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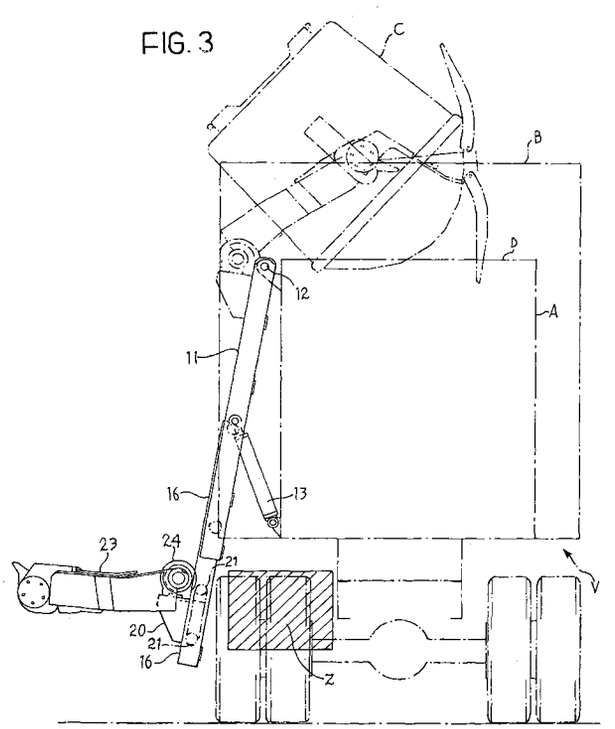
(54) An apparatus for lifting and tilting a refuse container

(57) A carriage (20) is slidable between a lowered position and a raised position along a guiding structure (11) to be mounted superiorly to a vehicle and rotatably in a vertical plane. A hydraulic cylinder (13) moves the guiding structure nearer to and farther from a side of the vehicle. Mounted on the carriage (20) are arms (23) for gripping and tilting a bin, and a hydraulic cylinder (24) for controlling the gripping and tilting movements of the arms (23). The guiding structure comprises a first guiding frame (11) mounted superiorly to the vehicle and rotatably in a vertical plane, and a second guiding frame (16) slidably mounted along the first frame between a lowered position and a raised position. The second frame forms guides (22) for sliding the carriage (20) along the second frame (16) between a raised position and a lowered position. The movement of the carriage along the second frame (16) and of this along the first frame is controlled by one or more hydraulic cylinders (25).

FIG. 3



EP 1 454 848 A1

Description

[0001] The present invention refers to a refuse container lifting and tilting apparatus to be mounted on a vehicle, particularly but not exclusively a refuse collection vehicle.

[0002] There are known refuse collection vehicles equipped with lateral loading apparatus for lifting refuse containers (or bins) picked up from a side of the vehicle and tilting them so as to empty the refuse out of the bin into a loading aperture obtained in the roof of the storage body of the vehicle.

[0003] For a better understanding of the state of the art and the problems inherent thereto, there will be at first described a loading apparatus of conventional type, shown in figures 27, 28 and 29 of the attached drawings.

[0004] With reference to figures 27-29, a lifting and tilting apparatus comprises a generally vertical frame 11 hinged at the top to a refuse collection vehicle V near a top loading aperture H. The frame 11 forms a pair of guides 14 along which a carriage 20 can slide, the carriage carrying a pair of pick-up arms 23 for hooking bins C and an actuator 24 for tilting the arms 23 with a bin C. The movement of the carriage along the guide is accomplished by a hydraulic cylinder 25, which is connected to the guide frame 11 and carries a pair of idle wheels 18 over which respective chains 19 pass, the ends of which are anchored to the frame 11 and the carriage 20. The extension and the withdrawal of the hydraulic cylinder 25 cause the carriage to move along the guide frame, by means of the chains 19, between a lowered position and a lifted position. A further hydraulic actuator (not shown) controls the extension and the withdrawal of a horizontal rod 13 that causes the frame 11 to swing between the vertical position of figure 27 and a position inclined laterally and outwardly for picking up a bin (figure 28). Apparatuses of this kind are known for example from EP-745 544 and EP-1 142 803.

[0005] In other known arrangements, the carriage is caused to move along the guides directly by a hydraulic cylinder interposed between the guides and the carriage (as shown for example in IT-1 262 500, US-4 872 801, GB-2 080 757), or by means of chains associated with motor driven gears (see, for example, US-5 049 026).

[0006] In the vertical or resting position, that is also the travelling position, the lower part of the frame 11 occupies a zone where usually accessories are mounted on the vehicle such as the fuel tank and the air tank. To move these accessories, which have to be relocated in other positions in the vehicle, is an expensive and complicated operation.

[0007] The object of the present invention is therefore to provide an apparatus of the type specified above, that may also be applicable to existing vehicles without requiring any modification to relocate the above mentioned accessories.

[0008] Another object of the invention is to provide an apparatus having an improved efficiency with respect to conventional ones, and particularly having a greater reach and manoeuvrability for picking up refuse containers.

[0009] These and other object and advantages, that will be better understood herein after, are attained according to the invention by an apparatus having the features defined in claim 1. Preferred embodiments of the invention are defined in the depending claims.

[0010] The constructional and functional features of a few preferred but not limiting embodiments of an apparatus according to the invention will now be described, reference being made to the accompanying drawings, in which:

Figures 1 to 4 are views showing schematically a sequence of movements of an apparatus according to the present invention, mounted on a refuse collection vehicle;

Figures 5 and 6 are front and side elevational views of first embodiment of the apparatus according to the invention in a raised or resting condition;

Figures 7 and 8 are a front view and a side elevational view of the apparatus of figures 5 and 6 in a lowered condition for picking up a bin;

Figures 9 and 10 are a front view and a side elevational view of a swingable frame being part of the apparatus of figures 5-8;

Figures 11 and 12 are a front view and a side elevational view of a frame slidable along the swingable frame of figures 9 and 10;

Figures 13 and 14 are a front view and a side elevational view of carriage slidable along the slidable frame of figures 11 and 12;

Figures 15 and 16 are a front view and a side elevational view of one of a pair of arms for picking up a bin carried by the carriage of figures 13 and 14;

Figures 17 and 18 are a front view and a side elevational view of a hydraulic actuator for controlling the motion of the pair of pick-up arms of figures 15 and 16;

Figures 19 and 20 are a front view and a side elevational view of a hydraulic actuating cylinder for controlling the sliding motion of the slidable frame of figures 11 and 12 and of the carriage of figures 13 and 14;

Figures 21 to 23 are elevational side views of a second embodiment of the apparatus according to the invention, shown in three different operational positions and mounted on a refuse collection vehicle;

Figures 24 and 25 are views schematically showing a sequence of movements of an apparatus according to the present invention mounted on a vehicle for washing refuse collection bins;

Figure 26 schematically shows an apparatus according to the invention mounted on a rotatable supporting member located on the roof of a vehicle for picking up bins for either side of the vehicle; and

Figures 27 to 29 show an apparatus of known kind

for picking up, lifting and tilting a refuse collection bin.

[0011] Referring initially to figures 1 to 4, a refuse collection vehicle is indicated V. The vehicle V comprises a front loading container A and a rear container or storage body B. A pressing device (of known kind and not shown) is fitted within the loading container A for pressing refuse into the rear storage body B. A first embodiment of a loading apparatus according to the invention for lifting and tilting refuse bins is indicated overall 10. In the examples shown in figures 1-23 and 26, the apparatus is intended to empty the content of a bin into an aperture (not shown) formed in the roof D of the front container A of a refuse collection vehicle. Naturally, reference to this possible field of use should not be interpreted as in any way limiting the scope of the patent. As a matter of fact, as shown in the examples of figures 24 and 25, the apparatus may advantageously be applied to vehicles or parts of a vehicle intended to wash bins already previously emptied.

[0012] The lifting and tilting apparatus 10 comprises a swingable guiding frame 11 hinged superiorly through horizontal pins 12 to the front loading container A of the vehicle at the level of the roof D. The frame 11 is capable of swinging in a transversal vertical plane by means of an actuating cylinder 13 (figure 4) interposed between the frame 11 and the vehicle for moving the frame from a vertical position, adjacent to the side wall of the vehicle (figure 1), to an operational gripping position in which the frame is inclined laterally towards the outside for picking up a bin C, according to the distance of the bin from the vehicle. In figure 4 the inclination of the frame 11 and the extension of the cylinder 13 are maximum for picking up a distant bin. In figure 3, the inclination of the frame and the extension of the cylinder are less, for gripping a bin nearer to the vehicle.

[0013] Throughout the description and the claims, terms and expressions indicating positions and orientations are to be interpreted as referring to a condition mounted on board of the vehicle. The expression "inner side" indicates a side facing the centre-line of the vehicle and the expression "outer side" indicates a side facing a longitudinal side edge of the vehicle.

[0014] The swingable frame 11 (shown separately in figures 9 and 10) comprises two parallel guides 14 with a C-shaped cross section joined by transversal connecting bars 15. A sliding frame 16 (shown separately in figures 11 and 12) is slidable along the swingable frame 11 and is provided at its upper part with pairs of side wheels 17 (or sliding blocks or bearings or other low-friction sliding or rolling means) engaging the guides 14 of the swingable frame 11 (figures 6 and 8).

[0015] At its upper part, the sliding frame 16 is provided with a pair of side idle wheels 18 over which a respective pair of side chain 19 or other flexible transmission means are engaged. Each chain 19 is joined at first end 19a thereof to the lower part of the sliding frame 16, passes over one of the idle wheels 18 and is secured at a second end 19b to a carriage 20. The carriage 20 shown separately in figures 13 and 14 has pairs of idle wheels 21 engaging parallel guides 22 of the sliding frame 16. Mounted on the carriage 20 is a pair of pivoting arms 23 (figures 15 and 16) for gripping a bin, and a hydraulic actuator 24 (figures 17 and 18) for controlling the simultaneous rotation of the gripping arms 23 in two vertical transversal planes and varying the longitudinal distance between the two gripping arms. The constructional and operational features of either the gripping arms 23 as well as the actuator 24 (which may be of any known kind) are not *per se* relevant to the understanding of the invention and will not therefore be described in detail herein. Preferably, the actuator 24 is a helical actuator of the type described, for example, in EP-0 745 544.

[0016] The movement of the carriage along the guides 22 of the sliding frame 16 and the simultaneous movement of the sliding frame along the guides 14 of the swingable frame 11 is controlled by a hydraulic cylinder 25 (figures 19 and 20) interposed between the swingable frame and the sliding frame and located centrally between the guides and the chains. In order to reduce vibration during the bin-gripping step, the hydraulic cylinder 25 is preferably connected to the top part of the swingable frame 11 and the bottom part of the sliding frame 16 at 26. The fixing of the chains 19 to the sliding frame 16 is accomplished by two chain tightening devices 27 shown more clearly in figure 10.

[0017] In passing from the fully extended position of cylinder 25, where the carriage and the gripping arms are in a lowered position (figures 7 and 8), to the fully retracted condition of figures 5 and 6, where the carriage and the gripping arms are raised high, the sliding frame pulls the carriage 20 upwards through the chains 19. The extension of the cylinder 25 causes the reverse movement of the sliding frame 16 and the carriage 20. As will be apparent, by virtue of the above arrangement, the stroke of the carriage 20 with respect to the swingable frame 11 is twice the stroke of the carriage with respect to the sliding frame 16 (and the stroke of the sliding frame with respect to the swingable frame 11, which corresponds to the stroke of the actuating cylinder 25).

[0018] It will be appreciated that in the raised resting or travelling condition shown in figure 1, the apparatus according to the invention does not protrude noticeably underneath the loading container A, and therefore does not interfere with the zone Z (figure 3) generally intended to accommodated accessories for the vehicle such as a fuel tank, an air tank, etc., and is so applicable to standard vehicles without requiring these accessories to be relocated in different places.

[0019] Above all it will be noted that, as compared to a conventional apparatus of the kind shown in figures 27-29, the coupling here termed "telescopic" of the swingable and sliding frames 11, 16 determines a greater range of motion and allows to pick up bins C located

further away and/or at lower points with respect to the vehicle, and therefore improves the efficiency of the vehicle on which the apparatus is mounted.

[0020] In figures 21-23 there is illustrated a second embodiment of the apparatus according to the invention. In this variant, the carriage and the sliding frame can be moved independently of one another. The movement of the sliding frame along the guides of the swingable frame is controlled by a pair of lateral hydraulic cylinders 25a connected to the upper end of the swingable frame 11 and the lower end of the sliding frame 16. Mounted centrally on the sliding frame is a further actuating cylinder 25b that serves to control the movements of the carriage 20 along the guides of the sliding frames. The actuating cylinder 25b is fixed inferiorly at 26 to the lower part of the sliding frame. At its upper part, the actuating cylinder 25b carries a pair of lateral idle wheels 18b over which a respective pair of side chains 29 is engaged. Each chain is joined at one end to the carriage 20, passes over one of the idle wheels and is secured to a second end of the sliding frame 16.

[0021] In passing from the resting position of figure 21, the sliding frame 16 and the carriage 20 are in their uppermost positions. The side actuating cylinders 25a are completely retracted, whereas the central actuating cylinder is extended. In figure 22 the sliding frame is still at its uppermost position whereas the carriage 20 with the arms 23 has been lowered along the sliding frame 16 by withdrawing the central cylinder 25b. In the gripping condition of figure 23 the side actuating cylinders 25a have been extended so as to lower the sliding frame 16 along the swingable frame 11, and the central actuating cylinder 25b is retracted, whereby the arms 23 are in the lowest position possible for gripping a bin. The actuators 25a and 25b can be driven in coordinate manner to control the lowering and rising steps of the carriage, according to requirements.

[0022] The lifting and tilting apparatus according to the invention can be advantageously applied also to vehicles not exclusively intended for refuse collection, as for shown for example in figures 24 and 25, where the vehicle V has a compartment E for washing bins with a cover F that can be opened and spraying heads G for delivering washing jets.

[0023] With reference finally to figure 26, the apparatus according to the invention can be mounted on a supporting structure rotatable in a horizontal plane so as to bring the apparatus 10 alternately to two opposite sides of the vehicle for picking up bins indifferently located on the left or right hand side of a street. In the example of figure 26 the apparatus 10 is secured to a truncated cone hopper 30 rotatably mounted on a thrust bearing 31 fixed on the roof of the front container A to convey therein refuse from a bin (not shown in figure 26) tilted above the hopper 30.

[0024] It is to be understood that the invention is not limited to the embodiments herein described and shown which are to be considered as implementing examples of an apparatus for gripping, lifting and tilting a refuse bin. Rather, the invention may undergo modifications as to the shape and location of parts, and constructional and functional details. Particularly, the actuating members that control the movement of the carriage and the sliding frame may be arranged and located differently from what is shown by way of not limiting example in the drawings. For example, hydraulic, pneumatic, electromechanical, etc., actuating systems may indifferently be used. Furthermore, actuating means such as the cylinder 13, that control the oscillation of the frame 11 and all the elements supported directly or indirectly by this, may be arranged differently from what it shown in the drawings.

Claims

1. An apparatus for lifting and tilting a refuse bin (C), intended to be mounted on a vehicle (V), the apparatus (10) comprising:

   a guiding structure (11) to be mounted superiorly to the vehicle and rotatably in a vertical plane;
   actuator means (13) for moving the guiding structure angularly in said vertical plane nearer to and farther from a side of the vehicle between a position near a vertical side of the vehicle and a position inclined downwardly and towards the outside with respect to said side;
   a carriage (20) slidable along said guiding structure between a lowered position and a raised position;
   actuator means (25) for controlling the sliding movement of the carriage along said guiding structure;
   a pair of parallel arms (23) for gripping and tilting a bin, the arms being mounted on said carriage;
   actuator means (24) mounted on said carriage for controlling the gripping and tilting movements of the arms (23);

   characterized in that the guiding structure comprises

   a first guiding frame (11) to be mounted superiorly to the vehicle and rotatably in a vertical plane and

   a second guiding frame (16) slidably mounted along the first frame between a lowered position and a raised position and forming guide means (22) for allowing the carriage (20) to slide along the second frame (16) between a raised position and a lowered position.

2. An apparatus according to claim 1, **characterized in that** the actuating means for the sliding move-

ment of the carriage comprise

at least one actuating cylinder (25) connected superiorly to the first guiding frame (11), and inferiorly to the second guiding frame (16) and

flexible transmission means (19) having opposite ends respectively anchored to the carriage (20) and the second frame (16) and passing over idle wheel means (18) fitted on the second frame.

3. An apparatus according to claim 2, **characterized in that** said actuating cylinder (25) is connected to the high part of the first frame (11) and the low part (26) of the second sliding frame (16).

4. An apparatus according to claim 2 or 3, **characterized in that** the means for actuating the sliding movement comprise a single actuating cylinder (25) located at an essentially central position between the guides of the first frame (14, 11) and the second frame (22, 16).

5. An apparatus according to claim 1, **characterized in that** the means for actuating the sliding movement of the carriage comprise

first actuator means (25a) for controlling the sliding movement of the second frame (16) with respect to the first frame (11) and

second actuator means (25b), independent of the first actuator means (25a), for controlling the sliding movement of the carriage (20) along the second sliding frame (16).

6. An apparatus according to claim 5, **characterized in that**

the first actuator means comprise at least one actuating cylinder (25a) connected superiorly to the first guiding frame (11) and inferiorly to the second guiding frame (16), and that

the second actuator means comprise at least a second actuating cylinder (25b) mounted inferiorly onto the second sliding guiding frame (16) and having superiorly idle wheel means (18b) over which flexible transmission means (29) pass, the flexible transmission means having opposite ends anchored to the carriage (20) and the second sliding frame (16), respectively.

7. An apparatus according to claim 5 or 6, **characterized in that** the first actuator means for controlling the sliding movement of the second frame (16) comprise a pair of actuating cylinders (25a) located symmetrically at the sides of the guiding structure and each connected to the top part of the first frame (11) and the low part (26) of the second sliding frame (16).

8. An apparatus according to claim 5 or 6, **characterized in that** the second actuator means comprise a single actuating cylinder (25b) located at an essentially central position between the guides of the first frame (14, 11) and of the second frame (22, 16).

9. An apparatus according to claim 1, **characterized in that** two pairs of low friction engaging means (17) are engaged in the guides (14) of the first frame (11) and mounted on the upper part of the second frame (16).

10. An apparatus according to claim 9, **characterized in that** said low friction engagement means (17) are chosen from the group consisting of wheels, or rollers, or sliding blocks or bearings.

11. An apparatus according to any one of the preceding claims, **characterized in that** it is mounted on a refuse collection vehicle (V).

12. An apparatus according to any one of the preceding claims, **characterized in that** it is mounted on a vehicle arranged for washing refuse containers (C).

13. An apparatus according to claim 11 or 12, **characterized in that** it is mounted on a vehicle (V) through an interposed supporting structure (30, 31) rotatable in a horizontal plane for bringing the apparatus (10) alternatively to two opposite sides of the vehicle.

14. An apparatus according to claim 13, **characterized in that** it is secured to a hopper (30) rotatable on a thrust bearing (31) mounted on the roof (D) of a container (A) for conveying therein refuse from a bin (C) tilted above the upper (30).

FIG. 1

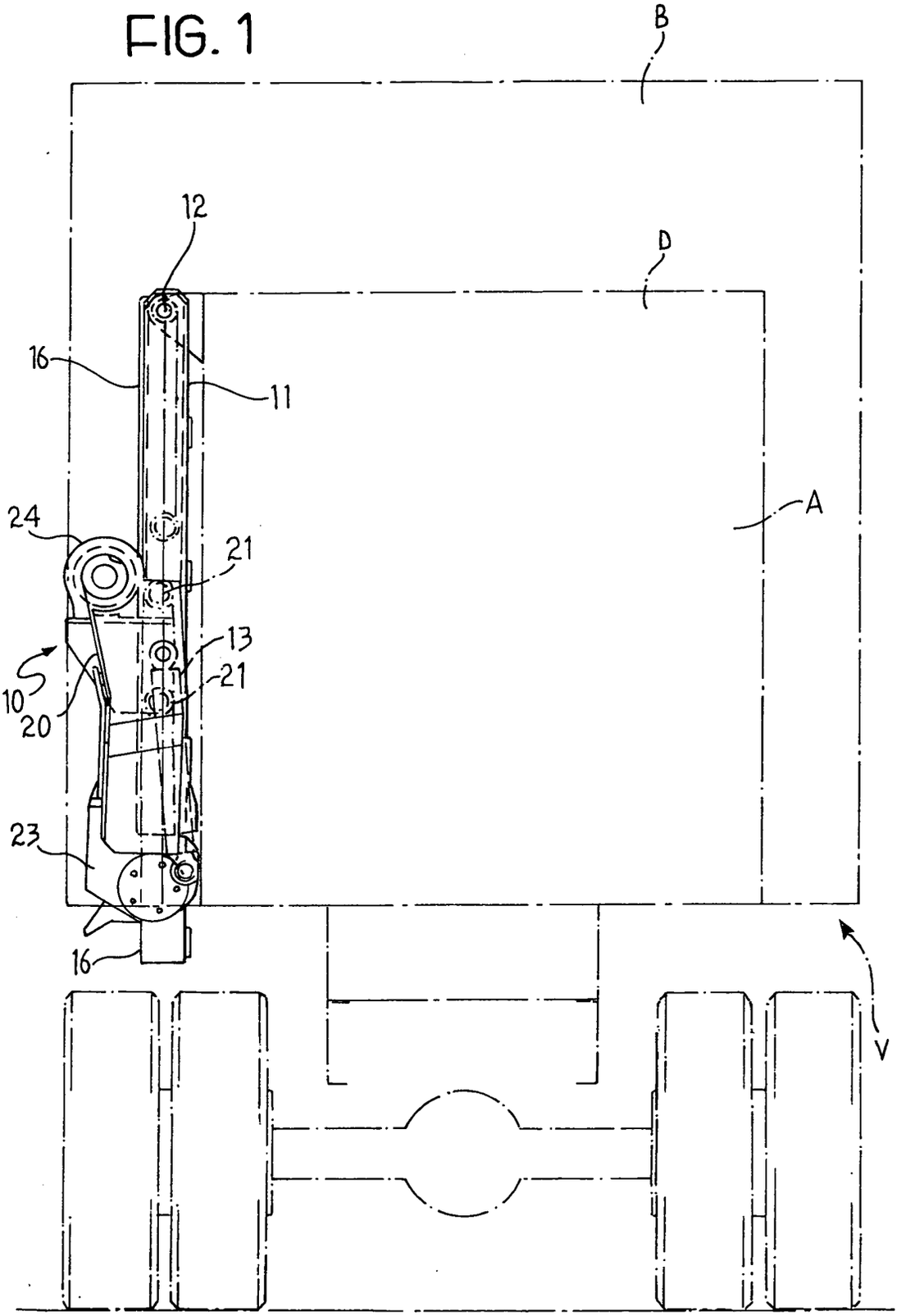


FIG. 2

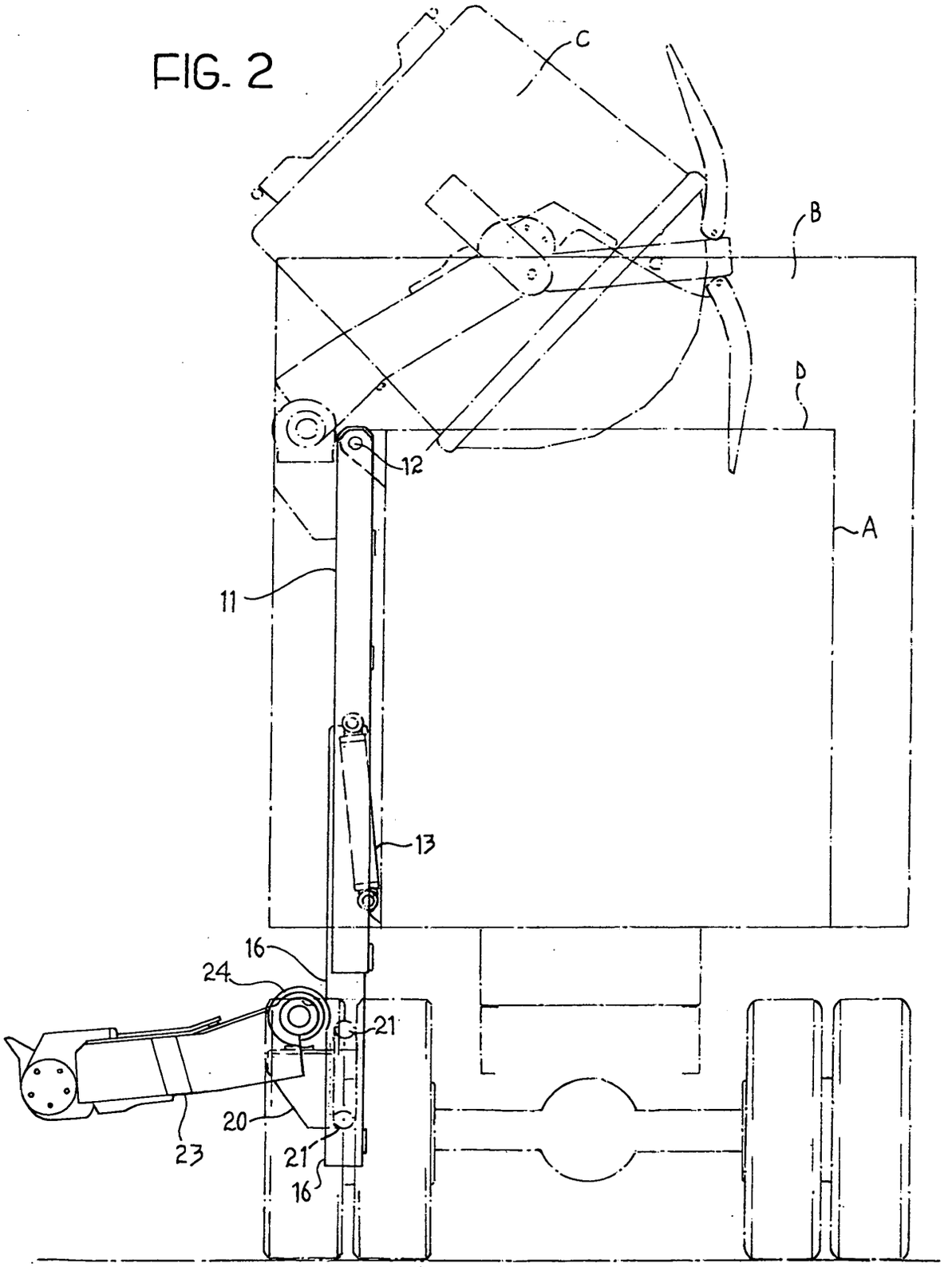
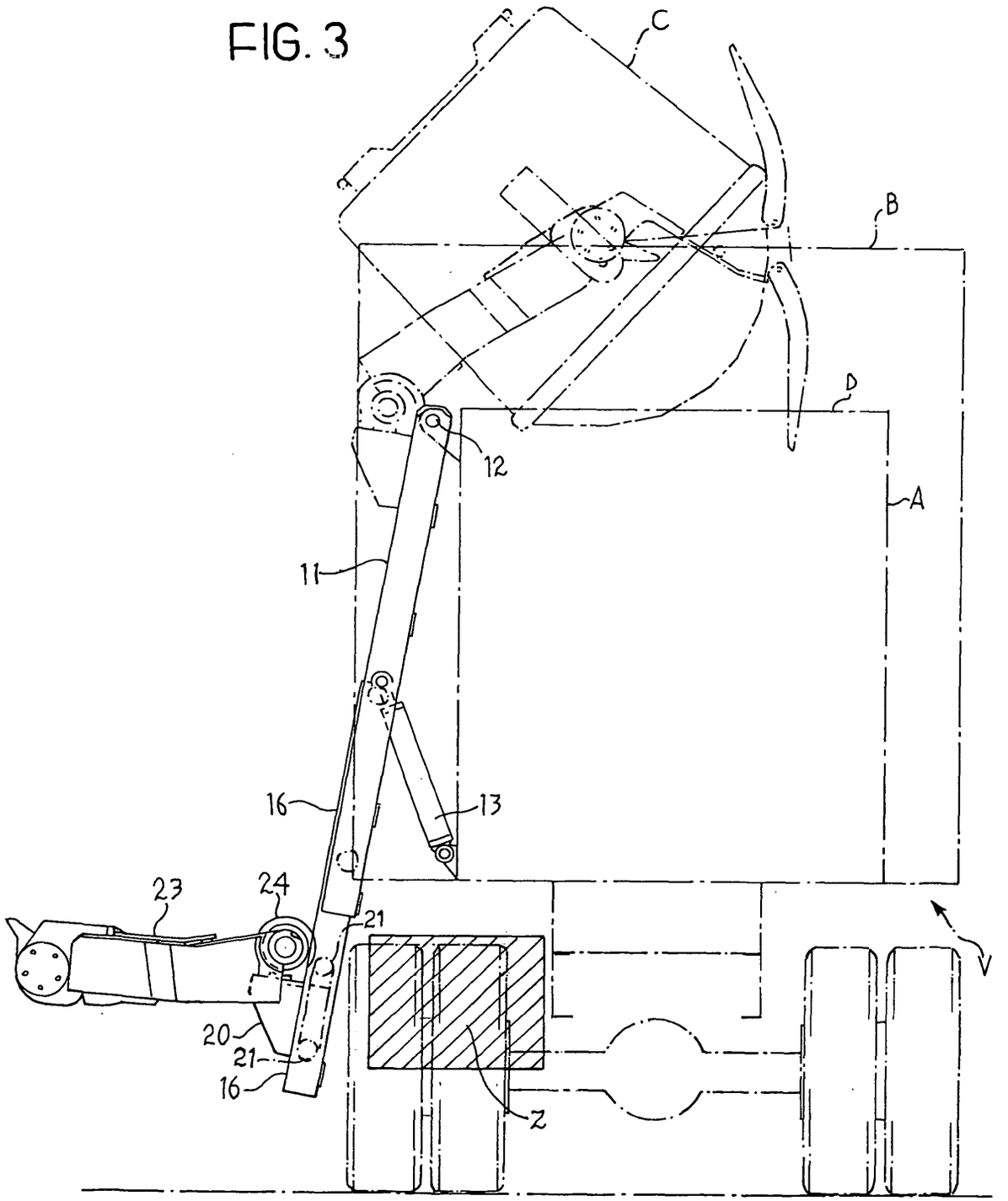


FIG. 3



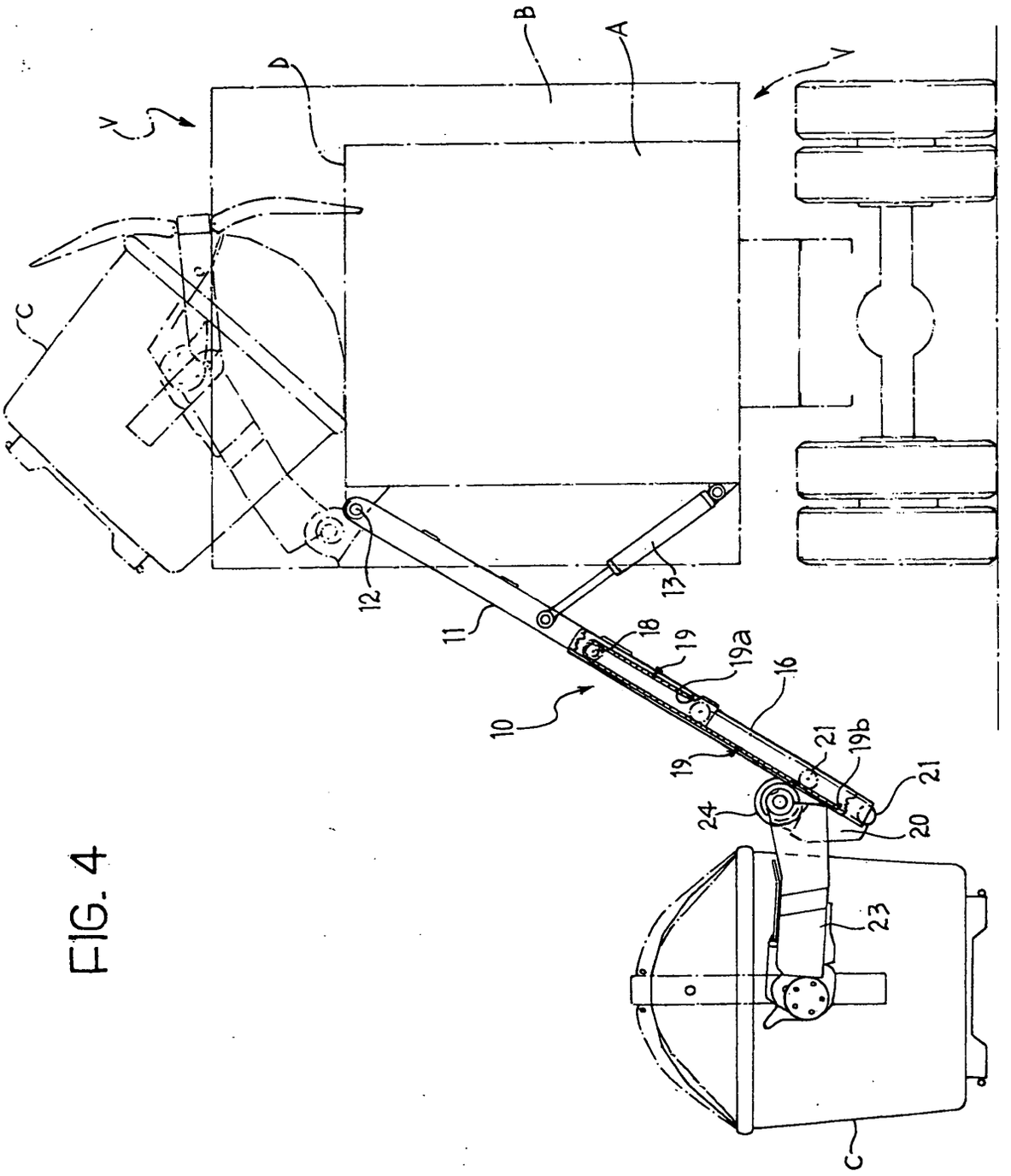


FIG. 4

FIG. 5

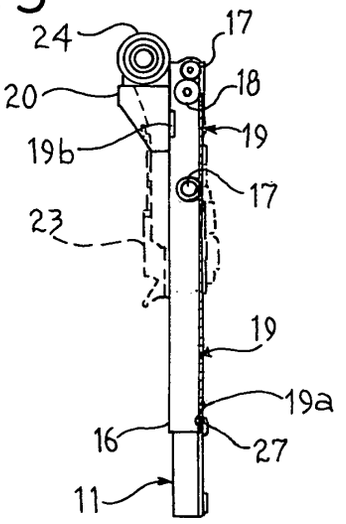


FIG. 6

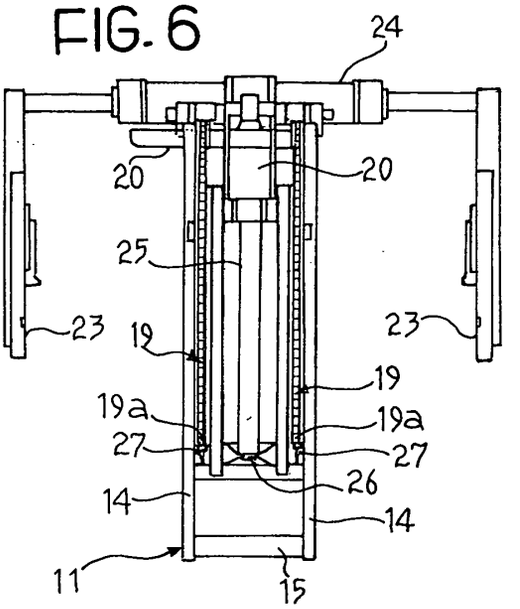


FIG. 7

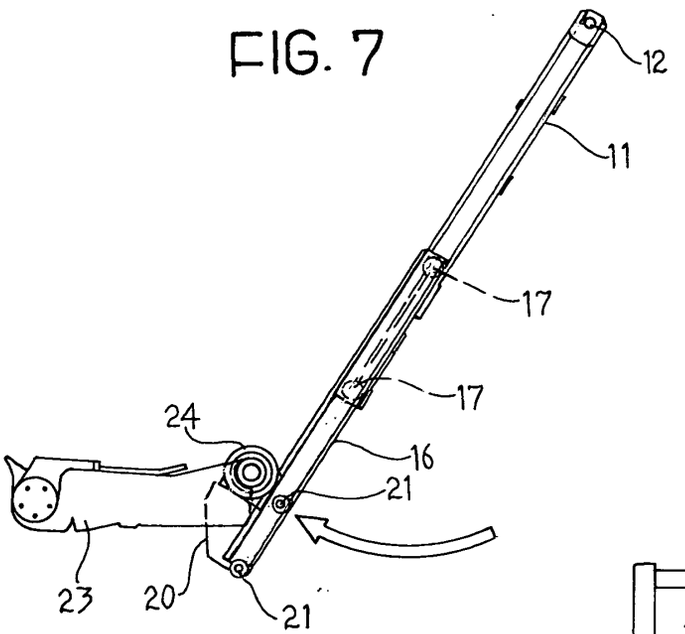


FIG. 8

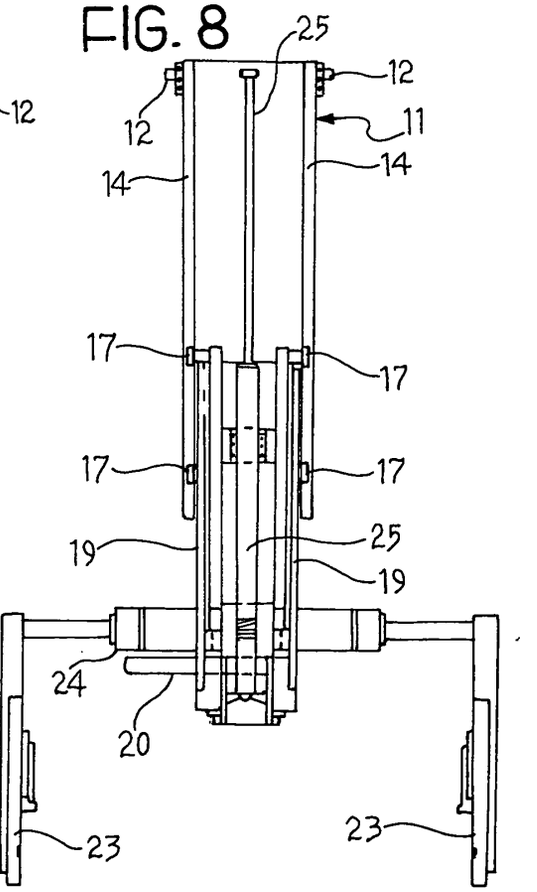


FIG. 9

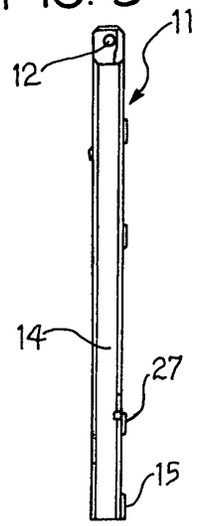


FIG. 10

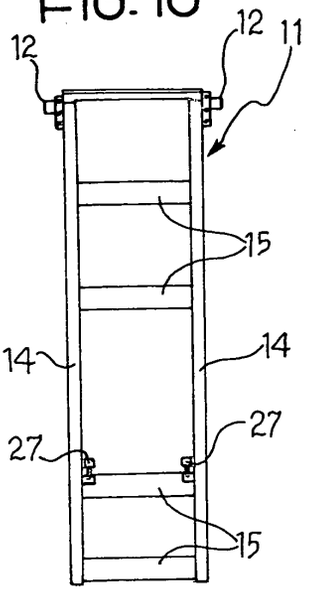


FIG. 11

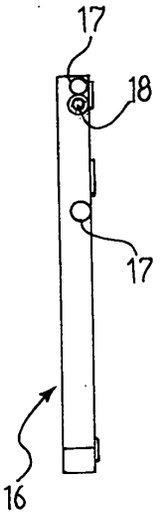


FIG. 12

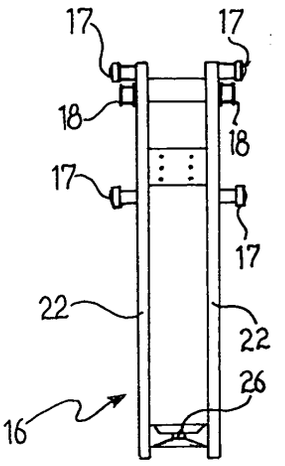


FIG. 13

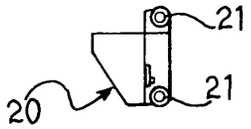


FIG. 14

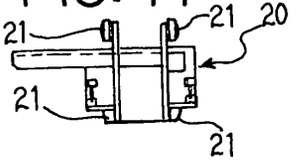


FIG. 15

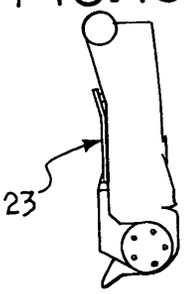


FIG. 16

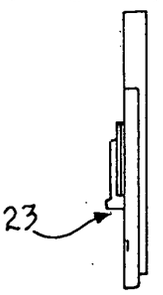


FIG. 17

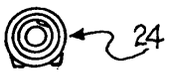


FIG. 18

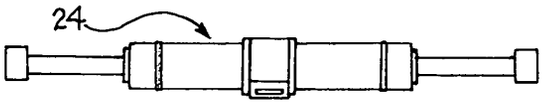


FIG. 19

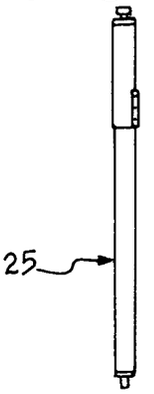


FIG. 20

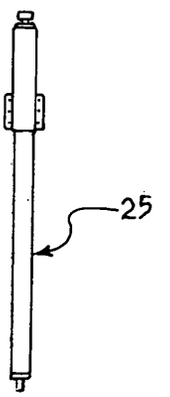


FIG. 21

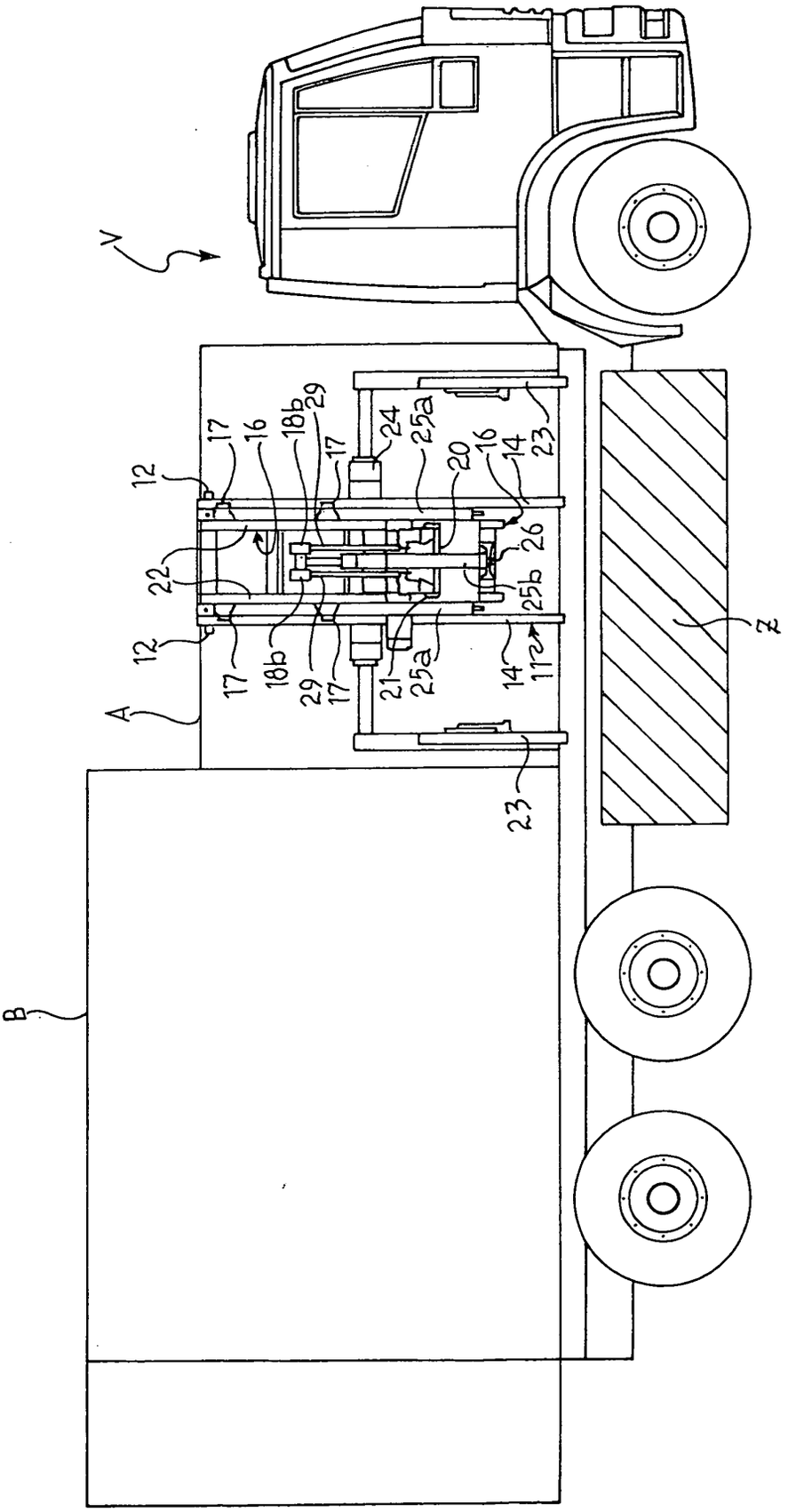
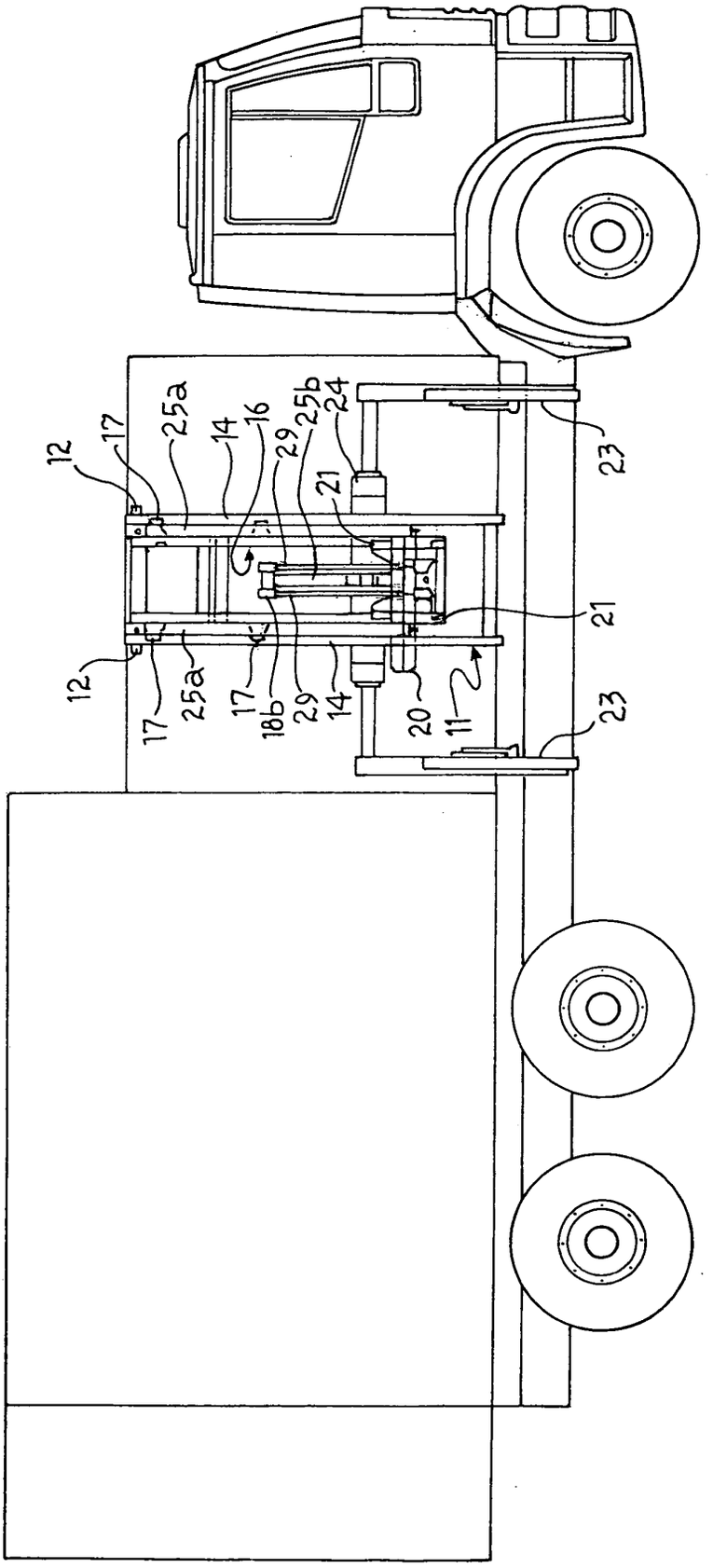


FIG. 22



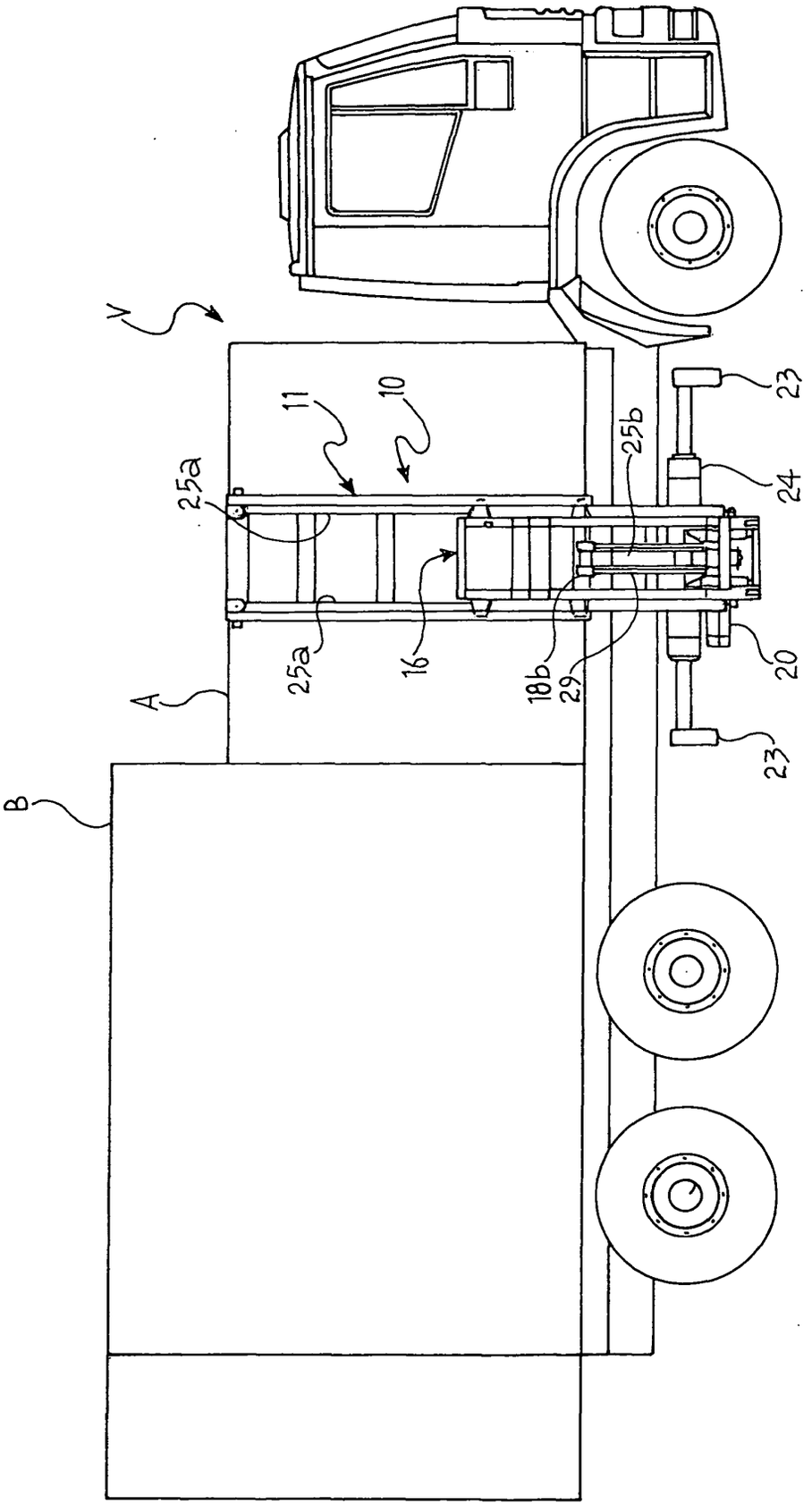


FIG. 23

FIG. 29 (PRIOR ART)

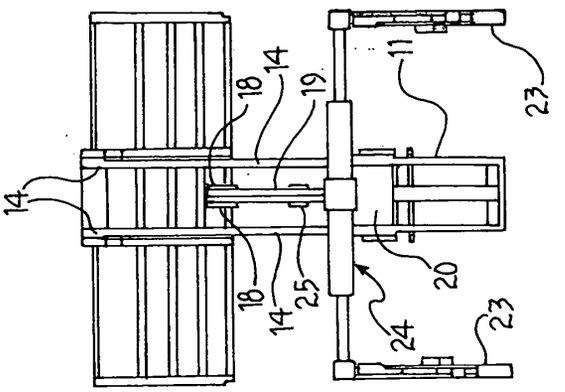


FIG. 25

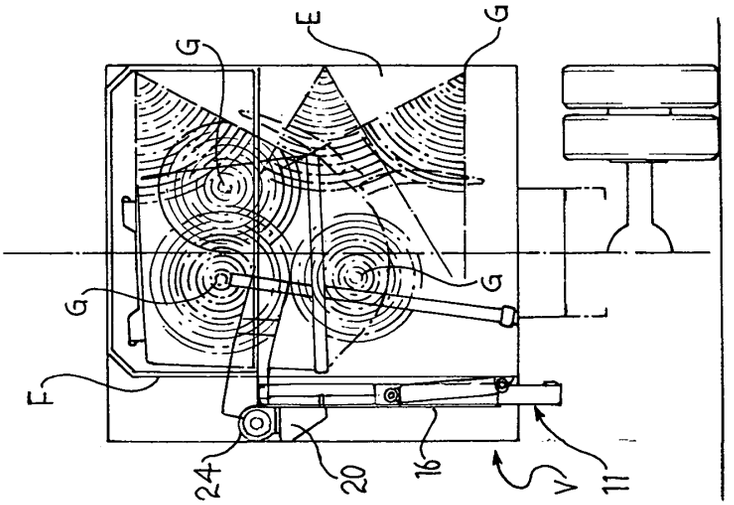


FIG. 24

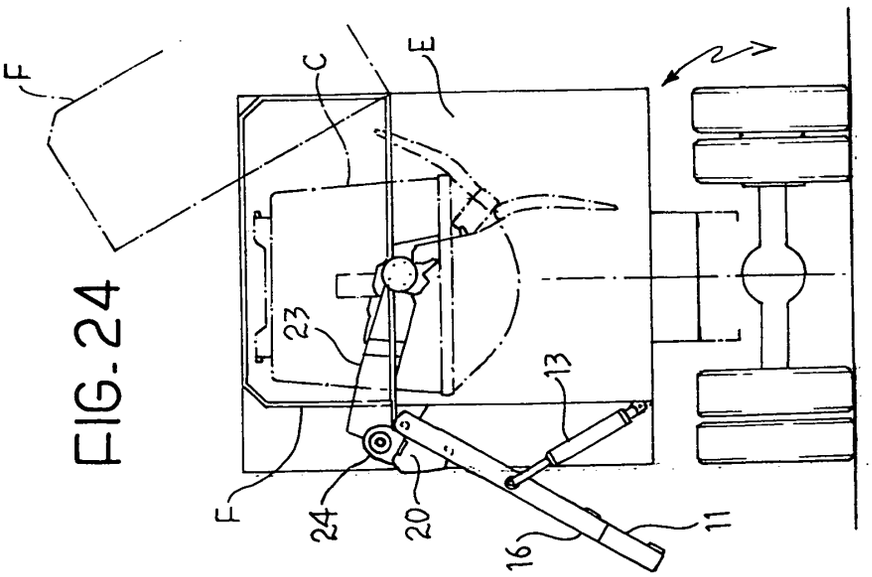


FIG. 26

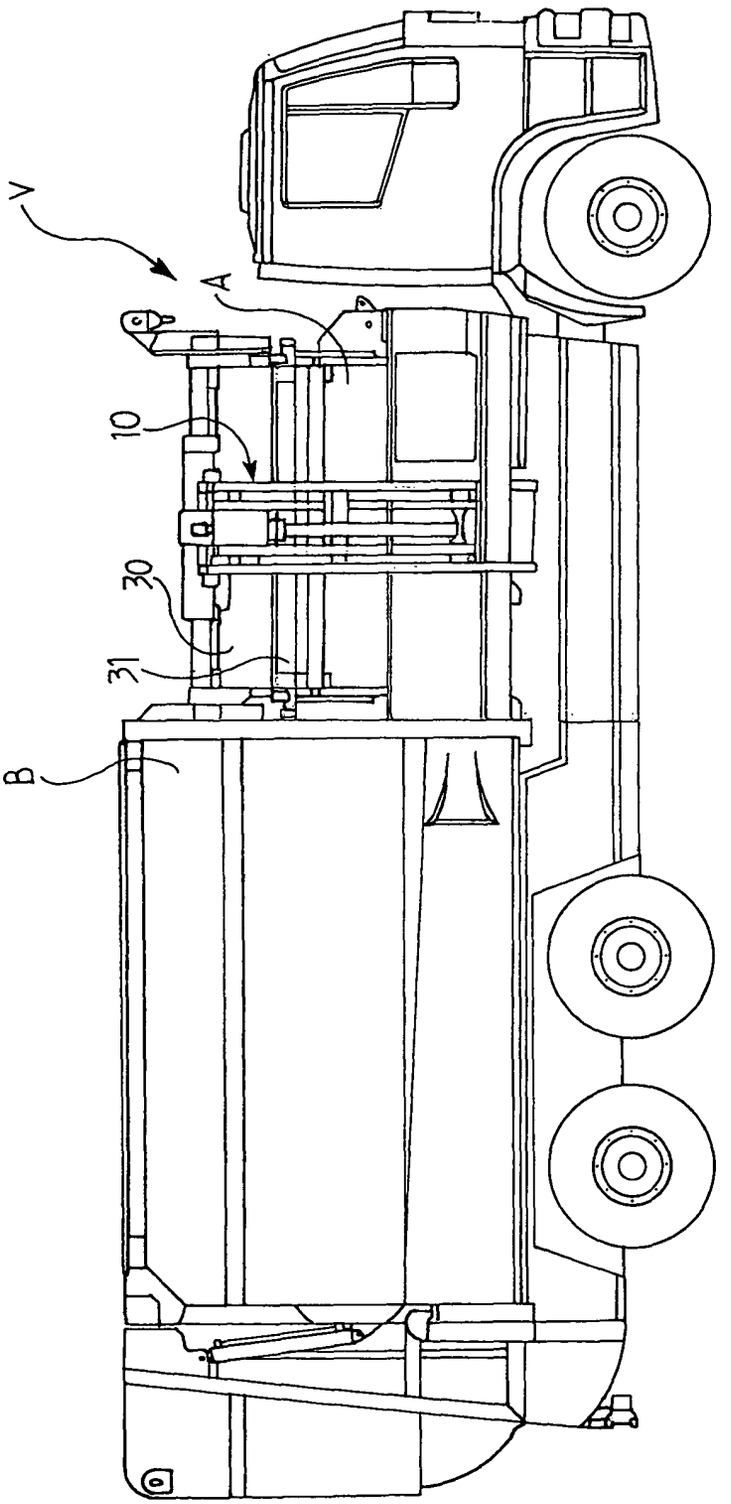


FIG. 27 (PRIOR ART)

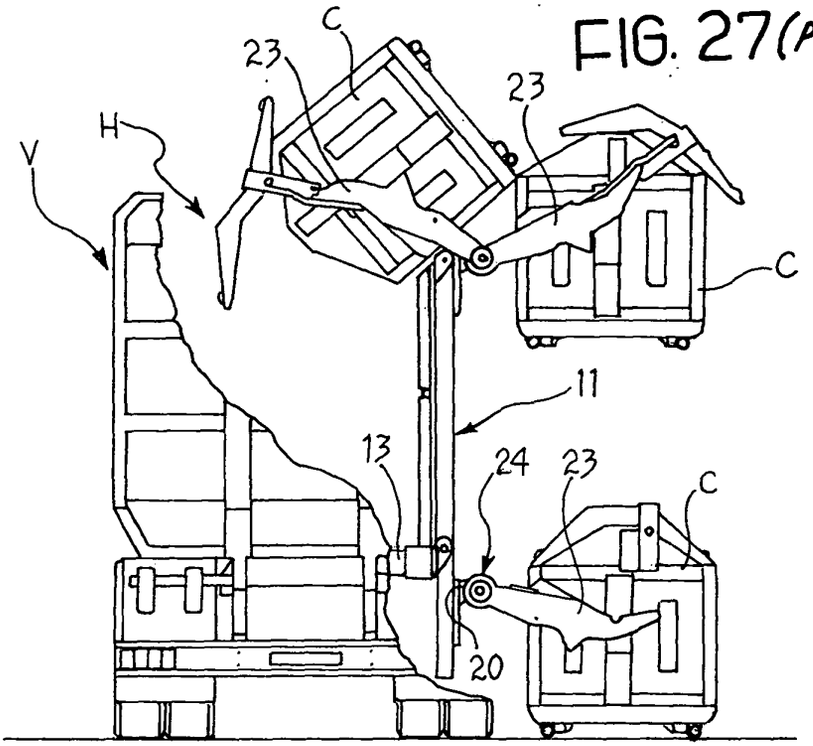
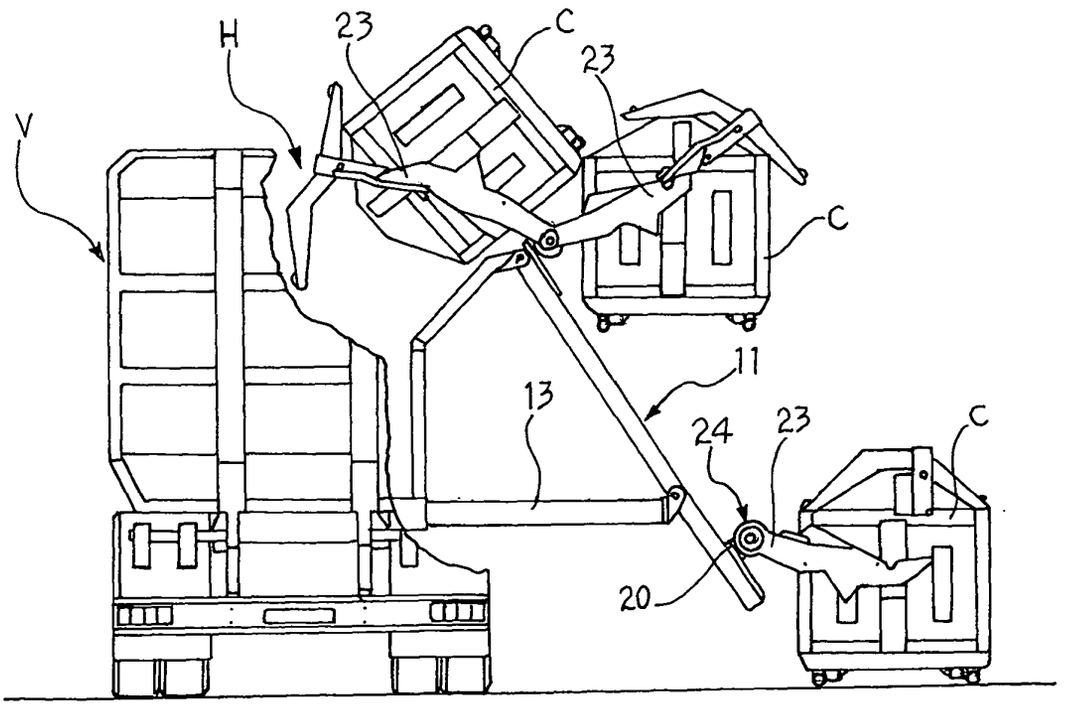


FIG. 28 (PRIOR ART)



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Place of search	Date of completion of the search	Examiner
The Hague	4 June 2004	Smolders, R

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