

Description

Field of the invention

[0001] This invention relates to the collection of refuse, more specifically to a device mounted on a garbage truck for lifting refuse containers and emptying these into the hopper of the vehicle, which in the preferred embodiment is designed to be arranged on the side of the refuse collection truck.

State of the art

[0002] Lifting and loading devices for side loading refuse collection trucks are known from the state of the art.

[0003] CN201292125 discloses a utility model that relates to the design of a refuse loader for side loading refuse collection trucks. The refuse loader is arranged on one side of the truck.

[0004] EP0312900 discloses a device for engaging, lifting and tilting a garbage or refuse container, which is designed for side loading trucks. The device comprises an articulated quadrilateral, a slide slidable toward and away from the container.

[0005] US5525022 discloses a side loading refuse collection truck that has a lift arm, which mounts a longitudinally moveable slide, which in turn pivotally mounts a faceplate for engaging refuse containers.

[0006] US4889462 discloses a refuse loading apparatus. The receptacle can either be a single large container or a plurality of small containers. In the preferred embodiment, the apparatus has two transport units of refuse containers which are self-adjusting against the container(s) and provided on opposite sides of a fulcrum of a transverse beam.

[0007] US2003152447 discloses an automated refuse container loader that is mounted to the side of a truck and adapted for lifting refuse containers and emptying them into a hopper. The loader is equipped with a lift arm that has a gripping element with gripping jaws for engaging refuse containers attached to it.

[0008] JPH0692405 discloses a refuse container tilting device for refuse collection trucks, which helps achieve stable operation and complete discharge of refuse from containers. The device has right and left brackets, a gripping unit that is supported on an axis and is freely pivotable. A U-shaped pin receiver is used to engage refuse containers, which has a hook-shaped catch that is used for locking containers when these are lifted and emptied.

[0009] The companies Scania and Faun offer side loading refuse collection vehicles that are equipped with a movable beam and gripping unit behind the driver's compartment, which can be moved up and down as well as towards the side on a moving base, thus providing better manoeuvrability for emptying refuse containers. It is not possible to load refuse containers from both sides of the vehicle.

[0010] The lifting and loading devices of side loading refuse collection trucks known from the state of the art have some weak points. For example, the distance between the vehicle and the refuse container to be emptied must be greater than that required by the lifting device of the invention, which gives the solution of this device the advantage of the refuse collection truck using less street space for loading refuse, since the lifting device lifts refuse containers from a shorter distance in relation to the body of the refuse collection truck than in the case of known solutions (especially compared to NTM OM side loaders). The design of some side loading lifting devices is such that they use claws or jaws to grasp around refuse containers. The shortcoming of this design is that there must be gaps between refuse containers or they cannot be too close to any obstacles (poles, cars, mailboxes, etc.), since the containers cannot be grappled in such cases. The lifting and loading devices of the state of art do not allow loading of refuse containers from both sides of a refuse collection truck.

Summary of the invention

[0011] The aim of the invention is to provide a cantilevered lifting and loading device for refuse collection trucks located in the middle of the vehicle behind the driver's compartment, which ensures the kinematics of a lifting mechanism that is analogous to the lifting mechanism of a rear-loading refuse collection truck. This enables lifting containers quite close to the side of the refuse collection truck, meaning that less lifting space is needed on the street. The device of the invention also comprises a horizontal linear movement mechanism to engage and lift refuse containers, enabling the device to grapple a container from a distance so that the refuse collectors do not have to manually push containers next to the truck. The loading of refuse containers can be controlled from the driver's compartment. The lifting and loading device of refuse containers includes a cantilevered lifting mechanism that is movable towards the side of the truck on rollers, slide surfaces or similar implements. The mechanism comprises a beam, which has a gripping unit for gripping refuse containers, and the beam and gripping unit are pivotable in relation to the attachment axis, and their tilt angles are controlled manually or electronically, by a computer processor. The coordination of the base with horizontal linear movement, the beam, the gripping unit and the hydraulic cylinders for the latching of refuse containers ensures control and navigation of the position of refuse containers, which is especially important in the given solution since the lifting and loading device is adapted for operation on both sides of refuse collection trucks. A flexible support is provided in order to limit the motion range of refuse containers in the phase of emptying them as well as to facilitate discharge. In an alternative embodiment, a double door covering the refuse hatch, which opens in two directions and is located in the upper part of the body of a refuse collection truck, may

be used.

List of figures

[0012] A more detailed overview of the invention is provided by reading the following detailed description of an exemplary embodiment in conjunction with the attached figures, wherein:

FIG 1 is a front view of the cantilevered lifting and loading device for refuse containers of the invention;

FIG 2 is a top view of the cantilevered lifting and loading device for refuse containers of the invention;

FIG 3 shows the movable frame of the cantilevered lifting and loading device of refuse containers of the invention, which is used to move refuse containers horizontally;

FIGS 4A, 4B, 4C show the different positions of the locking device in the detailed view B of figure FIG 3;

FIG 5 shows the operating cycles of the lifting and loading device of the invention and the movement trajectory of a refuse container when the container is located on the right side of the truck;

Figure FIG 6 shows the operating cycles of the lifting and loading device of the invention and the movement trajectory of a refuse container when the container is located on the left side of the truck.

Figure FIG 7 shows the position of the beam of the lifting and loading device of the invention during a transition from right side loading to left side loading.

Figure FIG 8 shows an alternative drive for the beam of the lifting and loading device of the invention, which is a hydraulic or electric motor with transmission.

An exemplary embodiment of the invention

[0013] The lifting and loading device of refuse containers with a cantilevered design comprises a beam 1 (figure FIG 1), which is attached to the front of the body of a refuse collection truck 2 behind the driver's compartment 3 (shown in FIG 2), which enables lifting a refuse container 4 maximally close to the refuse collection truck since less space is needed to lift containers and empty them into the refuse collection truck. In order to ensure the optimum trajectory when a refuse container 4 is lifted and emptied, the beam 1 of the lifting device is equipped with a hydraulic or electric motor 5, which transfers torque to the gripping unit 7 of containers by way of a cogwheel 6. Chain or other similar transmissions may be used instead of the gear transmission. When the beam 1 is lifted

using a hydraulic cylinder 8, the position of the refuse container 4 can simultaneously be adjusted and finally emptied into the refuse collection truck 2. When lifted, the beam 1 rotates around the axis 9, and the gripping unit 7 similarly rotates around its axis 10. When a hydraulic or electric motor is used to rotate the gripping unit 7, the trajectory of the refuse container 4 can be changed if needed, and it is mechanically not dependent on the angle of rotation of the beam 1 as is the case when the comb lifters of traditional refuse collection trucks (rear and side loaders) are used. This also enables separately controlling the angle of the gripping unit 7 by the use of an electronic computer processor (not shown in the figure) or manually, irrespective of the position of the beam 1. This solution of rotational movement of the gripping unit makes it possible to engage the container 4 from both sides of refuse collection trucks since the reach of the rotational movement of the gripping unit is not limited. If a hydraulic or electric motor with sufficiently high torque can be used, gear or other types of transmission may turn out to be unnecessary to rotate the gripping unit 7, and the drive (motor) may directly be connected to the gripping unit 7.

[0014] The means for locking refuse containers 4 to the gripping unit 7 is shown in FIGS 4A, 4B, 4C. In its essence, the locking means is similar to the locking mechanism of comb lifters known from the state of art. The locking means comprises a locking device 11 pivotably connected to the gripping unit 7, which essentially includes a plate the width of which corresponds to the gripping unit. The free edge is movable by the use of the cylinder of the locking device 12 and can be fixed to both sides of the gripping unit 7. In the preferred embodiment, both ends of the locking device have a cylinder 12. This ensures that the edge of a refuse container can securely be fixed between the gripping unit and locking device. The locking device works in both cases: when refuse containers are engaged from either the right or left side of refuse collection trucks. FIG 4A shows a situation in which the locking mechanism of the refuse container 4 is opened when the refuse container is engaged and locked from the right side of the refuse collection truck. FIG 4B shows a situation in which the locking mechanism of the refuse container 4 is opened when the refuse container is engaged and locked from the left side of the refuse collection truck. FIG 4C shows a situation in which the locking mechanism of the refuse container 4 is closed. The dashed line indicates the extreme positions of the locking mechanism in the opened positions. The locking device 11 ensures that the gripping unit 7 is fixed against the container 4 so that the refuse container 4 would not be disengaged from the gripping unit 7 when the container is lifted and emptied into the refuse collection truck 2. A flexible support 13 is provided to limit the motion range of the refuse container 4 in the phase of emptying it as well as to facilitate discharge. In an alternative embodiment, a double door equipped with a spring and covering the refuse hatch, which opens in two directions and is

located in the upper part of the body of refuse collection trucks, may be used (not shown in the figures).

[0015] In order to engage the container further away from the refuse collection truck, the horizontal linear movement of the gripping unit must be enabled. To achieve this, the entire lifting device is attached to the moving frame 14 (see FIG 3), which is moved by means of a hydraulic cylinder 15 or other drive. The frame may be equipped with rollers or slide surfaces that facilitate horizontal movement along guide rails 16. The dotted line in FIG 5 indicates how a refuse container is engaged if the container is in position I. II, III and IV mark the different stages of lifting and loading a refuse container. A computer processor controlling the movement of the lifting and loading device is configured to change the tilt angle of the gripping unit in these different stages as well as the tilt angle of the refuse container locked to the gripping unit with the locking device 11, taking the height of the refuse container and the position of the moving frame 14 into account.

[0016] One of the novelties of the lifting device is that it can be used to engage containers from both sides of refuse collection trucks (the position indicated with a dotted line in FIG 1). The gripping unit 7 and locking device 11 have a partially symmetrical design for this purpose, which makes it possible to engage and lock containers from both sides of a refuse collection truck. This ensures that refuse containers can be emptied from both sides of a refuse collection truck, like figures FIG 5 and FIG 6 schematically show.

[0017] In order to guide the lifting device to one side of a refuse collection truck or the other, the hydraulic cylinder 8 works as a crank mechanism (see FIG 7), making it possible for the lifting device to move over the central axis using the force of inertia. As shown schematically in FIG 8, other drives may also be used instead of the hydraulic cylinder 8 to lift the beam 1, such as a hydraulic or electric motor 17 with gear transmission 18 or a drive with other types of transmission. The gear transmission 18 is fixed to the beam and ensures its rotational motion.

[0018] The operating cycle of the lifting device of the invention is depicted in FIG 5. The phases of the operating cycle are as follows: I - engagement and pulling of the refuse container, II - simultaneous lifting and opening of the lid, III - stopping the refuse container against the limiter, IV - emptying of the refuse container into the refuse collection truck.

Claims

1. A lifting and loading device for side loading refuse collection trucks, the lifting and loading mechanism of which has a movable beam (1) and gripping unit (7) for engaging and lifting refuse containers, a locking device (11) and hydraulic cylinders (12) for locking refuse containers to the gripping unit, **characterised in that** the gripping unit (7) is pivotably con-

nected to the beam (1), the tilt angle of the gripping unit (7) is controllable, and the beam (1) on the movable frame (14) is adjusted to work on both sides of refuse collection trucks in cooperation with the gripping unit (7) and locking device (11).

2. The lifting and loading device of claim 1, **characterised in that** the cooperation between the beam (1), gripping unit (7), locking device (11), cylinder of the locking device (12) and movable frame (14) is electronically controlled by a computer processor.
3. The lifting and loading device of claim 1, **characterised in that** there is a drive to rotate the gripping unit, which is connected to the gripping unit by means of a transmission.
4. The lifting and loading device of claim 3, **characterised in that** the drive is connected to the gripping unit by means of direct transmission.
5. The lifting and loading device of claim 1, **characterised in that** a hydraulic cylinder is used to move the movable frame.
6. The lifting and loading device of claim 1, **characterised in that** one of the following is used to move the beam: a hydraulic cylinder, hydraulic motor with transmission, electric motor with transmission, hydraulic motor with direct transmission, electric motor with direct transmission.
7. The lifting and loading device of claim 6, **characterised in that** the hydraulic cylinder of the beam is adjusted to operate as a crank mechanism to move the beam to either side of the refuse collection truck.
8. The lifting and loading device of claim 1, **characterised in that** the movable frame has rollers or slide surfaces, which are adjusted to move on the guide rails of the movable frame.
9. The lifting and loading device of claim 2, **characterised in that** the computer processor that moves the gripping unit electronically is adjusted to control the tilt angle of the gripping unit.
10. The lifting and loading device of claim 2, **characterised in that** the edge of the locking device (11) is movable to either side of the edge of the gripping unit (7) to fix the edge of a refuse container between the gripping unit and locking device regardless of whether the refuse container is on the right or left side of a refuse collection truck.
11. The lifting and loading device of claim 1, **characterised in that** the lifting and loading mechanism includes a flexible support (13) to limit the movement

of refuse containers (4) in their emptying phase.

12. The lifting and loading device of claim 1, **characterised in that** the lifting and loading mechanism includes a refuse hatch equipped with a double door with springs, located in the upper part of the body of refuse collection trucks to limit the movement of refuse containers (4) in their emptying phase.

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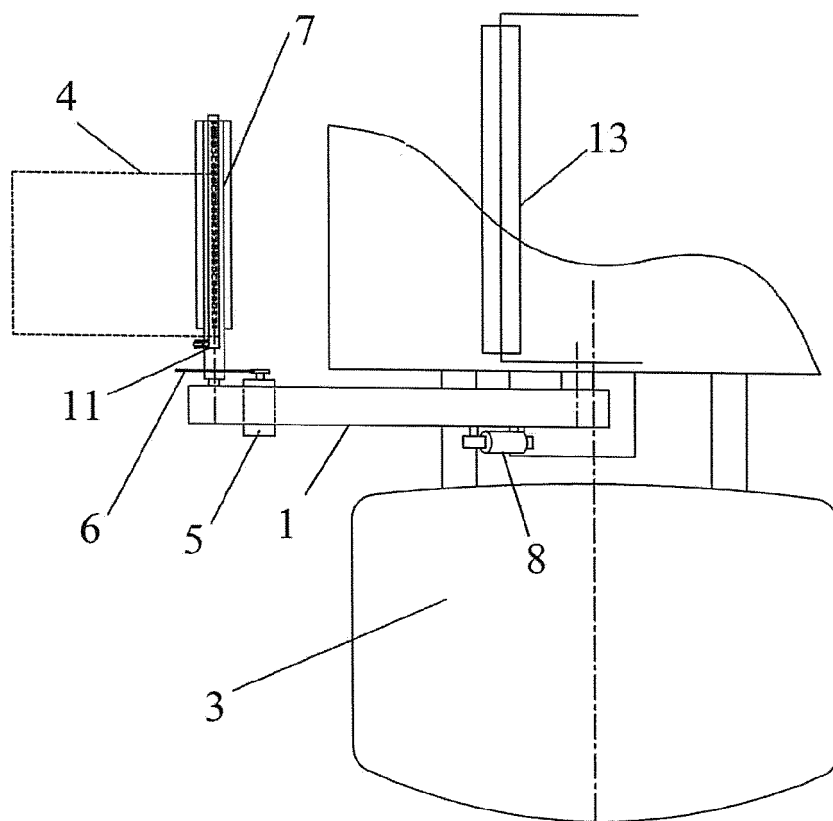
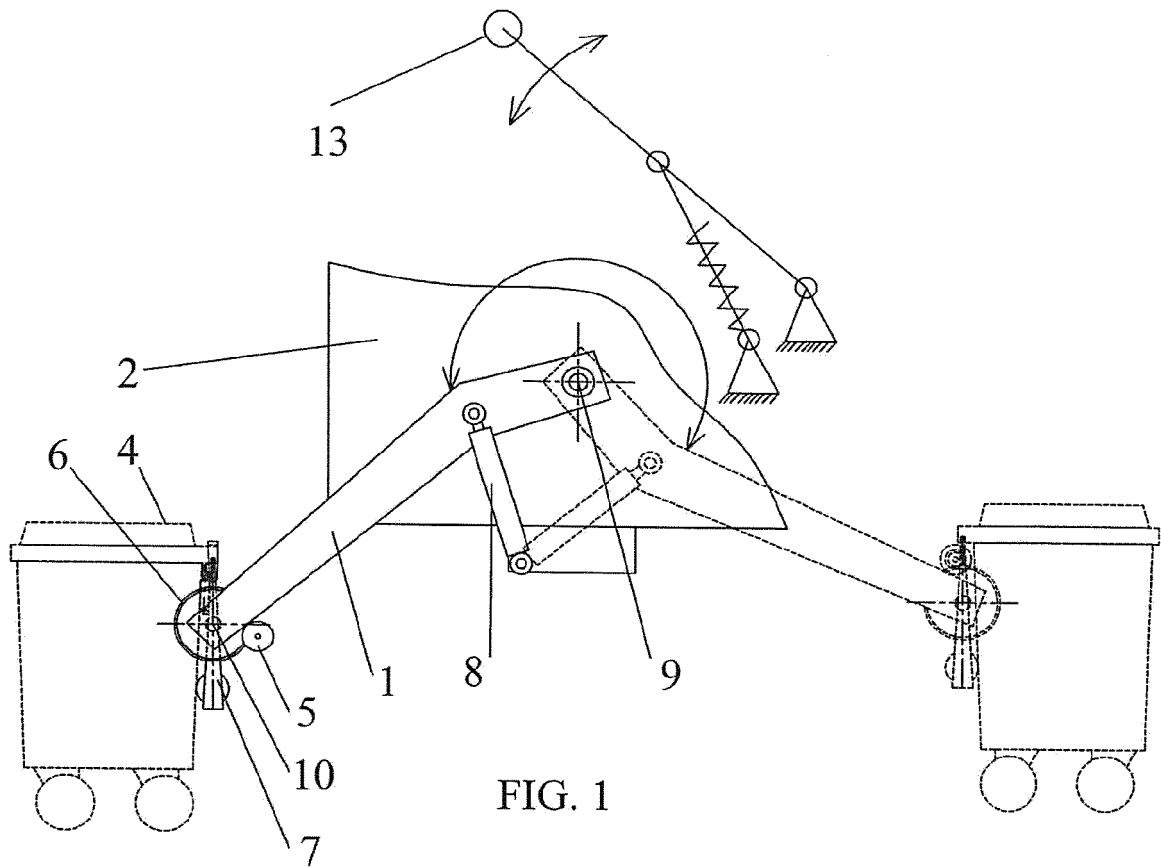
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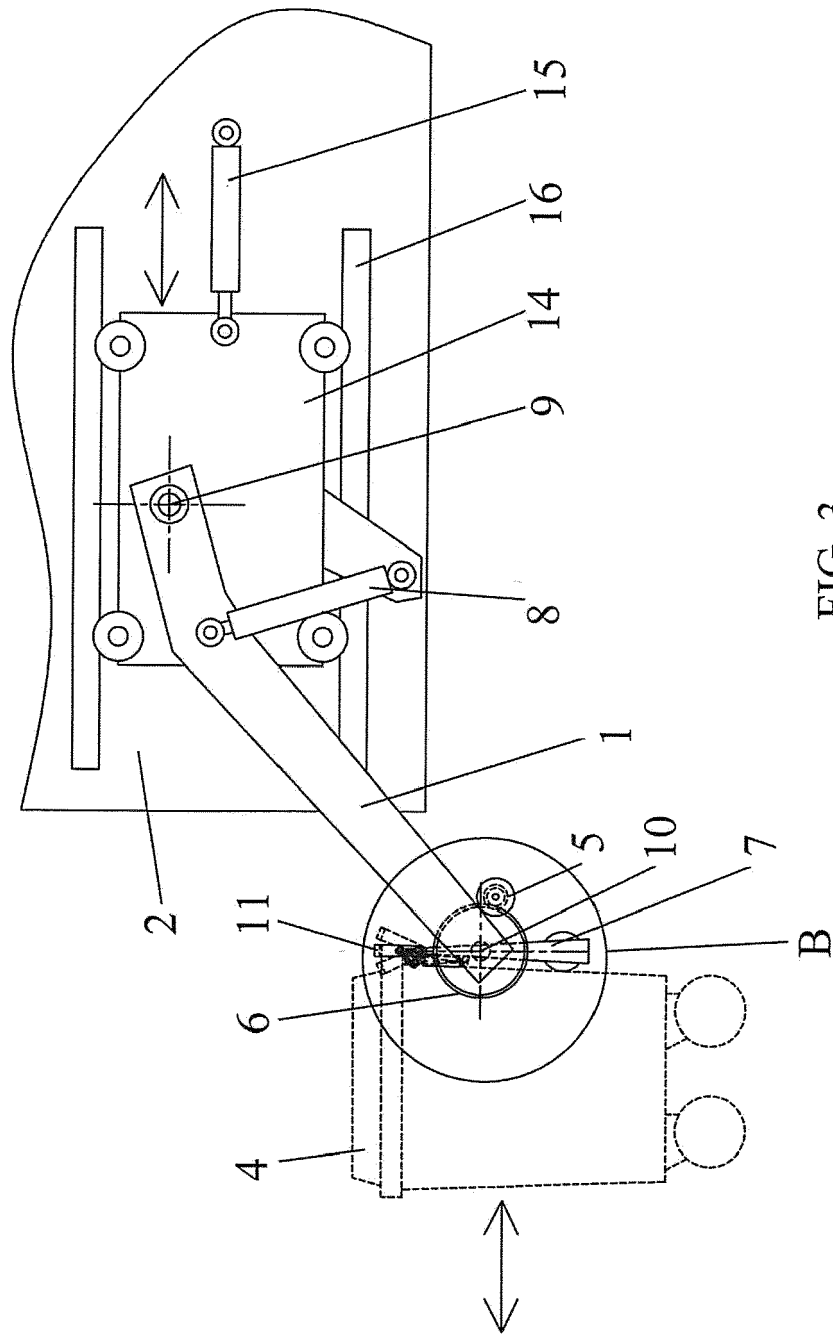
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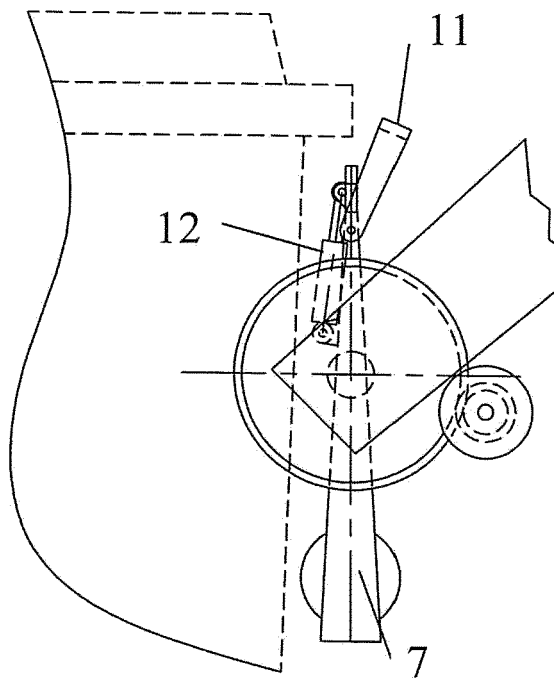


FIG. 4A

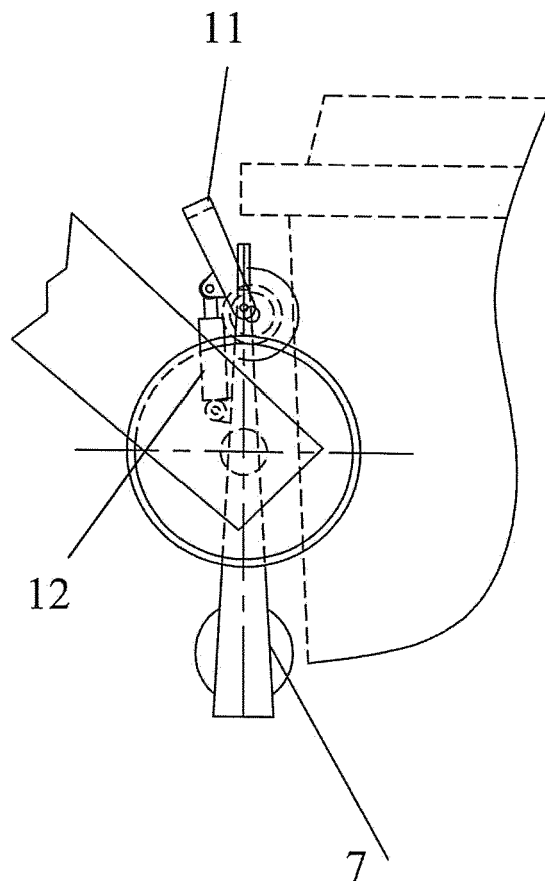


FIG. 4B

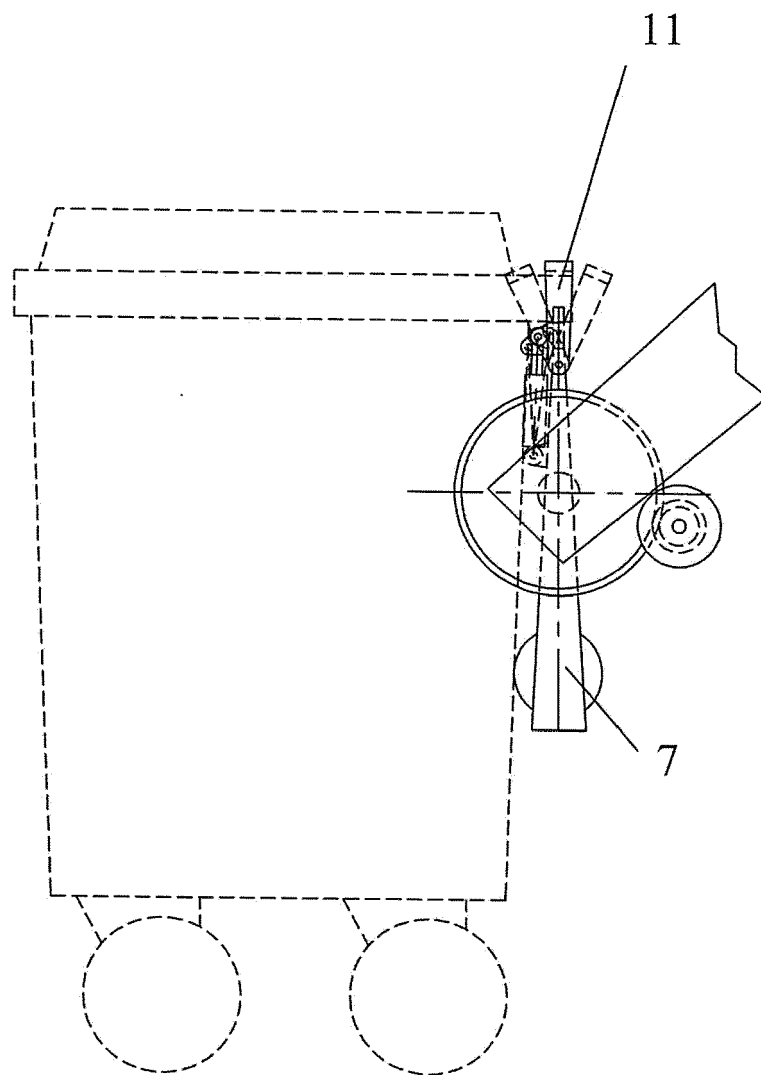


FIG. 4C

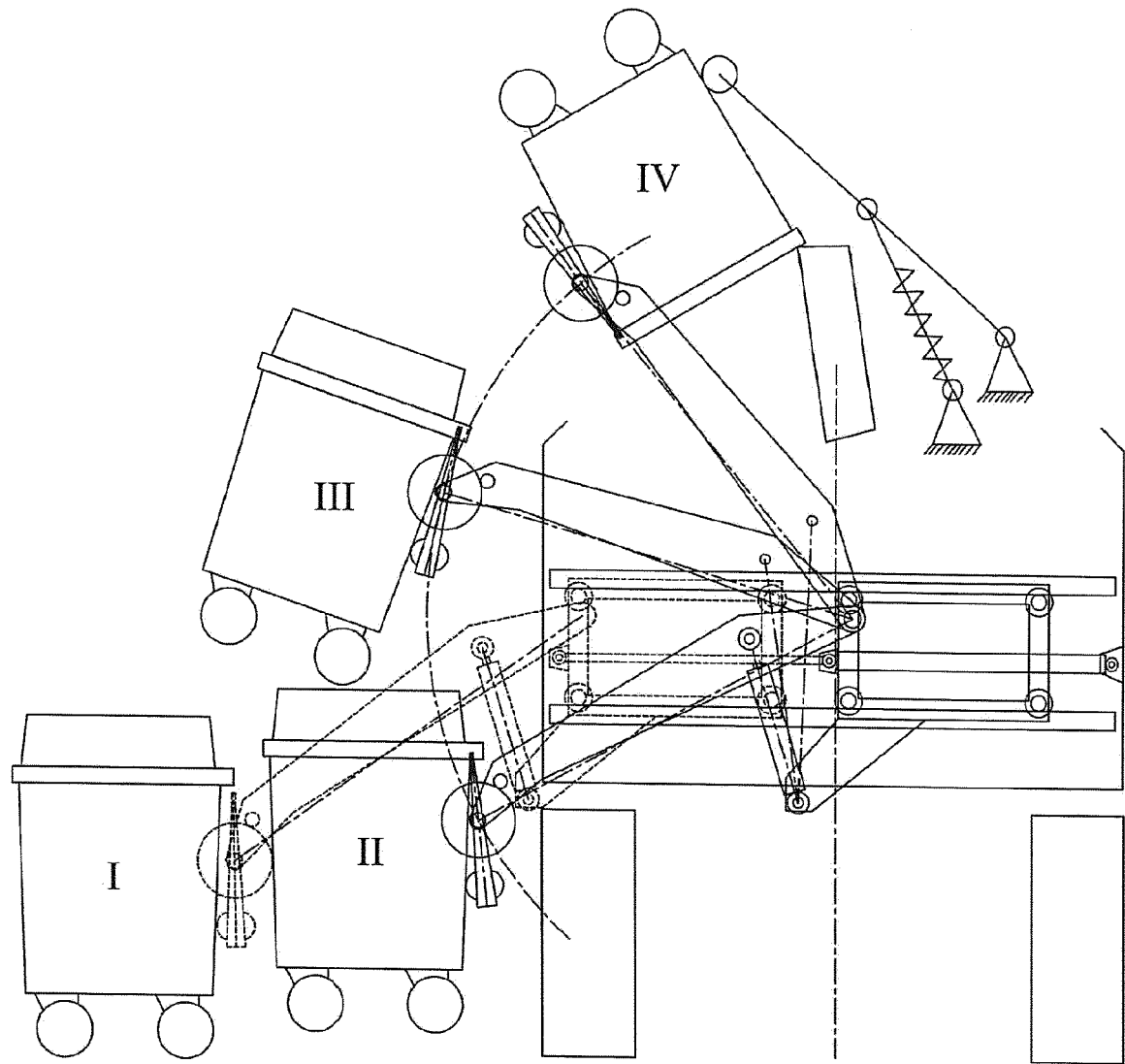


FIG.5

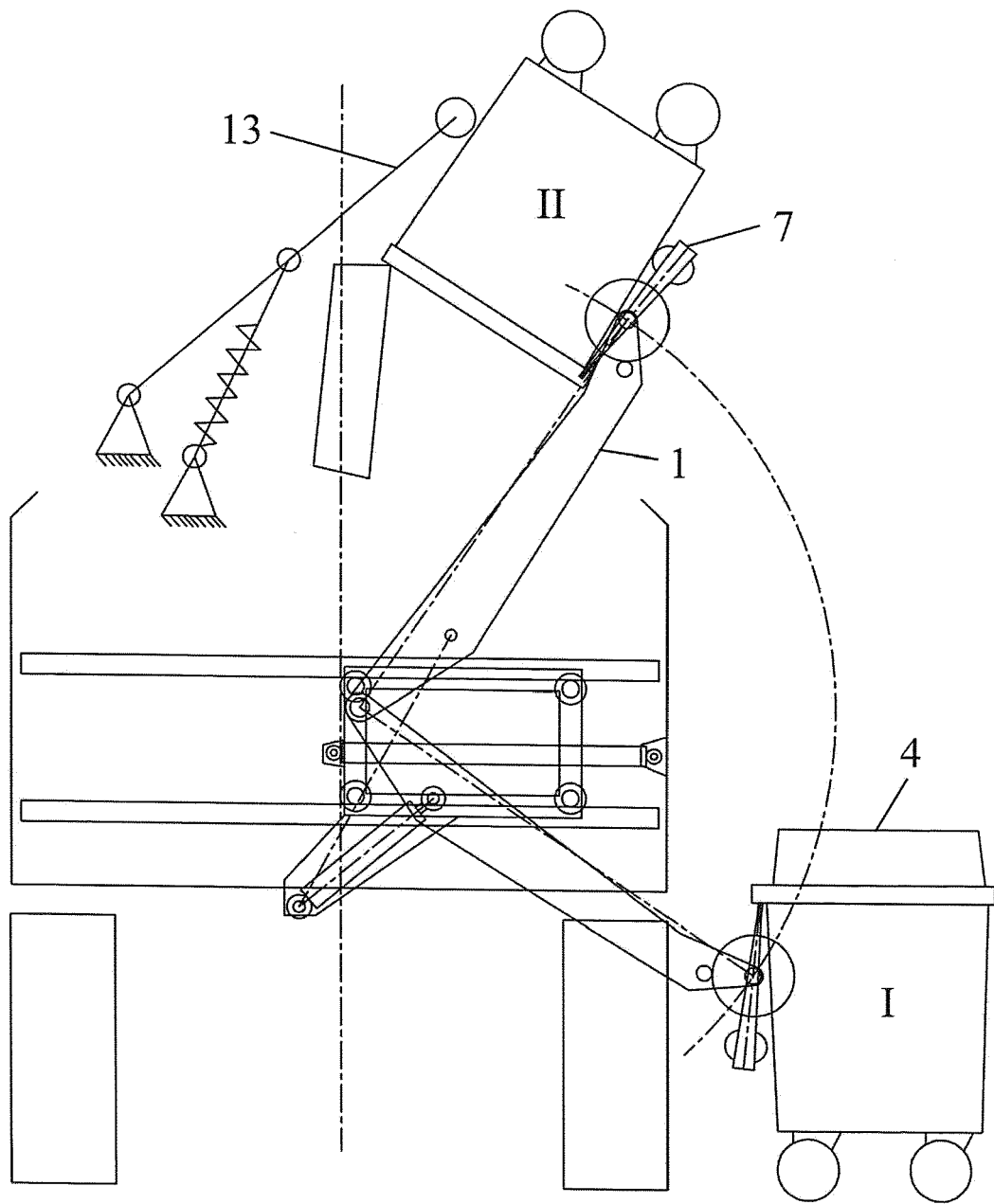


FIG. 6

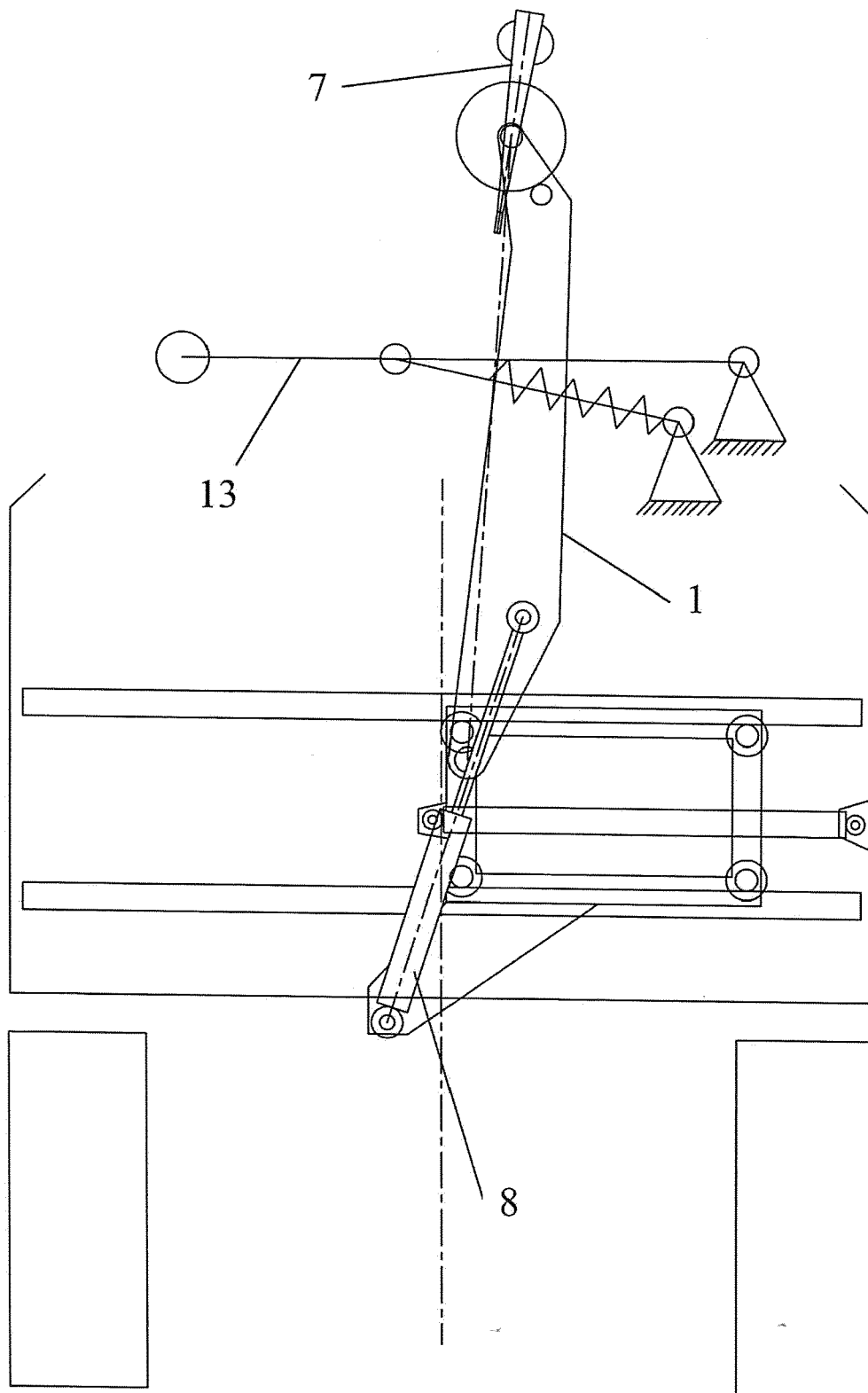


FIG. 7

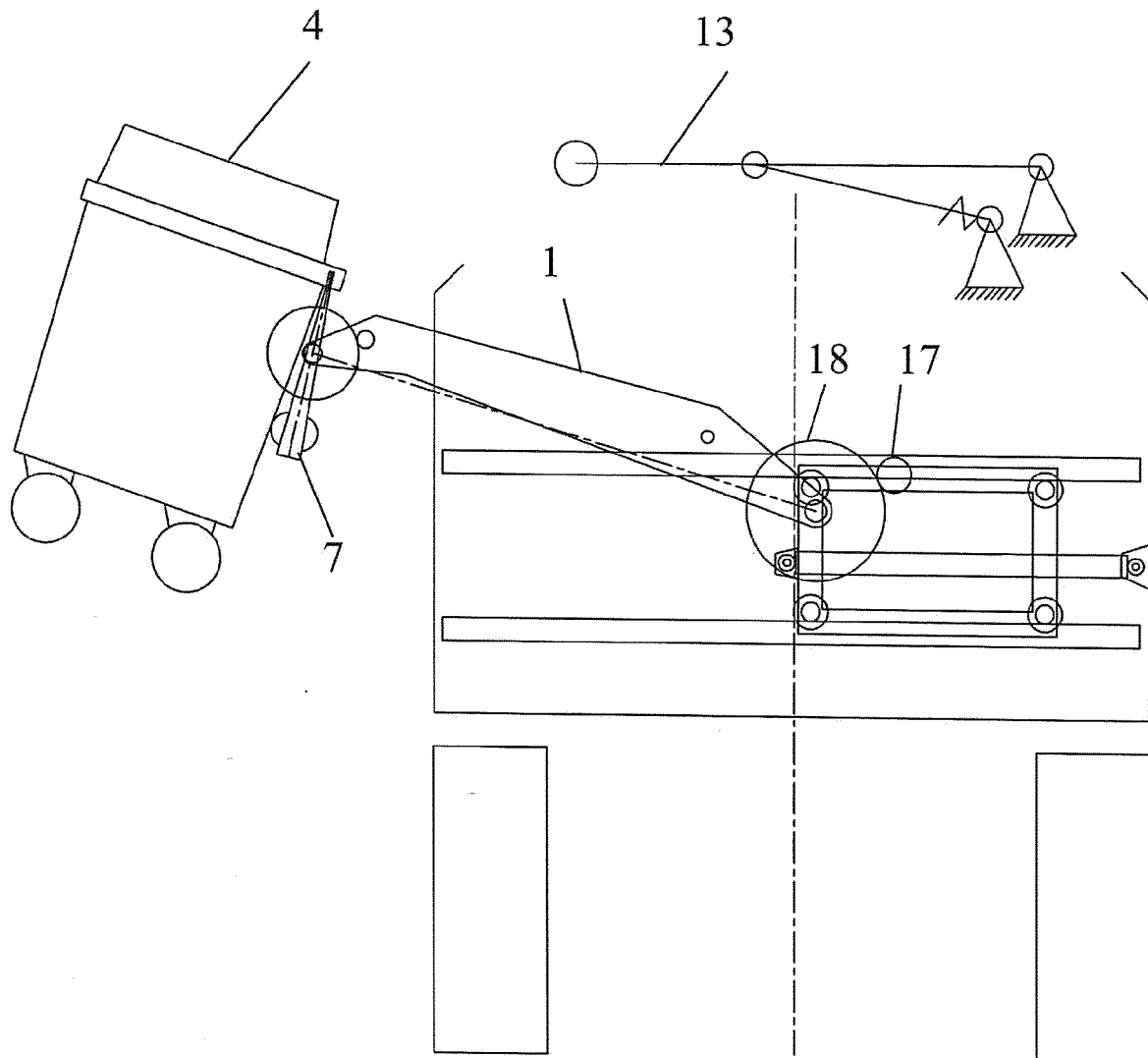


FIG. 8



EUROPEAN SEARCH REPORT

Application Number
EP 15 17 0008

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DOCUMENTS CONSIDERED TO BE RELEVANT			
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 5 October 2015	Examiner Pardo Torre, Ignacio
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	

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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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
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05-10-2015

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