence of the described device is the following:

- at the end of a compacting cycle and therefore at the beginning of the following one, the shovel is in the position shown in figure 1 with the long plate 11 completely raised.

[0020] At this point operate the pistons 13 which, while they are retracting, rotate in a counterclockwise direction the short plate 7 around the fixed hinges, impressing through the anchoring points 9 to the second plate 11 a translation movement accompanied and driven in the lower part by the connecting rods 14, carrying the articulated plate-shovel unit in the position of fig. 2.

[0021] The lower edge of the plate 11, during the downward movement, is driven by the connecting rods 14 so to move along a circle arc with the centre in correspondence with the point 15.

[0022] The extension of the pistons 17 is now controlled by rotating the shovel in a clockwise direction to lead it in the position of figure 3.

[0023] During this movement the lower edge of the shovel runs near the curved bottom 6, collecting all the waste.

[0024] It is now sufficient to control the extension of the pins 13 to rotate the short plate 7 in a clockwise direction around the hinges 10, impressing through the anchoring points 9 to the second plate 11 an upward translation movement accompanied and driven in the lower part of the connecting rods 14 until the position of figure 4.

[0025] During this movement the waste, previously collected from the curved bottom 6 by the rotatory movement of the shovel, is raised to be pushed and compacted into the body 1 through the opening of the front face 5.

[0026] The control of the closure of the pistons 17 is now given, which rotates the shovel around the hinge 19 of the lower edge of the plate 11, carrying the embodiment, object of this invention, back to the position of figure 1.

[0027] It shall be clear from the description given that the compaction device according to the invention carries out the translation movement of the plate-shovel unit by adopting a particular short plate, hinged in two fixed supporting points on the lateral walls of the casing-hopper, which from its lower end hinges the upper part of the long plate and from the part of the integral arms hinges an end of the pistons carrying out this movement.

[0028] The connecting rod unit anchored from one side at the pins connecting the shovel to the long plate and from the other side in an appropriate recess of the lateral walls of the casing near the front access face of the hopper, accompany the plate-shovel unit and secure a translation run to the upward and downward movement.

[0029] With these arrangements it was tried to obtain all the advantages of the building simplicity with the maximum exploitation of the access room of the garbage cans into the hopper without interferences with the plate-shovel unit in movement, and all the advantages of the piston push of maximum efficiency for the rise of the compacting unit as well as the piston positioning in a room protected from the waste and not encumbering for the casing unit.

[0030] A skilled in the art can then foresee many changes and variations which shall nevertheless be all comprised within the extent of this invention.

Claims

1. A compaction device to be coupled to garbage cans for the collection and transport of urban solid waste, of the kind comprising a casing consisting of two lateral walls, a front face, a rear face for the coupling to the body and an arc-shaped face (hopper), characterized by the fact that:

- a first (short) plate hinged (by means of two overhanging pins) in the upper zone of the lateral walls of the casing, including two arms integral with the said plate, to control its rotation around the hinging point;
- a second (long) plate hinged upwardly at the lower edge of the first plate which, coupled thereto, constitute in this way a long articulated plate;
- a shovel hinged at the lower edge of the second plate;
- a couple of connecting rods hinged from one side at an appropriate recess of the lateral walls, in a point near the front face of the hopper and from the other side on the overhanging extension of the said pin hinging the shovel at the lower edge of the second plate, to drive this lower edge along a curvilinear path during the upward and downward movements of the plate-shovel unit.

2. A compaction device according to claim 1, characterized by the fact that the translation movement of the plate-shovel unit is carried out by adopting a particular connecting rods-articulated plate combination through the utilization of a couple of connecting rods anchored from one side at the pin connecting the shovel to the lower edge of the articulated plate and from the other side at an appropriate recess of the lateral walls of the casing in a point near the front access face to the hopper and an articulated plate wherein its upper semiconstituent including two arms integral thereto to control the rotatory movement around the hinging point on the lateral walls of the casing causes the carrying out of the translation movement of the plate-shovel unit above from down and vice versa.

3. A compaction device according to the previous claims, characterized by the fact that the couple of pistons provided for the translation movement of the plate-shovel unit, placed inside the casing in line with the upper lip of the walls of the said casing are not mixed with the waste; and hinged from one hand at a transversal structure connecting the two sides on the upper edge of the rear face coupling the casing with the body and from the other hand at the two arms integral with the first plate to control its rotation around the fixed points hinging on the casing walls operate in conditions of maximum efficiency (with the total section of the barrel in the upward phase of the articulated plate-shovel unit) for a better compaction coefficient.

4. A compaction device according to the previous

claims, characterized by the fact that advantageously this system does not need to keep the contact of partial closure with the front wall towards the body to convey the waste into the said body, because this front wall can be of reduced height and a second backward-moved wall placed vertically starting from the hinging point of the first plate up to the roof together with the articulated plate-shovel unit covers all the section of the rear face of coupling to the body of the said casing, without a contrast or a back-up of the waste in the conveyance and compaction running in the body can take place.

5. A compaction device according to the previous claims, characterized by the fact that the hinging on the casing walls, forming a fixed point anchoring all the articulated plate-shovel unit does not allow lateral deviations against the casing walls during the different movement phases as it can take place with the other systems.

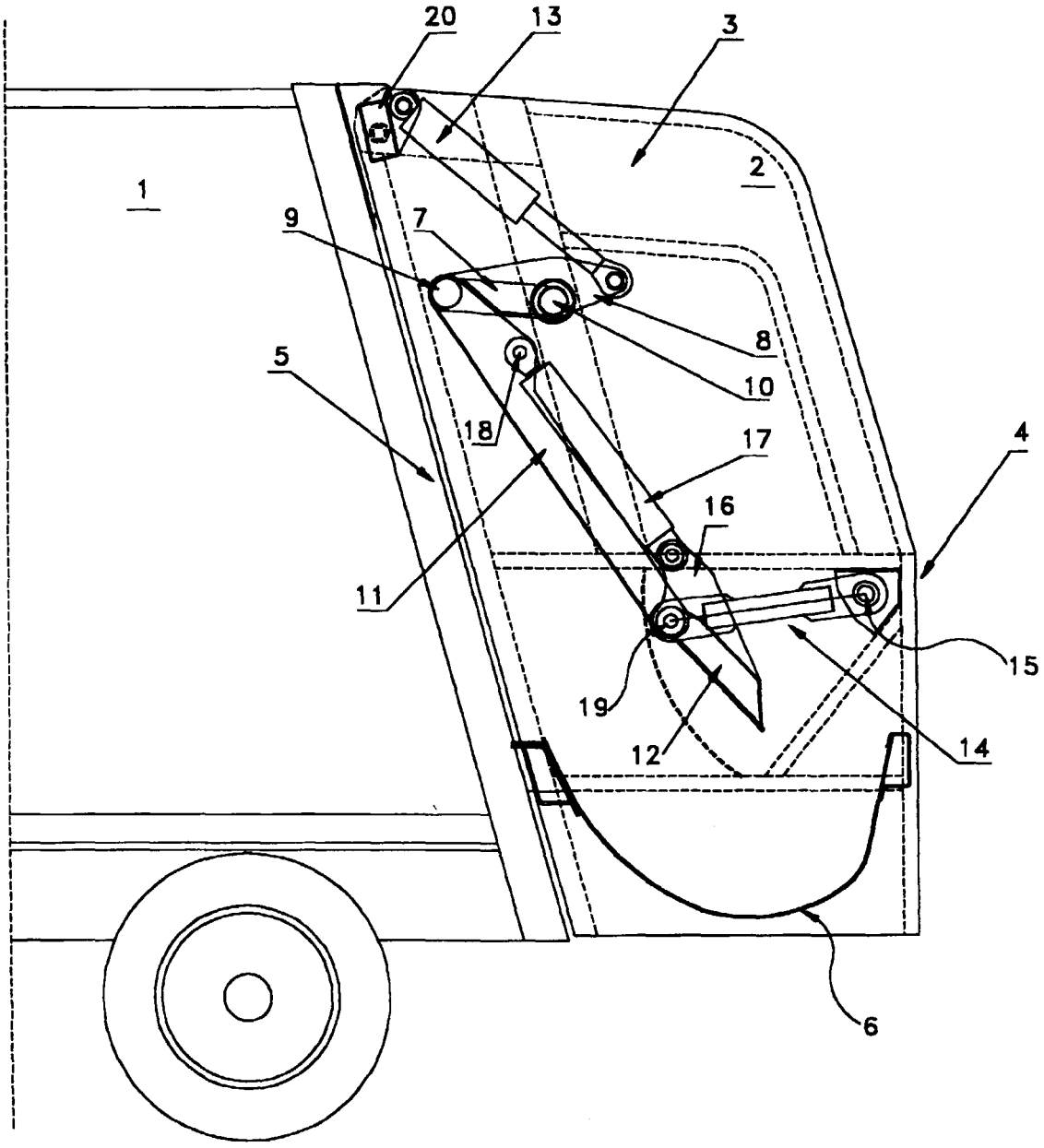

Fig. 1

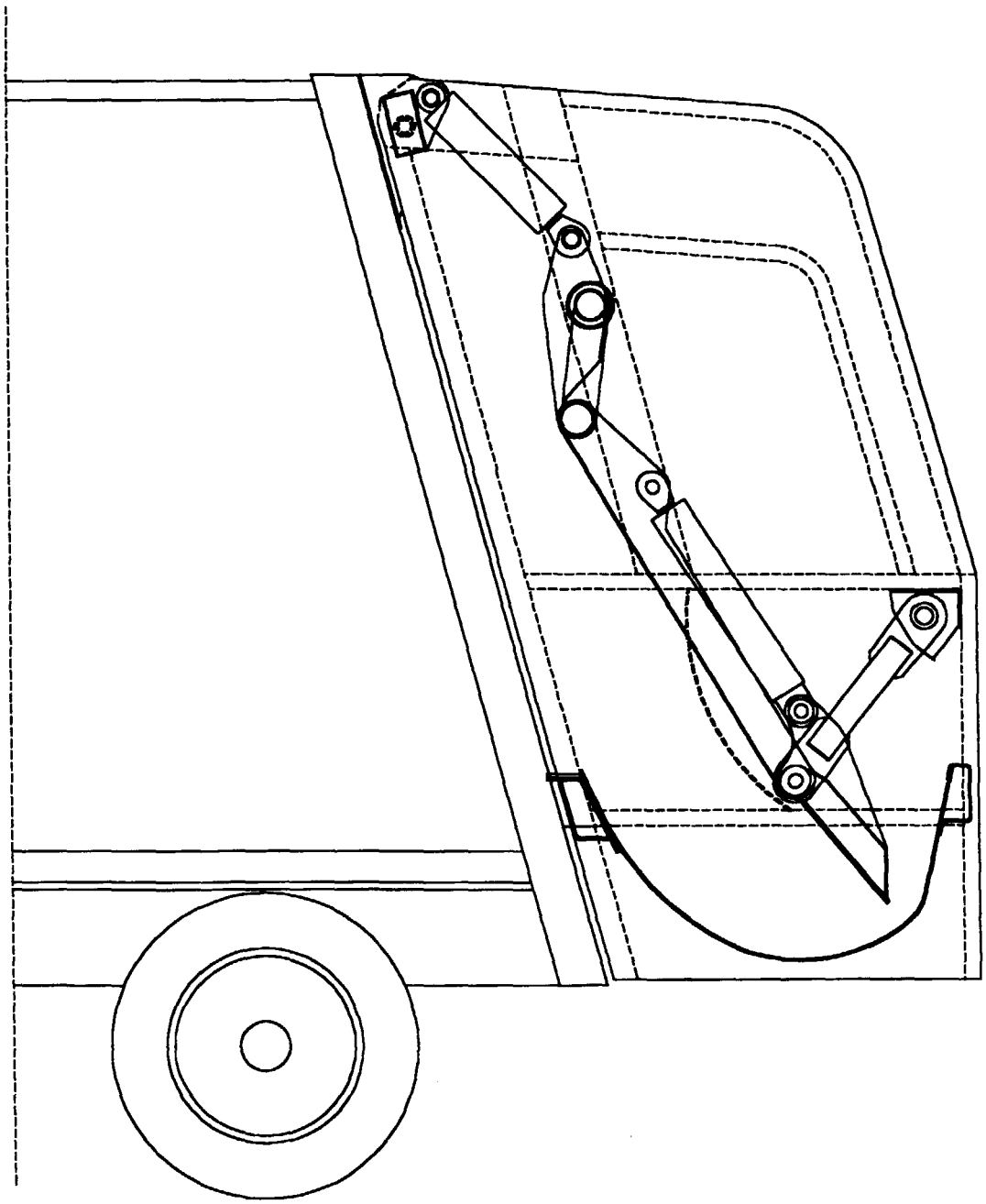

Fig. 2

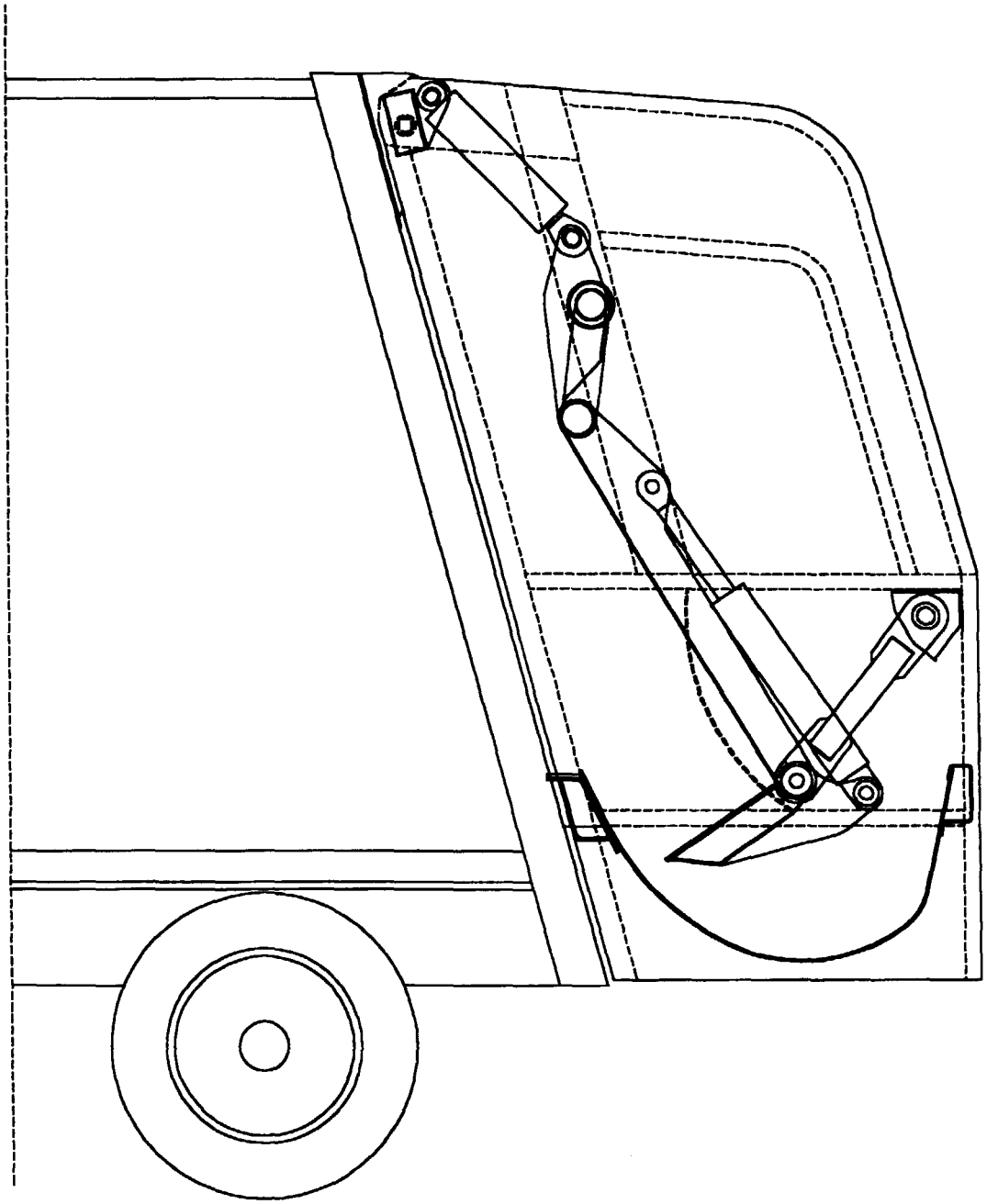

Fig. 3

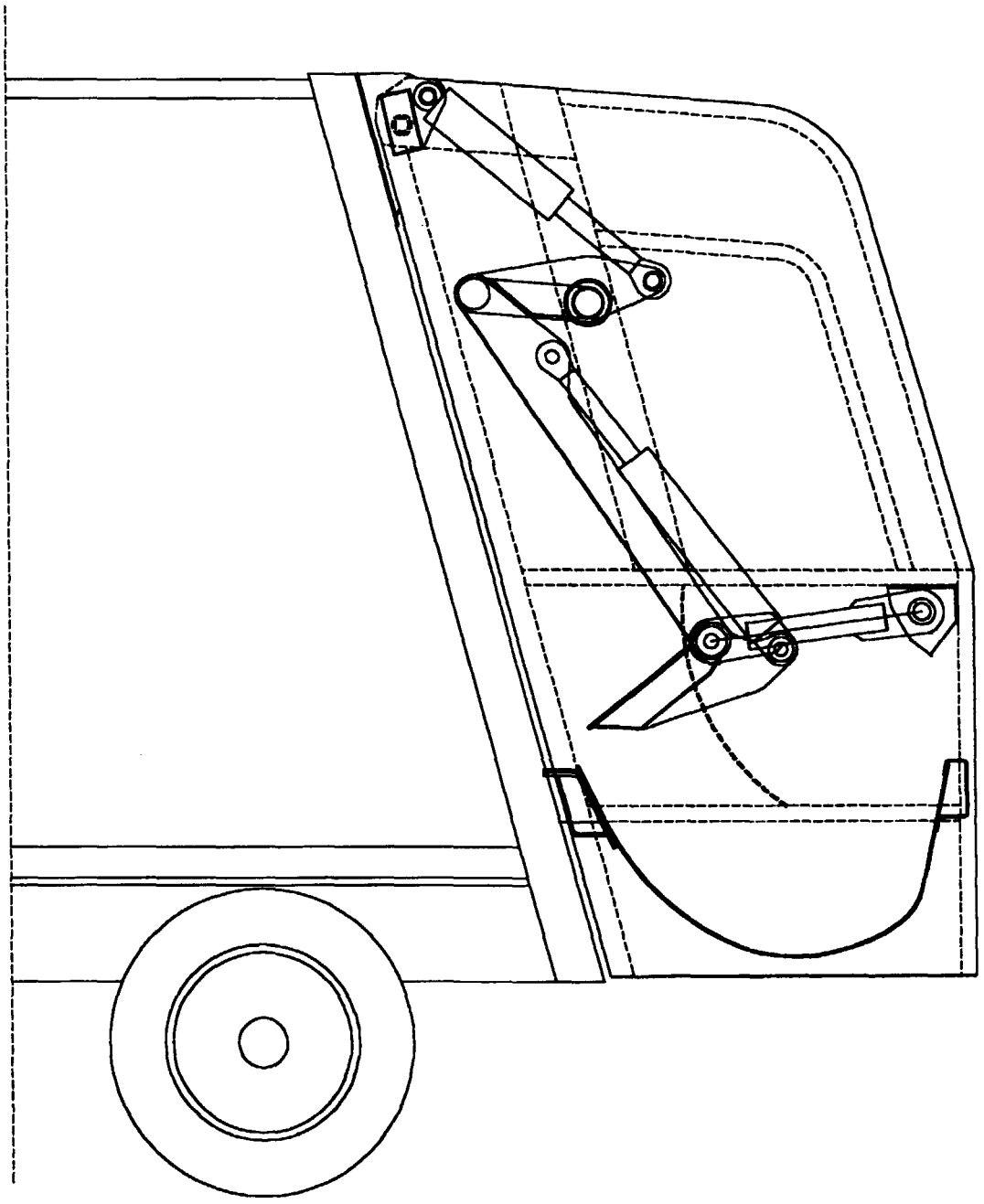

Fig. 4

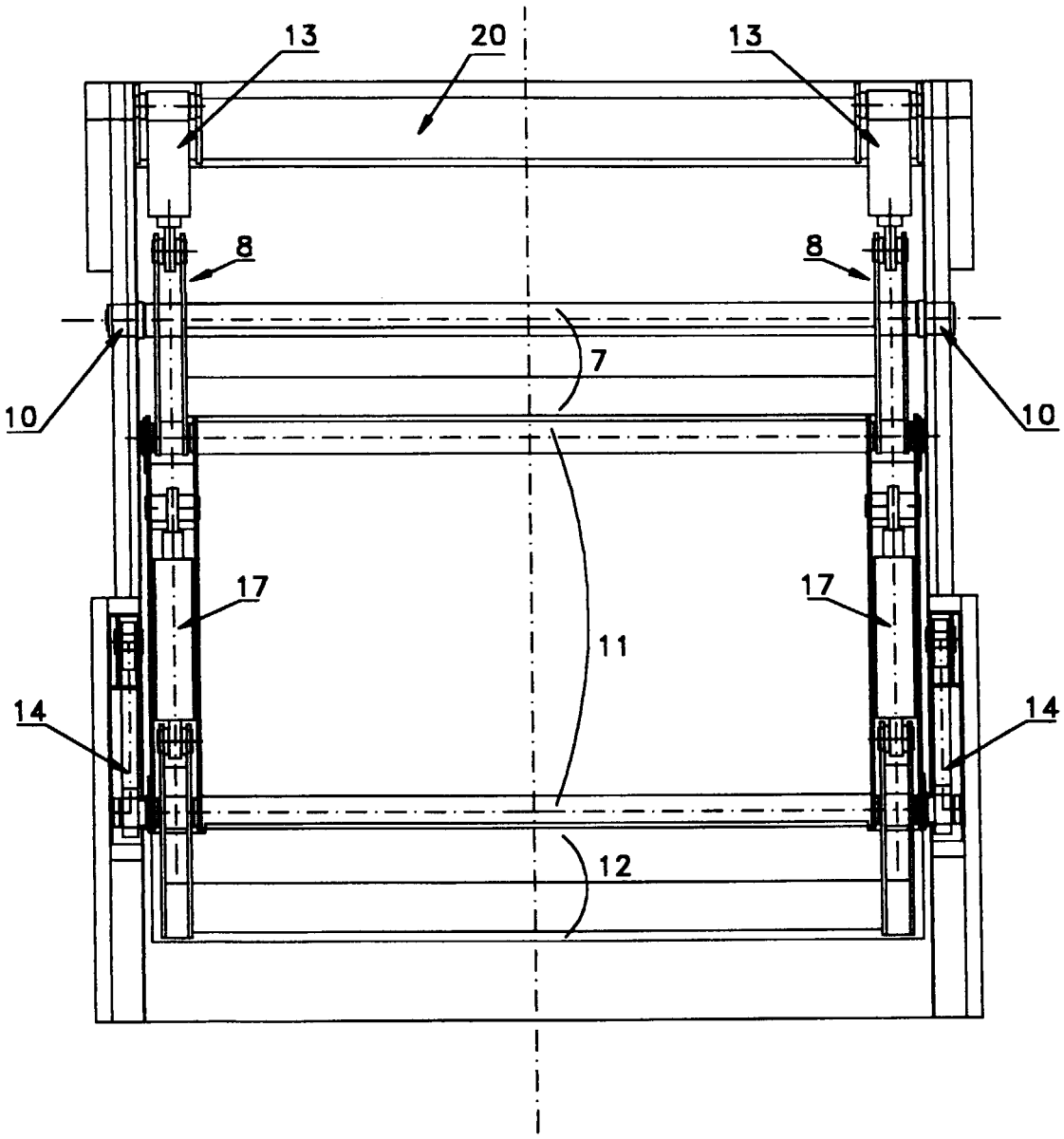

Fig. 5

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EUROPEAN SEARCH REPORT

Application Number
EP 98 12 3332

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	GB 2 077 217 A (M. COLIN) 16 December 1981 * page 2, line 10 - line 70 * * figures 1-7 *	1,2	B65F3/20
A	EP 0 285 582 A (BERGOMI SPA) 5 October 1988 * column 3, line 6 - column 5, line 13 * * figures 1-5 *	1,2	
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			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	27 April 1999	Smolders, R

CATEGORY OF CITED DOCUMENTS

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