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(54) **LOADING SYSTEM FOR LIFTING AND EMPTYING A CONTAINER INTO A COLLECTOR, REFUSE TRUCK PROVIDED WITH SUCH A LOADING SYSTEM AND METHOD THEREFOR**

(57) information on abstract not available

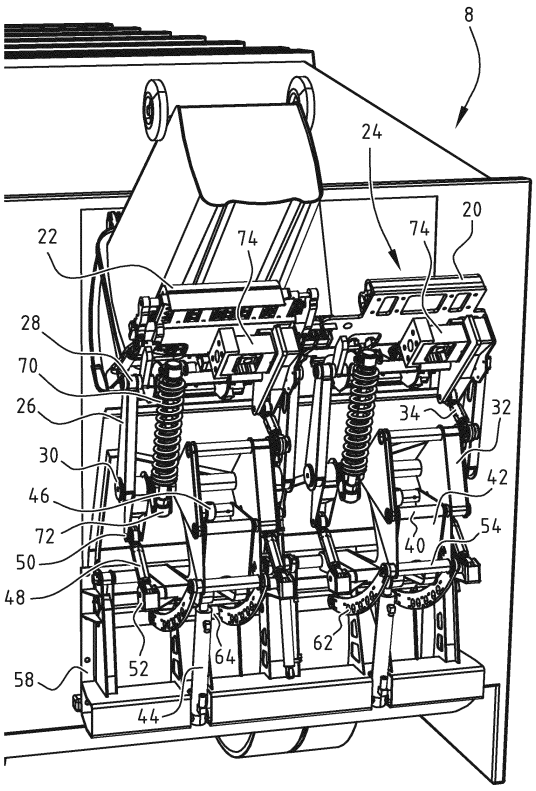

FIG. 1B

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Description

[0001] The present invention relates to a loading system for emptying a container, such as a refuse bin, into a collector. This relates particularly to a vehicle such as a refuse truck, whereby the contents of containers/bins are collected.

[0002] Known in practice are diverse loading systems. NL 2015999 thus shows a loading system provided with a lifting and tilting mechanism for performing a lifting movement and a tilting movement with a container for the purpose of emptying it into a collector.

[0003] A problem with known loading systems is providing sufficient flexibility for enabling diverse types of container to be handled, manual loading of refuse, and also enabling compatibility with different types of refuse truck in the case that the loading system is mounted thereon.

[0004] The present invention has for its object to provide a loading system whereby the above stated problems are obviated or at least reduced, such that inter alia a greater flexibility is obtained in respect of dimensions of containers which can be emptied into a collector.

[0005] This object is achieved with the loading system according to the invention for lifting and emptying a container into a collector, wherein the loading system comprises:

- a frame which can be mounted on the collector with coupling means;
- a lifting mechanism arranged on the frame for the purpose of picking up and lifting the container, the lifting mechanism comprising:
    - a drive frame connected rotatably to the frame;
    - a tilting frame connected rotatably to the drive frame;
    - a drive connected operatively to the drive frame and configured to rotate the drive frame relative to the frame;
    - at least one tilting arm connected operatively to the tilting frame and configured to rotate around a tilting rotation point of the at least one tilting arm relative to the tilting frame; and
    - a lifting seat connected operatively to the at least one tilting arm for the purpose of picking up the container,

wherein the tilting rotation point is moved in an upward direction during lifting and emptying of the container.

[0006] By providing a frame for being mountable, and preferably releasable, with coupling means the loading system can be mounted on the collector in relatively simple manner. Such a collector is for instance a refuse truck. A lifting seat of the loading system serves to pick up the container and then lifting and tilting it, wherein the container undergoes a lifting and tilting movement. This lifting and tilting movement is made possible according to the invention by a drive frame and a tilting frame connected rotatably thereto. The tilting frame is also moved, and herein rotated around the drive frame, by movement of the drive frame using a drive. According to the invention, at least one tilting arm is operatively connected to the tilting frame and provided such that during driving of the drive frame this tilting arm undergoes a rotation around a tilting rotation point relative to the tilting frame. Because the lifting seat is connected to this at least one tilting arm, the lifting seat undergoes a lifting and tilting movement.

[0007] During lifting and emptying of the container the tilting rotation point is moved in an upward direction in the loading system according to the invention. This upward movement of the tilting rotation point is brought about by the movement of the tilting frame relative to the drive frame under the influence of the drive. This movement of the tilting rotation point carries the rotation point of the container upward, whereby a relatively high insertion height for the container for emptying is provided. This makes throwing in of the contents of the container easier. This also creates more space for the waste in the collector.

[0008] With the relatively large upward movement of the tilting rotation point further it is further achieved that a compact loading system is obtained, while a relatively high insertion height is provided. A higher ratio between the dimensions of the loading system and the insertion height is obtained by the relatively high insertion height and the relatively compact system. This makes the loading system according to the invention particularly suitable for, among other things, relatively small refuse trucks which must be able to handle a possible variety of dimensions of containers. Relatively small containers can thus also be handled, and it is easier to load refuse manually, whereby a greater flexibility is obtained in respect of the containers to be handled.

[0009] A further additional advantage of the loading system according to the invention is that it progresses with a relatively constant movement, whereby fewer shocks occur during the emptying cycle. Loads on the various components of the loading system hereby remain limited, which enhances the lifespan thereof. It has further been found that the energy consumption can here even be reduced relative to similar conventional loading systems. It will be apparent that this has advantages in respect of efficiency and utility of the loading system according to the invention.

[0010] A further additional advantage of the loading system according to the invention is that driving of an individual loading seat is possible by making use of a single cylinder, and separate lifting cylinders and tilting cylinders can be dispensed with. This simplifies the construction of the loading system and the control thereof. An effective and efficient loading system is hereby obtained. In addition, this reduces the risk of disruptions. The drive can here take a mechanical, hydraulic and/or electrical form.

[0011] For the purpose of picking up the container the

loading seat is preferably provided with a lifting comb and/or other engaging means which engage for instance just below an edge of the container. In order to prevent the container from coming loose or otherwise undergoing an uncontrolled movement, particularly during the tilting movement, a closing mechanism is provided in the form of an arm or clamping which, in closed state, engages on the container and clamps or retains the edge of the container with for instance the lifting comb. The closing mechanism is preferably provided as a closing plate. A controlled movement of the container during emptying thereof can be realized in effective manner with the closing mechanism. The closing plate preferably co-displaces during movement of the loading system. It has been found that, in a particularly advantageous embodiment of the loading system according to the invention, in the case of a tilting of about 30° of the container relative to the vertical, the closing plate forms an effective locking, such that a safe loading system is obtained.

[0012] A further advantage of the relatively compact loading system according to the invention is that it can perform a full emptying cycle in a shorter time. It has thus been found possible to accelerate the emptying cycle by about 10 to 25% in terms of time. This increases the overall capacity of the loading system according to the invention.

[0013] The number of entrapment points is also reduced by the more compact loading system. This results in a safer loading system. The more compact construction of the loading system also makes it possible to arrange the loading system behind or under the loading seat and to dispense with drive elements on the sides of the collector/refuse truck. This means that these side edges of the collector/refuse trucks are available for operating components, and wherein lighting elements of for instance the refuse truck are in addition more clearly visible to other road users. This results in a safer refuse truck provided with the loading system according to the invention.

[0014] The frame of the loading frame is preferably fixed to the collector/refuse truck with the coupling means, particularly a bolt connection. This makes it possible to mount the loading system in relatively simple manner in that it is possible to dispense with further fasteners. Because the various pivot points of the loading system are fixed to this frame or other components of the loading system, and not to the refuse truck, it is also possible to test the loading system in relatively simple manner, for instance during production or repairs. The loading system can also be mounted in effective manner on various types of refuse truck which are being used in practice. This is made possible in particular in that in a preferred embodiment the mounting height is adjustable to the height of the refuse truck. This increases the flexibility of the loading system, such that the loading system can for instance also be mounted on relatively small refuse trucks.

[0015] An additional advantage which is obtained with the upward movement of the tilting rotation point is that the container for emptying does not move rearward, or hardly so, relative to the collector/refuse truck during the lifting movement. This prevents a user, for instance a dustman, from being hit by the container during lifting thereof. This increases the safety of working with the loading system.

[0016] Owing to the greater compactness of the loading system according to the invention, the container furthermore guards the whole construction on the rear side during the emptying cycle. This increases the overall safety of the loading system in practice. If desired, a separate side guard can here be provided, whereby the whole area of movement is guarded.

[0017] In a currently preferred embodiment according to the invention a spring mechanism is arranged between the lifting frame and the closing plate of the lifting seat.

[0018] By providing such a spring mechanism the forces exerted by the container on the loading system can be wholly or partially absorbed in effective manner. Forces are hereby transmitted in controlled manner to the components of the loading system, which are hereby loaded less and/or less abruptly. This enhances the overall lifespan of the components of the loading system according to the invention. In addition to the reliability/robustness of the loading system, the number of repairs and the preventive maintenance required is significantly reduced in practice. The safety of the loading system is hereby also increased. This also increases the utility of the loading system according to the invention. By applying the spring mechanism it is further possible to dispense with arranging a separate hydraulic or pneumatic cylinder. The loading system hereby remains compact and relatively simple.

[0019] In an advantageous preferred embodiment according to the invention the loading system comprises a lifting connecting arm connected between the tilting frame and the lifting seat.

[0020] Providing a lifting connecting arm between the tilting frame and the lifting seat brings about a controlled relative movement of the lifting seat relative to the tilting frame. This increases the controllability and manageability of the movement. It will be apparent that, if desired, such a lifting connecting arm can also take a multiple form, for instance a dual form.

[0021] The loading system further preferably comprises a driving connecting arm arranged between the tilting frame and the frame, particularly the drive frame. It is hereby possible to further control the movement of the tilting frame. The loading system is preferably embodied with both the lifting connecting arm and the driving connecting arm. In addition, use is preferably made of a tilting connecting arm arranged between the at least one tilting arm and the drive frame or frame. The tilting movement of the container during the emptying cycle can hereby be enlarged further. The combined application of connecting arms in particular provides a controlled and even movement of the loading frame during an emptying cycle. It

will be apparent that such a driving connecting arm can if desired also take a multiple, for instance dual, form.

[0022] In a further advantageous embodiment according to the invention the drive is provided under or behind the lifting seat.

[0023] By arranging the drive of the loading system under or behind the lifting seat it becomes possible to give the loading system and even more compact form. In addition, the safety of working with the loading system according to the invention is increased further in practice. The drive preferably comprises a hydraulic cylinder. It has been found that with such a cylinder the forces acting on the construction of the loading system can be handled in effective manner and emptying of the container can be performed effectively.

[0024] In a further advantageous embodiment according to the invention the loading system comprises a second lifting seat.

[0025] Providing a second lifting seat increases the flexibility of the loading system for handling various dimensions of containers on the one hand and for handling two types of waste flow on the other. Large containers can for instance be picked up with two loading seats at the same time and be emptied by synchronous operation thereof. In the case of a separate control of the individual lifting seats it is possible to handle diverse waste flows separately and collect them simultaneously with for instance a refuse truck provided with the loading system in an embodiment according to the invention. Organic waste can here for instance be collected separately of other waste in a single round of collection.

[0026] In an advantageous embodiment the loading system is optionally provided with a third lifting seat. This provides an even greater flexibility of the loading system according to the invention. It is thus possible to collect three individual waste flows at the same time in a single round of collection. Alternatively or additionally, it is likewise possible in the embodiment provided with three lifting seats to control two of these synchronously, for instance for large containers, and to control one separately, for a divided waste flow. It will be apparent that an even greater flexibility for the utilization of the loading system according to the invention is hereby obtained. The possible applications of a plurality of lifting seats, particularly in an embodiment with three lifting seats, is improved by the compact construction of the loading system according to the invention, wherein a relatively large width for insertion of the contents of the containers is available.

[0027] In a further advantageous embodiment according to the invention the loading system comprises a sensor arranged on or at the lifting seat.

[0028] Providing a sensor, for instance a load cell, enables the weight of the container to be determined and an additional safety to be built in. Further sensors can additionally or alternatively be applied. It is thus possible with application of a single position sensor to detect the whole movement of the loading system since, in the most advantageous embodiment of the loading system according to the invention, the movement of the individual components thereof is defined unequivocally by determination of the position of one component. This enables a relatively simple control of the movement during an emptying cycle. It is further possible to take additional safety measures. An overflow for the cylinder can thus for instance be provided. In the case of overloading of a loading system in an embodiment wherein the loading system is provided with a refuse slide-off plate an optionally separate drive thereof can also be provided with an overflow and/or with a position sensor for indicating whether the plate in question has been brought into the correct position for emptying of the container, which sensor can thereby generate a release and/or alarm. This increases the overall safety of the loading system still further.

[0029] In a further advantageous embodiment the lifting seat of the loading system is provided with a footboard.

[0030] Particularly in the embodiment of a loading system in combination with a refuse truck does providing a footboard enable a person, particularly a dustman, to travel along in effective manner with the refuse truck between the separate collection locations of the containers. An effective construction is hereby provided.

[0031] The invention also relates to a refuse truck provided with a loading system in an embodiment according to the invention.

[0032] Such a vehicle, particularly a refuse truck, provides the same effects and advantages as described for the loading system. Such a refuse truck is particularly provided on the rear side thereof with a loading system according to the invention. The compact construction of the loading system allows it to be arranged in effective manner, wherein the frame preferably forms the only direct connection between the loading system and the refuse truck. The other components of the loading system are fixed to the loading system itself. Making use of the loading system according to the invention gives the refuse truck a longer lifespan, particularly a longer operating time, wherein a longer maintenance interval can be applied. Costs for maintenance, including preventive maintenance, are hereby reduced relative to conventional systems.

[0033] The invention further also relates to a method for emptying a container, wherein the method comprises the steps of:

- providing a loading system and/or refuse truck in an embodiment according to the invention;
- picking up the container for emptying with the loading system;
- lifting and emptying the container; and
- setting down the emptied container.

[0034] Such a method provides the same effects and advantages as stated for the loading system and/or the vehicle/refuse truck. With the upward movement of the

tilting rotation point a compact construction of the loading system is enabled on the one hand and a great insertion height for the container for emptying is obtained on the other hand. The insertion height is particularly provided at a height above 1.5 metres, more preferably above 1.6 metres, still more preferably above 1.7 metres. Compared to conventional loading systems this insertion height is considerably higher, since the conventional insertion height, at an identical depth of the system, amounts to about 1.4 metres. Because of the compact construction of the loading system with a construction height of about 600 to 700 mm, preferably 600-650 mm, and a depth/length of about 800-850 mm the ratio between the insertion height and the construction height of the loading system is relatively high. A ratio higher than 2 between insertion height and construction height can therefore be achieved hereby, preferably even higher than 2.25, still more preferably even higher than 2.5, and most preferably higher than 2.75.

[0035] Further features, advantages and details of the invention are described in preferred embodiments thereof, wherein reference is made to the accompanying drawings, in which:

- Fig. 1A-B show a view of a refuse truck provided with a loading system according to the invention;
- Fig. 2-5 show various views of the loading system from different viewpoints and different positions during an emptying cycle of the loading system of figure 1.

[0036] Refuse truck 2 (figures 1A-B) is provided with cab 4 with collector and press 6. Loading system 8 is arranged on the rear side of refuse truck 2. Containers 10 can be picked up with loading system 8. In the shown embodiment use is made here of refuse slide-off plate 12 (figures 2-5) which, using cylinder 14, is moved between a rest position wherein loading system 8 is not in use and the position of use wherein loading system 8 is in use. In the position of use refuse plate 12 has been moved to a wholly or partially vertical position. Refuse plate 12 rotates here around refuse plate rotation shaft 16. Operation of loading system 8 is preferably carried out using preferably a separate control or control panel arranged on the rear side of refuse truck 2.

[0037] In the shown embodiment lifting comb 18 is arranged for the purpose of engaging on container 10. Container 10 is supported with support 20. In the shown embodiment a footboard 22 on which a dustman can travel along is provided behind one of the supports or cushions 20. This footboard 22 and cushions 20 are arranged on loading seat or lifting seat 24. Cushions 20 are optionally provided with a separate sensor or function as sensor themselves. This relates for instance to application of a load cell for the purpose of monitoring the load exerted on loading system 8 by container 10.

[0038] Movement of loading seat 24 is made possible by tilting arms 26. In the shown embodiment with two loading seats 24 use is made per loading seat 24 of two tilting arms 26 which are connected at a first outer end close to loading seat 24 to loading seat 24 via pivot point 28. Tilting rotation point 30 enables rotation of tilting arms 26 relative to the other parts of loading system 8. Lifting frame 32 is connected to tilting arms 26 and via connecting arm 34 to the construction of loading seat 24. Connecting arm 34 is here connected at one outer end to loading seat 24 via pivot point 38 and connected with the other outer end to lifting frame 32 via pivot point 36. Lifting frame 32 is connected via pivot point 40 to drive frame 42. In the shown embodiment drive frame 42 is moved using hydraulic drive cylinder 44. In the shown embodiment drive cylinder 44 is connected via pivot point 46 to drive frame 42. Tilting connecting arm 48 is connected via pivot point 50 to tilting arm 26 and the other outer end connected via pivot point 52 to drive frame 42. Lifting frame 32 is connected via pivot point 54 to driving connecting arm 62. Drive frame 42 is connected via pivot point 56 to mounting frame 58 which can be arranged on refuse truck 2. Drive cylinder 44 is connected via pivot point 60 to mounting frame 58. Driving connecting arm 62 is likewise connected via pivot point 64 to mounting frame 58. Closing plate 66 is movable round pivot point 28, wherein spring construction 70 is provided for the purpose of absorbing loads by container 10. Spring construction 70 is connected via pivot point 72 to lifting frame 32, and connected via pivot point 68 to closing plate 66. Sensor or load cell 74 is optionally placed in or on loading seat 24. It is likewise possible to provide additional or alternative sensors.

[0039] It will be apparent that the various pivot points can be embodied in different ways, for instance as traditional hinges or rotation shafts. Combinations of various constructions are likewise possible according to the invention.

[0040] In the shown embodiment the compact loading system 8 is in a rest position provided with a construction height of about 620-625 mm and a length/depth of about 820-830 mm, wherein the width also depends on refuse truck 2 and/or type of container 10.

[0041] When picking up container 10 for the purpose of emptying thereof, container 10 undergoes a movement from the ground position to a lifted and tilted position, wherein the container is emptied in the tilted position.

[0042] In the emptying cycle drive frame 42 is rotated relative to mounting frame 58 by controlling cylinder 44. In the shown embodiment control of cylinder 44 is possible only after upward movement of refuse plate 12 around rotation shaft 16 using cylinder 14. Because of the rotating movement of drive frame 42, tilting frame 32 is likewise moved and therein rotated relative to tilting frame 32 and mounting frame 58. Tilting rotation point 30 is here moved substantially upward such that tilting arms 26 co-displace. By preferably applying a number of connecting arms, tilting arms 26 are additionally rotated around tilting rotation point 30 during this movement such that container 10 undergoes a gradual lifting move-

ment and tilting movement, wherein the lifting preferably gradually transitions into the tilting of container 10 during the movement. Closing plate 66 is also moved during the picking up of container 10. At an angle of about 30° of container 10 relative to the vertical, closing plate 66 will here effect a clamping relative to lifting comb 18 whereby container 10 is wholly retained. During the tilting movement container 10 rests on cushions 20 of loading seat 24.

[0043] Loading system 8 is suitable for handling various types of container 10 with different volumes, for instance 120 litres as well as 360 litres. In the shown embodiment with two loading seat 24 even larger containers 10 can be emptied and/or two separate waste products can be collected in one round of refuse truck 2.

[0044] The present invention is by no means limited to the above described preferred embodiments thereof. The rights sought are defined by the following claims, within the scope of which many modifications can be envisaged.

Claims

1. Loading system for lifting and emptying a container into a collector, the loading system comprising:

- a frame which can be mounted on the collector with coupling means;
- a lifting mechanism arranged on the frame for the purpose of picking up and lifting the container, the lifting mechanism comprising:
  - a drive frame (42) connected rotatably to the frame;
  - a tilting frame (32) connected rotatably to the drive frame;
  - a drive (44) connected operatively to the drive frame and configured to rotate the drive frame relative to the frame;
  - at least one tilting arm (26) connected operatively to the tilting frame and configured to rotate around a tilting rotation point (30) of the at least one tilting arm relative to the tilting frame; and
  - a lifting seat (24) connected operatively to the at least one tilting arm for the purpose of picking up the container,

wherein the tilting rotation point is moved in an upward direction during lifting and emptying of the container.

2. Loading system as claimed in claim 1, further comprising a spring mechanism (70) arranged between the lifting frame and a closing plate (66) of the lifting seat.

3. Loading system as claimed in claim 1 or 2, further comprising a lifting connecting arm (34) connected between the tilting frame and the lifting seat.

4. Loading system as claimed in claim 1, 2 or 3, further comprising a driving connecting arm (62) arranged between the tilting frame and the drive frame.

5. Loading system as claimed in any one of the foregoing claims, further comprising a tilting connecting arm (48) arranged between the at least one tilting arm and the drive frame or frame.

6. Loading system as claimed in any one of the foregoing claims, wherein the drive is provided under or behind the lifting seat.

7. Loading system as claimed in claim 6, wherein the drive comprises a hydraulic cylinder.

8. Loading system as claimed in any one of the foregoing claims, further comprising a second lifting seat.

9. Loading system as claimed in claim 8, further comprising a third lifting seat.

10. Loading system as claimed in any one of the foregoing claims, further comprising a sensor arranged on or at the lifting seat.

11. Loading system as claimed in any one of the foregoing claims, wherein the lifting seat is provided with a footboard.

12. Refuse truck provided with a loading system as claimed in any one of the foregoing claims.

13. Method for emptying a container, the method comprising the steps of:

- providing a loading system and/or refuse truck as claimed in any one of the foregoing claims;
- picking up the container for emptying with the loading system;
- lifting and emptying the container; and
- setting down the emptied container.

14. Method according to claim 13, wherein the insertion height is provided at a height above 1.50 metres, preferably above 1.60 metres, more preferably above 1.70 metres, and most preferably amounts to about 1.75 metres.

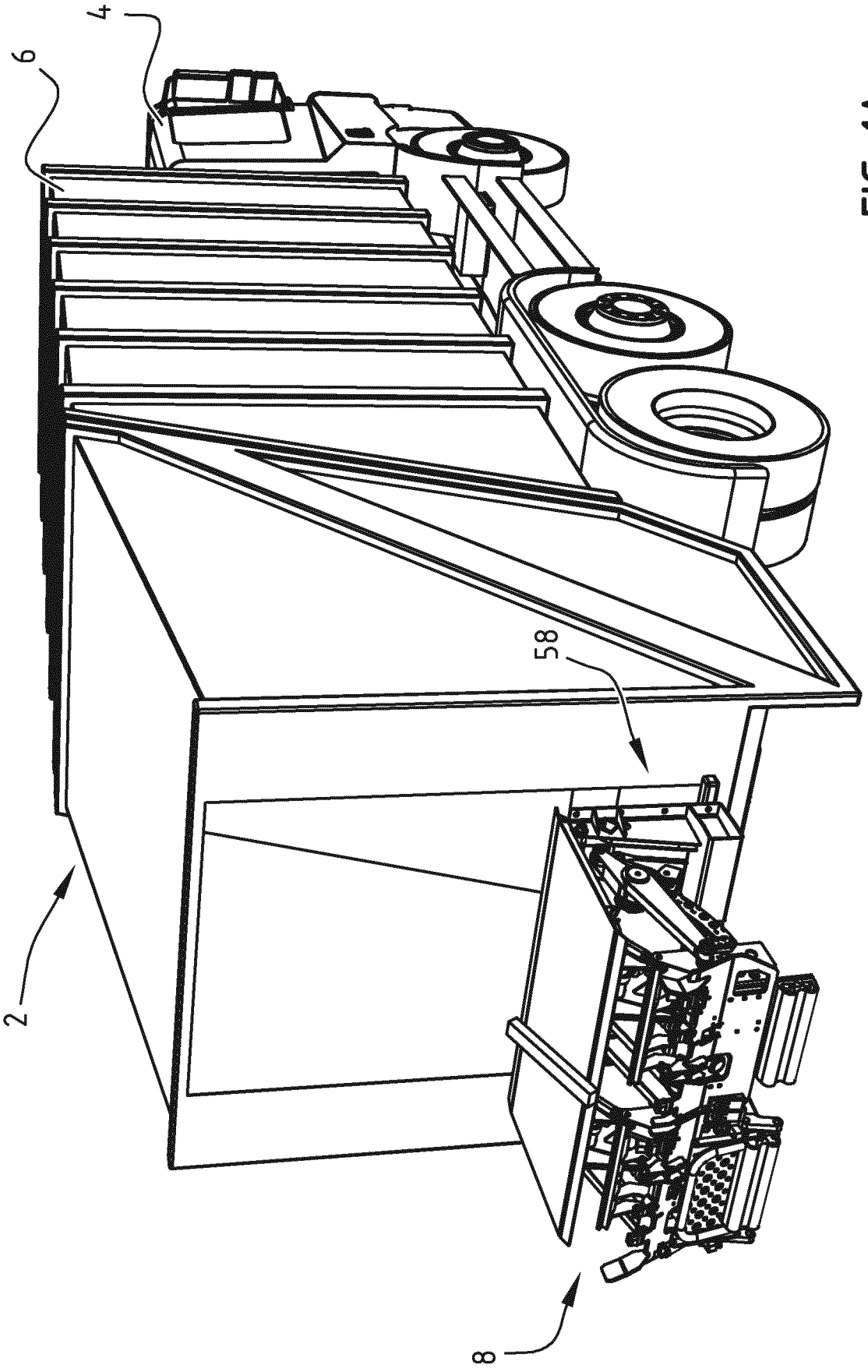

FIG. 1A

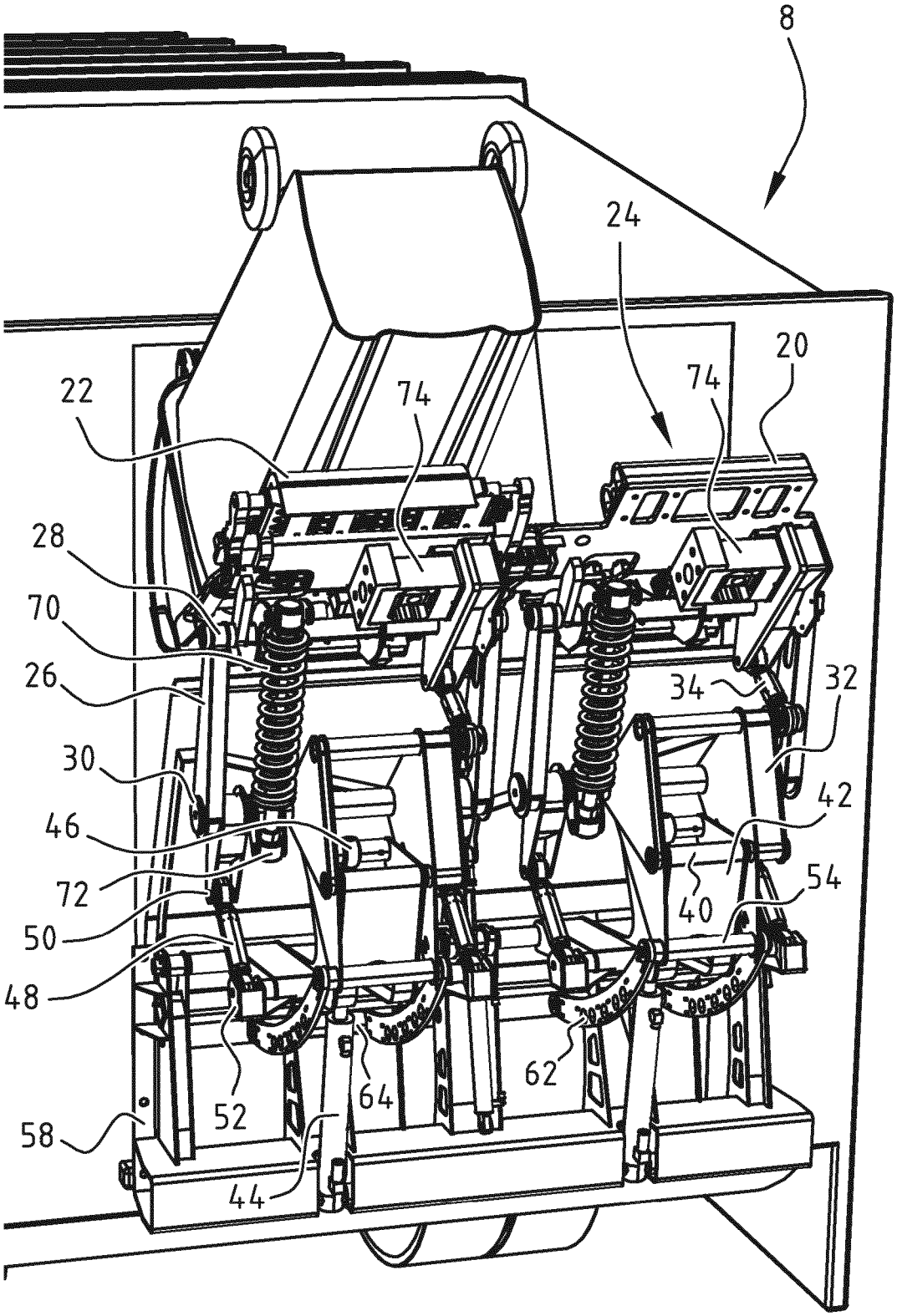

FIG. 1B

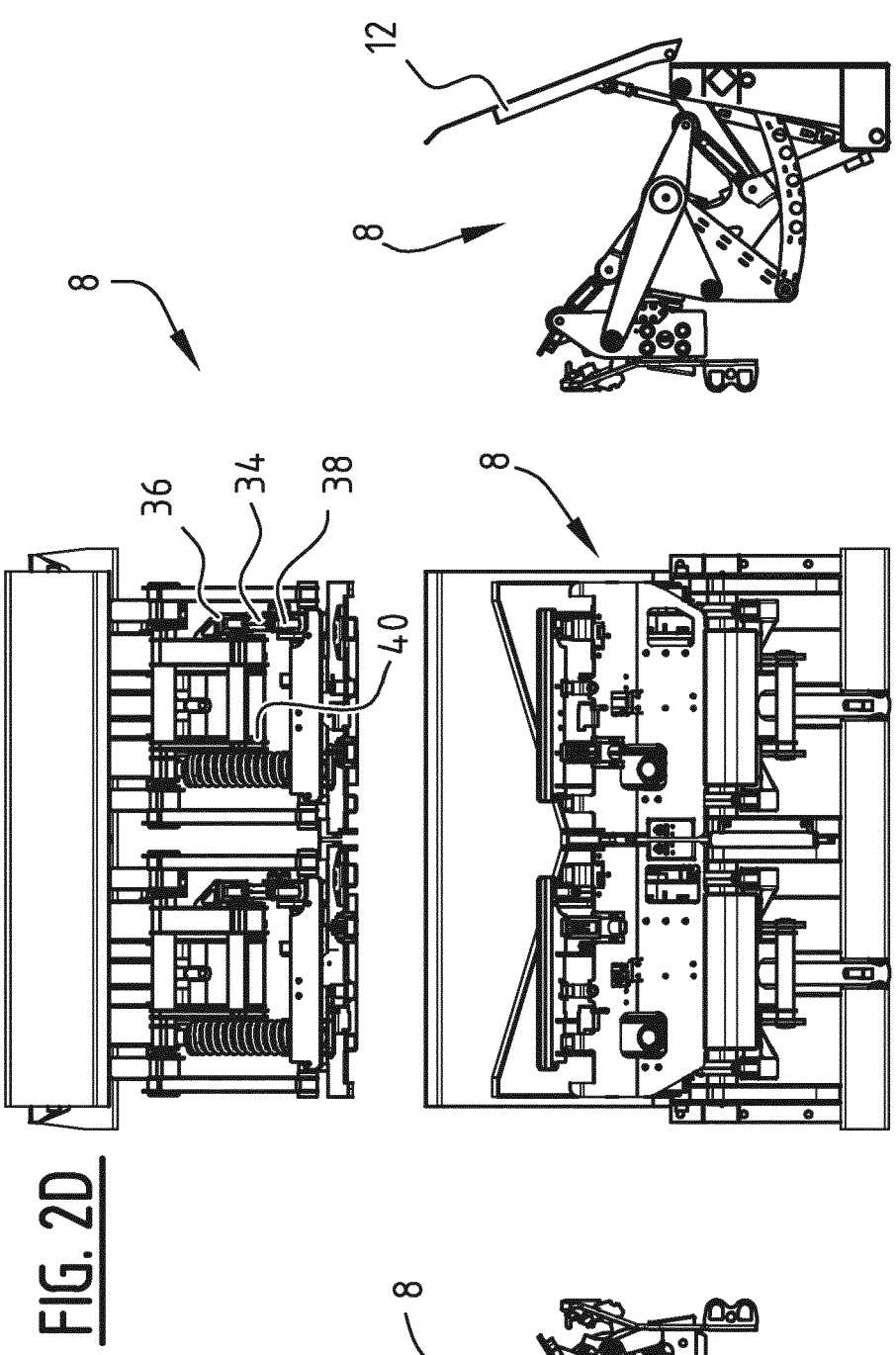

FIG. 2D

FIG. 2A

FIG. 2C

FIG. 2B

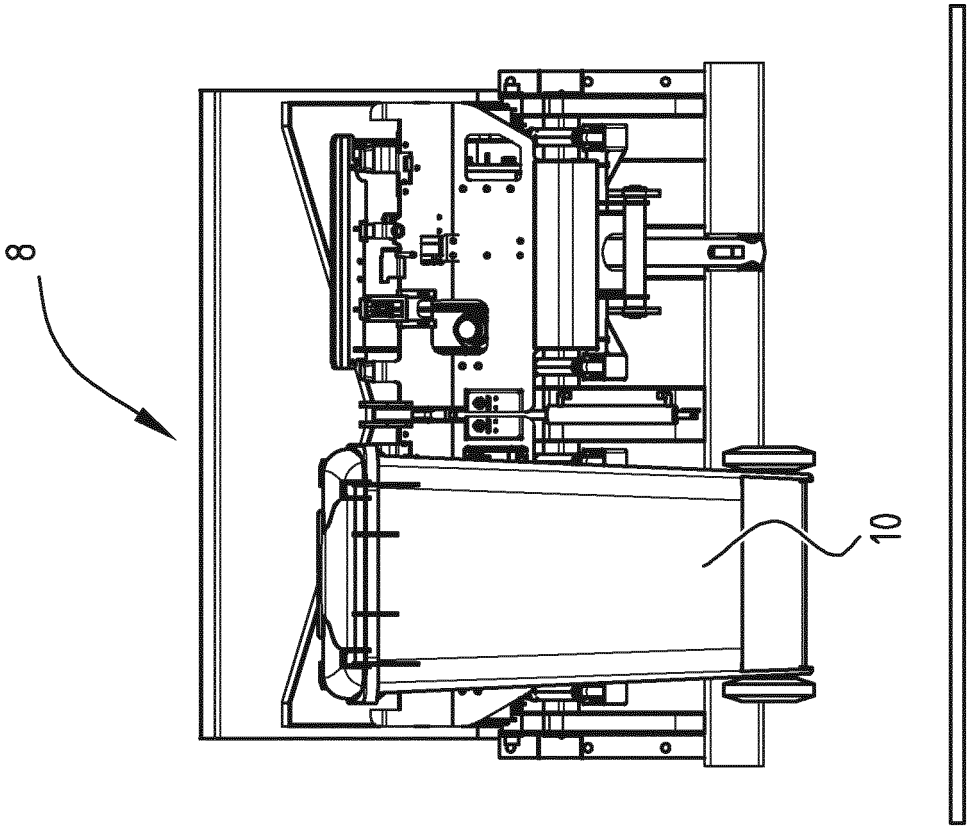
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FIG. 3A

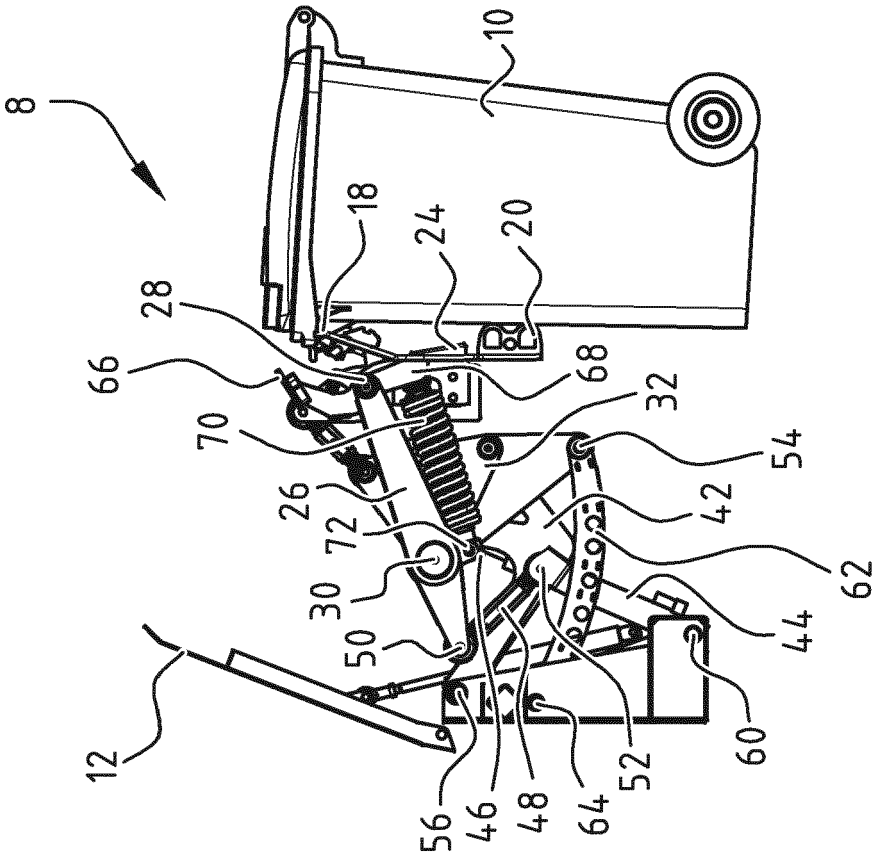
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FIG. 3B

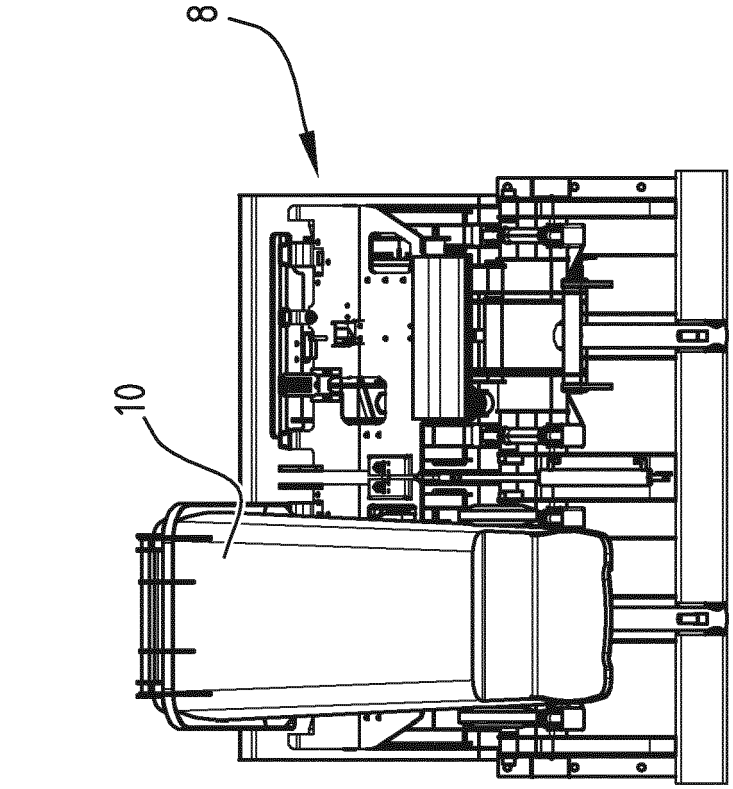

FIG. 4A

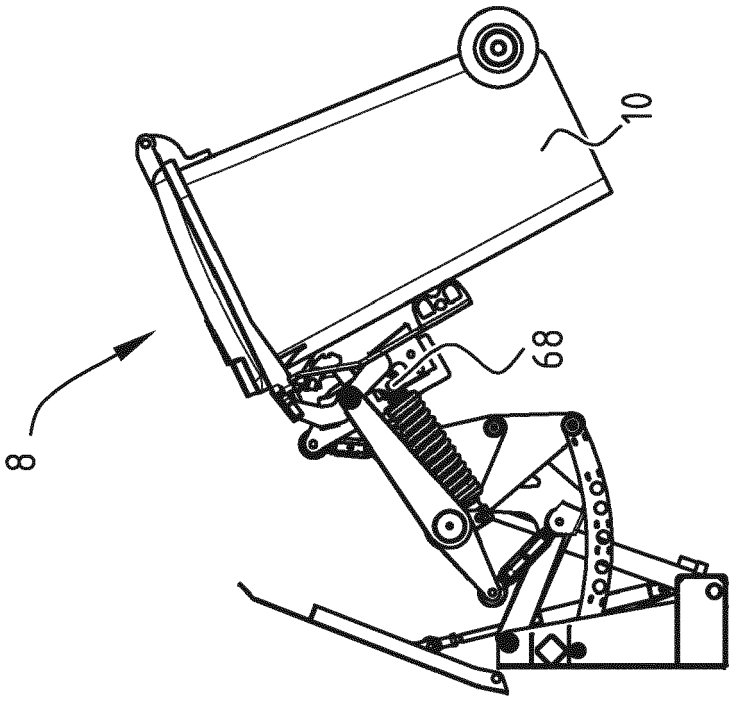

FIG. 4B

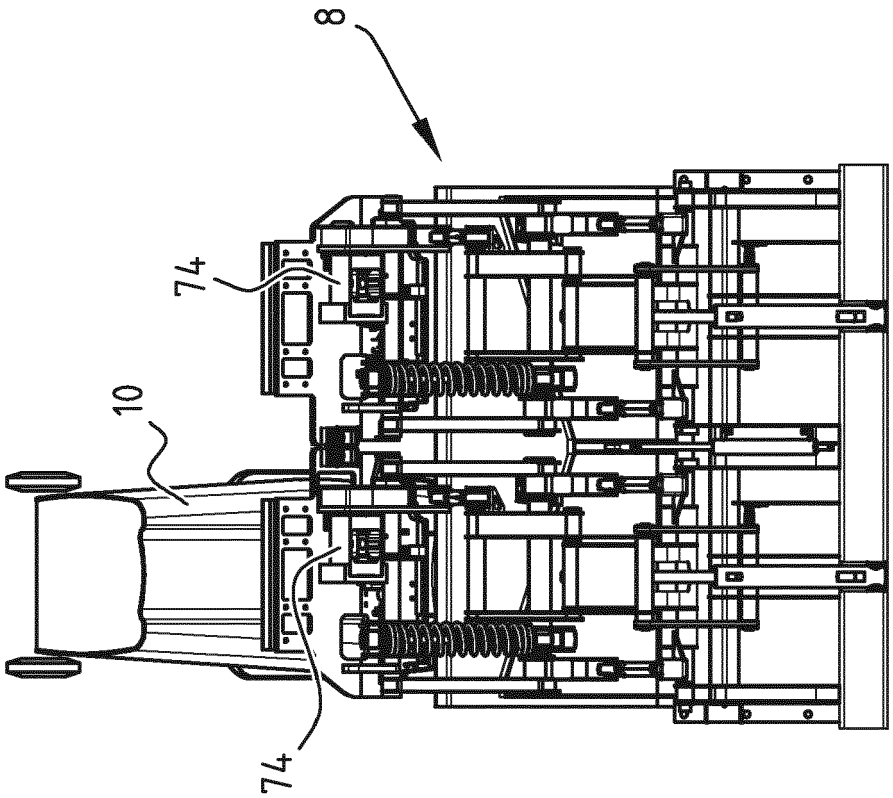

FIG. 5A

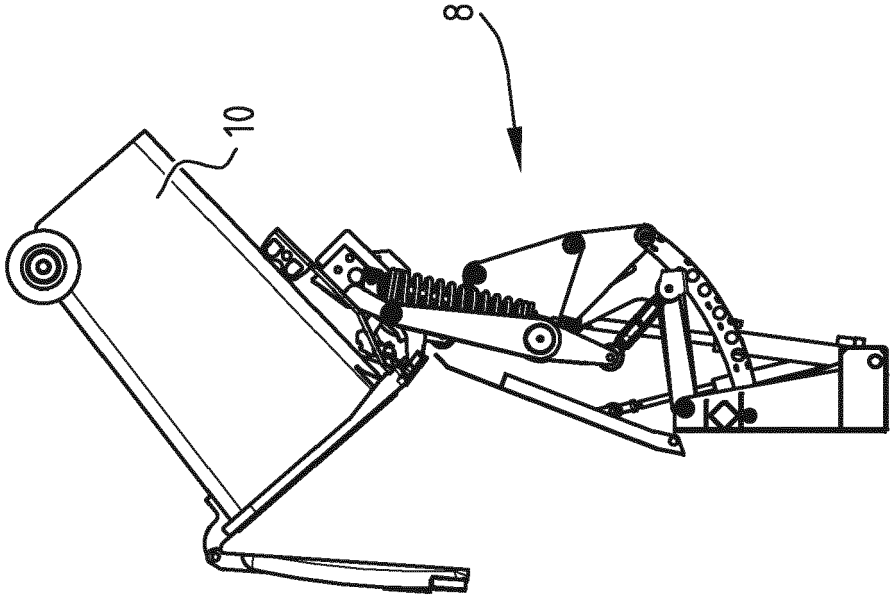

FIG. 5B

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EUROPEAN SEARCH REPORT

Application Number
EP 18 20 3047

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 0 675 058 A1 (ENVITA AG) 4 October 1995 (1995-10-04) * column 3, line 36 - column 5, line 48 * * figures 1-7 * -----	1-14	INV. B65F3/04
X	AU 629 165 B3 (CHASE WASTE & ENVIRONMENTAL CONTROL EQUIPMENT PTY LTD) 13 August 1992 (1992-08-13) * page 8, line 25 - page 10, line 16 * * page 11, line 27 - page 12, line 4 * * figures 1-3 * -----	1,5, 12-14	
X	FR 2 407 156 A1 (GUIMA) 25 May 1979 (1979-05-25) * page 2, line 29 - page 3, line 29 * * figures 1,2 * -----	1,4, 12-14	
			TECHNICAL FIELDS SEARCHED (IPC) B65F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	31 January 2019	Smolders, Rob

CATEGORY OF CITED DOCUMENTS

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EPO FORM 1503 03.82 (P04C01)

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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