

LOADING SYSTEM FOR LIFTING AND EMPTYING A BIN, COLLECTION VEHICLE
PROVIDED THEREWITH AND METHOD THEREFOR

5 The present invention relates to a loading system which is used particularly to empty bins, or other containers, which are filled for instance with waste, into a refuse truck or other collection vehicle, or into a collection container. Such a loading system also comprises a so-called side loader system with which a bin or container can be emptied at the side of a refuse truck or collection container.

10 Known in practice are diverse loading systems with which refuse bins are emptied into a refuse truck. These loading systems are usually provided on the rear side of a refuse truck, wherein the bins are raised using a so-called loading seat and are emptied into an opening of the collector. Such a collector is preferably arranged on the refuse truck. During emptying, the bin undergoes an upward lifting movement and also a tilting movement, which are performed simultaneously and/or
15 successively. Also known in practice are refuse trucks provided with a side loader system wherein use is made of two lifting arms for picking up a bin, wherein the loading system with the lifting arms are provided on a side of the refuse truck. After the refuse truck has been positioned relative to the bin to be emptied, the lifting arms are activated to pick up the bin and perform the desired lifting movement and tilting movement to empty the bin.

20 EP 0 745 544 A1 and IT MI20 130 846 A1 describe systems for emptying bins.

 In practice it may occur during the tilting movement that bins continue to tilt or continue to rotate, and thereby come loose from the loading system. Such over-rotation of the bin results in damage to the bin and/or the loading system, and in damage to the collector and a refuse truck provided therewith. This can also result in unsafe situations for users and bystanders. It is known in
25 practice to provide a lid part provided on the bin with an additional stop (trunnion), wherein an arm of the loading system can engage thereon and prevents over-rotation of the bin during the tilting movement. A problem with this occurring in practice is that this requires an additional element to be provided on the lid part on the bin. Such an additional element is further susceptible to damage resulting from improper use or vandalism, whereby this over-rotation is in practice not prevented
30 in many cases. Bin variants that impede the view of for instance pedestrians less are also commercially available. Such bin variants are usually not provided with such additional elements.

 The present invention has for its object to provide a loading system whereby the above stated problems are obviated, or at least reduced.

 This object is achieved with the loading system according to the invention for lifting and
35 emptying a bin into a collector, wherein the loading system comprises:

- a loading frame mountable on the collector with coupling means;

- a lifting mechanism arranged on the frame and configured to pick up, lift and empty the bin, wherein the lifting mechanism is provided with two lifting arms for picking up the bin;
- a lifting drive system connected operatively to the lifting mechanism and configured to drive the lifting mechanism;
- 5 – a lid engaging mechanism configured to engage on a lid of the bin; and
- a blocking mechanism connected operatively to the lid engaging mechanism and configured to prevent over-rotation of the bin during emptying.

wherein the blocking mechanism is provided with a blocking element which is configured to engage on the bin.

- 10 The loading system according to the invention is configured to pick up and lift a bin and then empty it into a collector. Bin is understood to mean any type of container suitable for containing waste, including glass, paper, biodegradable waste, other waste and other types of material. In use the loading frame of the loading system is preferably mounted on the collector using coupling means. The coupling means can take diverse forms, including using bolts, hooks, pin/hole
- 15 connections and other suitable and preferably releasable connections.

- The collector can be a collection container at a specific location or a housing of for instance a refuse truck in which the waste can be placed. The collector is preferably operatively connected to a press or other press system whereby the material is placed in the collector in compressed form. The collector is provided here with an unloading opening into which or where the bin can be
- 20 emptied.

- The loading system is preferably configured to perform a substantially vertical or lifting movement, and a tilting movement for emptying the bin. This can for instance be embodied in similar manner as described for a loading system on the rear side of a refuse truck in for instance EP 2 347 978 A1, and for a so-called side loader system on the side of a refuse truck. Use can be
- 25 made in the loading system of a single drive and of separate drives, for instance with separate hydraulic cylinders. Alternative embodiments for such a drive are also possible according to the invention. It is for instance possible to envisage here a wholly or partially electrical drive using a battery or for instance the refuse truck and/or a separate battery.

- According to the invention, the lifting movement and the tilting movement can be performed
- 30 (partially) simultaneously as well as be performed successively. In the context of the invention the described lifting mechanism and the described drive system is preferably able to perform both the lifting movement and the tilting movement, optionally using separate cylinders. In a currently preferred embodiment the lifting movement, tilting movement, and in the case of a so-called side loader system preferably also the lateral positioning movement as well as the movement of the
- 35 optional lifting arms, are realized using a number of cylinders which are preferably driven hydraulically and/or alternatively electrically. In a currently preferred embodiment the lifting

mechanism is provided with lifting arms, wherein engaging elements are provided for engaging on a bin to be emptied. In a number of possible embodiments the engaging elements are formed by so-called trunnion pick-up points. In a number of possible embodiments according to the invention the lifting drive system is formed by a lifting drive, lifting arm cylinder and tilting cylinder. It will be apparent that alternative drive systems can also be envisaged.

The loading system is further provided with a lid engaging mechanism configured to engage on a lid or other lid part of the bin. Such a lid engaging mechanism can for instance engage on an additional element which is provided on the lid part, wherein the additional element is also referred to as trunnion.

The lid engaging mechanism usually particularly engages on a so-called upper trunnion which is provided on the lid part belonging to the bin. In a currently preferred embodiment this mechanism is provided with a lid engaging element, for instance a gripper arm which is also referred to as lid catcher and is preferably rotated into the desired position using a cylinder prior to or during the lifting movement and/or tilting movement.

According to the invention, the loading system is further provided with a blocking mechanism which is connected operatively to the lid engaging mechanism. Such a blocking mechanism is configured to prevent said over-rotation of the bin during emptying.

The blocking mechanism prevents such over-rotation even if the lid engaging mechanism is not able to engage on a lid or other lid part of the bin, for instance when there is no trunnion on the lid part. For this purpose the blocking mechanism is provided with a blocking element which is configured to engage on the bin itself. Such a blocking element can be designed in diverse ways, including as a pin, pawl, hook, rod or other suitable element.

Operatively connecting the blocking mechanism to the lid engaging mechanism enables the blocking mechanism, or at least a part thereof such as the blocking element, to be activated in similar or the same manner as the lid engaging mechanism. In a currently preferred embodiment the lid engaging mechanism comprises a cylinder whereby an arm, particularly said lid catcher, is moved and whereby the blocking mechanism is also activated and the blocking element can be moved relative to the bin in order to engage thereon and/or break the engagement. This has the advantage that an effective and efficient mechanism can be realized, wherein no separate parts and associated control is required. This provides a cost-effective mechanism which additionally comprises no additional components that are susceptible to malfunction. This also makes the system very robust.

By providing a blocking element the bin to be emptied is inhibited during the lifting movement and/or tilting movement, such that an over-rotation of the bin during emptying cannot occur.

Damage to the bin, loading system and collector such as a fuse truck is hereby prevented. Damage to the surrounding area is also prevented. Safety risks for a user and/or bystanders during the

emptying process are also prevented from occurring. This increases the safety of working with the loading system according to the invention. Because the blocking mechanism engages with the blocking element on the bin itself and not on the lid or the lid part belonging to the bin, a robust blocking mechanism is provided. The blocking element preferably engages on a side of the bin. It is hereby not necessary to provide additional elements, such as an upper trunnion, on for instance the lid or lid part belonging to the bin. This greatly increases the safety of working with the loading system according to the invention, since damaged bins and bins wherein such a stop/trunnion is not provided are also emptied in safe manner. This increases the utility and safety of the loading system according to the invention.

10 In an advantageous embodiment according to the invention the blocking mechanism comprises a blocking hinge configured to move the blocking mechanism to and from the bin.

Providing a hinge element, particularly a blocking hinge, enables the blocking mechanism and particularly the blocking element thereof to be moved in use between a releasing position, in which the blocking element is not in contact with the bin, and a blocking position in which the blocking element is in contact with the bin.

15 The blocking hinge preferably comprises a torsion spring or other suitable spring element. Using such a spring or spring element enables the blocking mechanism to be moved back to one position, i.e. the releasing position or the blocking position. In a currently preferred embodiment a torsion spring provides for the blocking mechanism being brought into the releasing position, in which the blocking element does not engage on a bin. Such a torsion spring can be embodied in diverse ways. A different positioning element, which brings about that the blocking mechanism is moved to a preferred position, can additionally or alternatively also be applied.

20 In an advantageous embodiment according to the invention the blocking mechanism comprises a blocking guide configured to bring the blocking mechanism from a releasing position into a blocking position.

Providing a blocking guide enables the blocking mechanism to be moved between the different positions in efficient manner. The blocking guide activates the blocking mechanism, particularly the blocking element thereof, to move between the different positions. A mechanical drive is preferably provided hereby, whereby no separate drive is needed for movement of the blocking element. In the currently preferred embodiment the blocking guide is activated by movement of the lid engaging mechanism. Such a blocking guide can comprise a guide element, such as a plate or other plate-like element and/or a rail, roller or other suitable guide. In a currently preferred embodiment the blocking guide is provided with at least one blocking roller or guide block.

30 Providing a blocking roller or guide block limits the (frictional) resistance resulting from movement of the blocking guide so that an efficient movement of the blocking element is made

possible. Optionally, more than a single blocking roller and/or guide block is provided, and two, three or even more rollers or blocks are provided in order to further optimize the guide.

In a further advantageous embodiment according to the invention the lid engaging mechanism is provided with a contact element configured to engage on the blocking guide.

5 Providing a contact element on the lid engaging mechanism makes it possible during movement of the lid engaging mechanism, particularly said lid catcher thereof, to use the relevant movement to drive the blocking mechanism, particularly for the movement of the blocking element thereof. For this purpose the contact element of the lid engaging mechanism is moved and will here come into contact with the blocking guide, for instance embodied in the form of one or more
10 blocking rollers and/or guide blocks. Owing to this contact, the blocking element will likewise move between the releasing position and the blocking position. An effective mechanical system for movement of the blocking element is hereby provided, resulting in the above stated advantages.

The contact element is preferably provided with a contact surface, wherein the contact surface is embodied to co-rotate with the lid engaging mechanism. During this rotation the
15 blocking guide of the blocking mechanism is engaged on in order to realize the movement of the blocking element. Additionally or alternatively, a different contact element can also be provided, such as a pawl, pin or other suitable element.

The lid engaging mechanism is preferably further provided with a blocking limiter configured to limit movement of the blocking mechanism, particularly the blocking element thereof, toward the bin. In a currently preferred embodiment such a blocking limiter is provided as
20 a plate-like element which co-displaces with the lid engaging mechanism and preferably the contact element thereof. The movement of the blocking mechanism is limited thereby, so that the blocking mechanism is only able to move between the releasing position and the blocking position and is unable to continue moving, as it were, and for instance cause damage to the bin. It will be
25 apparent that the blocking limiter can additionally or alternatively also be embodied as a different suitable element, for instance a pin, pawl, rod.

In a further advantageous embodiment according to the invention the blocking element comprises a spring mechanism which is configured to retract the blocking element in a longitudinal direction of the blocking element.

30 Providing a spring mechanism enables the blocking element to be retracted when it comes into contact with an object. This prevents damage to the blocking mechanism and to the object in question. For instance in the case that the blocking element is provided with a pin or pawl or rod which is moved reciprocally in longitudinal direction between a releasing position and blocking position it is possible that the blocking element comes into contact at the outer end with an object,
35 such as the bin itself, and can here cause damage to the object/bin and/or the blocking mechanism. By providing a spring mechanism the pressure on this object can be reduced and damage will be

avoided. If desired, the spring element can even be retracted and/or a signal emitted to a central control as a result of activation of the spring mechanism. The spring mechanism is for instance provided with a spring element or other resilient element, or other suitable mechanism.

In a further advantageous embodiment according to the invention the loading frame is
5 further provided with a lateral positioning system configured to position the lifting mechanism in a lateral direction relative to the bin.

By providing a lateral positioning system the lifting mechanism can be positioned relative to a bin to be emptied in effective manner. This lateral direction preferably extends in a direction substantially parallel to the longitudinal direction of the vehicle and/or collector. The lateral
10 positioning mechanism makes it possible to position the lifting mechanism in this lateral direction, for instance once the refuse truck with a side loader system has been parked adjacently of a bin, wherein the mutual distance between collector and bin is fixed. Following the parking, the lifting mechanism is positioned correctly relative to the bin using the lateral positioning system. Using the lateral positioning system the preferably two lifting arms are positioned relative to the bin, such
15 that the bin can be picked up in correct manner. This results in an optimal alignment of the lifting mechanism relative to the bin to be emptied. According to the invention, it is alternatively or additionally likewise possible to activate the lifting arms and align them using the lateral positioning system when they approach or even when they come into contact with the bin. This is for instance possible by positioning the lifting mechanism relative to the bin as soon as one of the
20 two lifting arms approaches the bin or has come into contact therewith. It will be apparent that the positioning system can be embodied in diverse ways so that the preferably two lifting arms are positioned relative to the bin such that the bin can be picked up in correct manner.

By positioning the lifting mechanism relative to the bin prior to activation of the lifting arms and/or after activation of these lifting arms a correct alignment of the lifting mechanism
25 relative to the bin is realized. This inter alia prevents the bin being pushed away as a result of an alignment which is incorrect or not optimal. This in turn results in prevention of damage to the bin and/or loading system and/or refuse truck provided with the collector and/or to the immediate surroundings, such as parked cars. This applies to both freestanding bins and to bins that are fixed at a specific position using positioning elements such as ramps, bumpers, edges and so on. It
30 further likewise applies to bins that are fixedly placed and to bins that are provided with wheels.

In a further advantageous embodiment according to the invention the blocking element is provided with a contact surface for engaging on the bin.

Providing a contact surface for engagement on preferably a side of the bin makes the engagement more stable. Providing a contact surface, for instance as a result of application of a
35 rectangular element such as a rectangular or square pawl or rod instead of a round pin, provides a

(rectangular) contact surface instead of only a contact line in the case of for instance a round pin. This increases the robustness of the blocking mechanism.

In a further advantageous embodiment according to the invention the blocking mechanism comprises a blocking mechanism protector.

- 5 Providing a blocking mechanism protector prevents damage to the blocking mechanism. Such a protector can for instance be embodied as an additional bracket or plate.

The invention further relates to a collection vehicle provided with the loading system in an embodiment according to the invention.

- 10 Such a collection vehicle provides similar effects and advantages as described for the loading system. Such a collection vehicle is preferably a refuse truck.

The collection vehicle is preferably provided with a loading system comprising a side loader system. It has been found that bins can hereby be emptied in effective manner.

The invention further also relates to a method for emptying a bin, wherein the method comprises the steps of:

- 15 – providing a loading system and/or collection vehicle in an embodiment according to the invention;
 – picking up the bin to be emptied with the lifting mechanism;
 – lifting and emptying the bin;
 – preventing over-rotation of the bin with the blocking mechanism; and
20 – setting down the emptied bin.

- Such a method provides similar advantages and effects as described for the loading system and/or collection vehicle. Picking up the bin to be emptied is here preferably performed by the lifting mechanism of the loading system, which can here be positioned in lateral direction relative to this bin, if desired. Using the blocking mechanism the container is fixed on the loading system
25 and over-rotation is avoided.

Further advantages, features and details of the invention are elucidated on the basis of preferred embodiments thereof, wherein reference is made to the accompanying drawings, in which:

- 30 – Figure 1 is a view of a refuse truck provided with a side loader system according to the invention;
 – Figure 2 is a view of the loading system of figure 1 with the blocking mechanism in a releasing position;
 – Figures 3A-B are views of the blocking mechanism in the releasing position of figure 2;
 – Figures 4A-C are views of the blocking mechanism in the releasing position of figures 2
35 and 3;
 – Figure 5 is a view of the loading system in a blocking position;

- Figures 6A-B are views of the blocking mechanism in the blocking position of figure 5;
- Figures 7A-C are views of the blocking mechanism in the blocking position of figures 5 and 6; and
- Figure 8 is a view of the loading system with the bin in the emptying position.

5 Refuse truck 2 (Figure 1) is provided as collection vehicle with loading system 4, vehicle cab 6 and collector 8 in which goods, such as waste, can be placed. In the shown embodiment loading system 4 is a side loader system which can be arranged on a side of refuse truck 2. Refuse truck 2 is further provided with chassis 10 and tailgate 12 for emptying collector 8. In addition, refuse truck 2 is provided in the shown embodiment with press 14 and hopper 16 with an unloading
10 opening. Hopper 16 is further provided with waste slide-off plate 18. Loading system 4 is further provided with loading frame 19 with lifting mast 20 over which lifting carriage 22 can move in an at least partially vertical direction in order to perform the lifting movement. Coupling means 23 are provided for mounting loading system 4 on refuse truck 2. Lifting arms 24, 26 are provided on loading system 4 and configured to pick up bin 28 (Figure 2). In the shown embodiment tilting
15 cylinder 30 is provided for tilting of bin 28.

Lateral positioning mechanism 32 (Figure 1) is provided with side guard 34 and lateral correction cylinder 36. Lifting arm cylinder 38 enables the height movement for the bin. Lifting arms 24, 26 are further provided with so-called trunnion pick-up point 40 which can engage on trunnion 42 (Figure 2) of bin 28. In the shown embodiment lifting mechanism 29 is formed by,
20 among other things, lifting arms 24, 26, lifting mast 20 and lifting carriage 22.

In the shown embodiment bin 28 (Figure 2) is provided with emptying lid 44. In the shown embodiment camera 46 (Figure 1) is optionally provided for the purpose of monitoring the unloading opening of hopper 16. Refuse truck 2 and/or loading system 4 are further provided with lifting drive 48 for loading system 4 and press drive 50 for press 14 (Figure 1). Lifting drive
25 system 51 is here formed by lifting drive 48, lifting arm cylinder 38 and tilting cylinder 30. It will be apparent that alternative drive systems can also be envisaged.

Bin 28 is provided with button 52, two sides 54, front side 56 and rear side 58. On the upper side lid 60 is provided on bin 28, wherein in the shown embodiment emptying lid 44 forms part of lid 60.

30 Loading system 4 is further provided with lid engaging mechanism 62 (Figures 2-8) and blocking mechanism 64. Lid engaging mechanism 62 is here provided with arm/lid catcher 66, which is provided rotatably around shaft 68. Arm 66 can here be moved from a releasing position (Figure 3A) to a blocking position (Figure 6A). Trunnion pick-up point 40 is provided on the inner side, i.e. toward the bin-facing side of lid engaging mechanism 62. Movement of arm 66 around
35 shaft 68 is realized using cylinder 70 and connecting arm 72. Blocking mechanism 64 is provided with blocking element 74, preferably provided with spring mechanism 76, and arranged on support

78. Support 78 is connected to frame part 80, which forms part of loading system 4. Support 78 is here connected via blocking hinge 82, in the shown embodiment preferably provided with a torsion spring, to frame part 80, whereby rotation about hinge 82 in direction A is possible (Figure 3A). Blocking mechanism 64 is further provided with first blocking guide 84 in the form of a blocking roller and second blocking guide 86 which is likewise embodied as a blocking roller in the shown embodiment. A variant can be for rollers 84 and 86 to be embodied as a guide block or as a profile or plate, as a cost-effective alternative which may however have slightly higher friction.

5 In the shown embodiment contact element 86 is provided with contact surface 88 which comes into contact with blocking roller 84, or optionally embodied as guide block, during rotation of the arm 66 around shaft 68. In the shown embodiment blocking limiter 90 preferably comes into contact with blocking roller 84 in blocking position of blocking mechanism 64 (Figures 5-8).

10 Rotation in rotation direction A (Figure 3A) moves blocking element 74 in direction B (Figures 4C and 7C). Blocking element 74 is here provided with contact surface 92, which in blocking position engages on side 94 of rib 96 which is arranged on bin 28. Depending on bin type 15 28, arm 66 can engage on upper trunnion 98 in a blocking position. Blocking mechanism protector 100 (Figure 7C) is further shown schematically.

In use refuse truck 2 is provided with loading system 4 and in a releasing position (Figures 2-4C) it is positioned relative to bin 28. Lifting arms 24, 26 are brought into position relative to bin 28, optionally using lateral positioning mechanism 32 (Figure 1). So-called trunnions 42 are placed 20 in trunnion pick-up points 40 of respective lifting arms 24, 26. Prior to or during lifting of bin 28 with loading system 4 lid engaging mechanism 62 is activated using cylinder 70. Movement of cylinder 70 is converted via connecting arm 72 into rotation of arm 66 around shaft 68, for instance through an angle of about 90°, wherein arm 66 is brought into blocking position (Figures 5-8). Contact element 86 and limiter 90 also co-rotate during rotation of arm 66. Guide roller 84 is 25 moved in direction B by contact element 86, wherein blocking element 74 will engage on side 94 of bin rib 96 (see for instance Figures 7A, C). Movement in direction B is enabled here by rotation of support 78 around hinge 82, optionally via further connecting elements. Spring element 76 is provided to resiliently move or be able to retract blocking element 74 in direction B, which corresponds with the longitudinal direction of blocking element 74 in the shown embodiment. 30 During emptying (Figure 8) blocking element 74 inhibits a further rotation of bin 28 in direction C, thereby preventing over-rotation of bin 28.

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 bin into a collector, the loading system comprising:
- a loading frame mountable on the collector with coupling means;
 - 5 – a lifting mechanism arranged on the frame and configured to pick up, lift and empty the bin, wherein the lifting mechanism is provided with two lifting arms for picking up the bin;
 - a lifting drive system connected operatively to the lifting mechanism and configured to drive the lifting mechanism;
 - a lid engaging mechanism configured to engage on a lid of the bin; and
 - 10 – a blocking mechanism connected operatively to the lid engaging mechanism and configured to prevent over-rotation of the bin during emptying.
- wherein the blocking mechanism is provided with a blocking element which is configured to engage on the bin.
- 15 2. Loading system according to the foregoing claim, wherein the blocking mechanism comprises a blocking hinge configured to move the blocking mechanism to and from the bin.
3. Loading system according to the foregoing claim, wherein the blocking hinge comprises a torsion spring.
- 20 4. Loading system according to any one of the foregoing claims, wherein the blocking mechanism comprises a blocking guide configured to bring the blocking mechanism from a releasing position into a blocking position.
- 25 5. Loading system according to the foregoing claim, wherein the blocking guide is provided with at least one blocking roller or guide block.
6. Loading system according to the foregoing claim 4 or 5, wherein the lid engaging mechanism is provided with a contact element configured to engage on the blocking guide.
- 30 7. Loading system according to the foregoing claim, wherein the contact element comprises a contact surface which is embodied to co-rotate with the lid engaging mechanism.
8. Loading system according to any one of the foregoing claims 4-7, wherein the lid engaging mechanism is further provided with a blocking limiter configured to limit movement of the blocking mechanism toward the bin.
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9. Loading system according to any one of the foregoing claims, wherein the blocking element comprises a spring mechanism which is configured to retract the blocking element in a longitudinal direction of the blocking element.

5 10. Loading system according to any one of the foregoing claims, wherein the loading frame is provided with a lateral positioning system configured to position the lifting mechanism in lateral direction relative to the bin.

10 11. Loading system according to any one of the foregoing claims, wherein the blocking element is provided with a contact surface for engaging on the bin.

12. Loading system according to any one of the foregoing claims, wherein the blocking mechanism comprises a blocking mechanism protector.

15 13. Collection vehicle provided with a loading system according to any one of the foregoing claims.

14. Collection vehicle according to the foregoing claim, wherein the loading system comprises a side loader system.

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15. Method for emptying a bin, the method comprising the steps of:

- providing a loading system and/or collection vehicle according to any one of the foregoing claims;
- picking up the bin to be emptied with the lifting mechanism;
- 25 – lifting and emptying the bin;
- preventing over-rotation of the bin with the blocking mechanism; and
- setting down the emptied bin.