

CONTAINER HANDLING APPARATUS AND METHOD

TECHNICAL FIELD

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This invention is directed to container handling systems and apparatus (mechanism), as well as methods for container handling. It has particular, but not exclusive, application to vehicles including such systems and apparatus. It also has particular but not exclusive apparatus to garbage bin handling systems, apparatus and methods.

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BACKGROUND OF THE INVENTION

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Vehicles having container handling mechanisms are known. One example is garbage (refuse) collection vehicles, which commonly include a hold or container area into which garbage is loaded i.e. emptied, and a docking area where garbage containers i.e. garbage bins, are brought to be emptied into the hold area by a container handling mechanism.

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Previously considered garbage collection vehicles typically use an arm or pair of arms to raise a garbage container/bin from the ground, and tip the container so that the contents are deposited in the garbage hold area.

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Such garbage containers or bins often have wheels on the base so they can be maneuvered i.e. moved from one location to another by refuse personnel or others. These bins are typically referred alternatively to “wheelie bins”. Refuse bins are typically emptied into appropriate containers in rubbish or garbage trucks. Typically, at the back of these trucks is a large opening for the container for rubbish.

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However, in order to do this, bins have to be lifted up. In order to save labour, trucks often have lifting and/or tipping mechanisms, adapted to cooperate with the bin to empty the bin into the truck container. In such cases the bins have to be carefully aligned by refuse personnel with such mechanisms in order for the operation and co-operation of the mechanism and bin. This can be tedious and

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time consuming. In addition, the mechanism required to grip and lift the bin can be complex and expensive.

The applicant does not concede that the prior art discussed above forms part of
5 the common general knowledge in the art at the priority date.

SUMMARY OF THE INVENTION

In one aspect is provided a container handling apparatus adapted to engage with
10 and lift a container, said container including a lip, comprising: a main arm configured to be actuated up and down a first axis; a locking arm connected to said main arm via a pivot point, and adapted to rotate around a rotational axis about said pivot point, to and from a first extended position away from the main arm; biasing means arranged to urge the locking arm around the rotational axis to said first
15 extended position.

Implementation of the techniques disclosed herein may allow for provision of a container/bin handling system which is an improvement over the prior art, including also being cheaper to manufacture.

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Said first axis is preferably substantially vertical.

Said rotational axis is preferably substantially perpendicular to said first axis

25 The distal tip portion of said locking arm is preferably above said pivot point.

Said biasing means may comprise spring means.

Said biasing means may comprise a tension spring whose ends connects to a point
30 on the main arm and a point on side arm.

The apparatus may include a guide rail or track adapted to guide said main arm up and down along said first axis.

The apparatus may be configured such that on downward actuation of the main arm, with the locking arm in its extended first position, causes consequential downward movement of distal (tip) portion of the locking arm so as to contact/engage the lip portion of an adjacently placed container, causing the locking arm to be pushed by
5 said lip around the rotation axis towards said main arm.

The apparatus may be further configured such that further downward movement of said main arm causes the distal tip of said locking arm to brush against the lip until a point is reached where the distal tip of the locking arm is urged by the biasing
10 means back away from the main arm to a position underneath the lip.

Said position underneath the lip is an engagement/locking position where the distal tip of the locking arm contacts the underside of the lip.

15 The apparatus may be further configured such that subsequent upward movement of the main arm causes the distal tip of the locking arm to move upwards to contact the bottom of the lip in an engagement/locking position.

The apparatus may be configured such that subsequent or further upward movement
20 of the main arm causes consequential upward movement of the distal tip of the locking arm in the locking position so as to raise the container.

The tip of the locking arm and/or the lip of the container may be formed such that in said locking position, the tip of said side arm is wedged under the lip.
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The apparatus may be further configured such that the main arm is configured to be rotatable about a rotational axis, said second rotational axis substantially perpendicular to said first axis.

30 In another aspect is provided a truck including a truck receptacle located thereon and an apparatus as claimed adjacent to said receptacle.

In a further aspect is provided a method of lifting a container, said container including a lip, comprising the steps of: a) placing an apparatus according to the above and/or said container adjacent to each other, b) actuating said main arm downwards such the distal tip of said locking arm moves downwards to contact said lip, and such that further movement of said main arm downwards causes the locking arm to be pushed against said biasing means by said lip, to a position away from said extended position, c) continuing to actuate said main arm downwards to point where the tip of the locking arm is urged by said biasing means to a position underneath said lip; and d) subsequently actuating said main arm upwards.

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Said position underneath said lip may be a locking/engagement position.

In step d) consequential movement upwards of the tip of the locking arm may cause it to contact the underside of the lip in a locking/engagement position.

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In step d) continued upward movement of said main arm may cause container to be lifted via contact of the distal tip portion of said locking arm and the underside of said lip.

20 BRIEF DESCRIPTION OF THE DRAWINGS

The present invention is now described by way of example with reference to the accompanying drawings in which:

- Figure 1 shows a cross section of a typical refuse (garbage) bin;
- 25 - Figures 2a, 2b, 2c, 2d, 2e shows the apparatus in operation;
- Figure 3 shows an alternative arrangement;
- Figure 4a, 4b and 4c show further exemplary arrangements;
- Figure 5 illustrates a yet further exemplary arrangement.

30 DESCRIPTION OF THE PREFERRED EMBODIMENTS

Figure 1 shows a cross section of a typical refuse (garbage) bin 1. Such refuse bins may be utilised such that they are located exterior to a property, and filled

with rubbish or garbage. They may be located for example exterior or interior to a property (building) at the base thereof e.g. at the outfall of a rubbish chute e.g. in an apartment block where residents empty rubbish into entry portals to a rubbish chute and the rubbish falls under gravity to exit the chute and into the open topped
 5 bin.

As can be seen typically these bins typically include a rim or lip 2 around all or part of the open top portion (perimeter) of the bin. Typically, the rim forms a recess 12 which is e.g. in the form of an upside-down V or U shape. The bin lip
 10 bottom surface/end is designated with reference numeral 11 and the outer surface of the lip is referred to with reference numeral 23.

As mentioned, such refuse bins often have wheels on the base so they can be maneuvered i.e. moved from one location to another. These bins are typically
 15 referred alternatively to “wheelie bins”. Refuse bins are typically emptied into appropriate containers in rubbish or garbage trucks. Typically, at the back of these trucks is a large opening for the container for rubbish.

However, in order to do this, bins have to be lifted up. In order to save labour
 20 trucks often have lifting and/or tipping mechanisms, adapted to cooperate with the bin to empty the bin into the truck container. In such cases the bins have to be carefully aligned by refuse personnel to the mechanisms for the operation and co-operation of the mechanism and bin. This can be tedious.

25 The inventors have made use of the fact that most bins include a lip or rim 2 to provide novel mechanisms, systems and methods which can be used to both engage and lift the bin by virtue of the lip.

Figure 2a, 2b, 2c, 2d and 2e shows schematically one example showing a novel
 30 mechanism, generally designated 3, and its operation to engage and grip a bin automatically and to lift the bin. The mechanism here may be utilised on the back of a refuse truck but is not limited to this and such mechanisms may be used

anywhere including on static rubbish containers which are used to take rubbish from such bins/containers with a lip.

The mechanism includes a main (dump) arm 4 which is adapted to move up and down i.e. generally vertically e.g. in relation to the back of the truck as shown by arrows A. An appropriate actuation mechanism may be provided to manifest the up and down movement of the arm. For example, a guide rail or track 5 may be provided disposed in a generally vertical orientation e.g. on the back of the truck. The dumper main arm can be guided up and down along a corresponding vertical axis 20 by means of component or portion 7 of the main arm 6 which co-operates with the guide rail/track slide so as to slide up and down in relation thereto (when actuated by appropriate actuation means, not shown) but allows no other e.g. lateral movement. e.g. a lug in of the main arm can be inserted between two track portions of a guide rail (not shown) in a track such that lug and thus main arm can only move vertically up and down by virtue of the lug moving in a slot in the guide rail or in between two sub rails of a guide rail. In further embodiments as will be explained hereinafter the main arm may also be adapted to rotate about a pivot e.g. provided in the lug. The skilled person would envisage other mechanisms to allow movement having a vertical component of the dumper main arm.

The extent of travel of the lug 7, and thus main arm along the rail or guide track is shown by arrow X in the figures. To recap there are actuation means, not shown, such as hydraulic means which move the arm up and down along the track along a vertical axis shown by arrows A.

Rotatably connected to the main arm, about pivot (point) 9, is a side or locking arm 8. This locking arm is rotatable along rotation axis, at pivot point 9 perpendicular to the page, and the rotational movement is shown by arrows B. The distal end (tip) of the locking arm can thus move to and away from the main arm and the arrow C shows the extent (limits) of such movement in an example. Figure 2a shows the locking arm in its fully extended position away from the main

arm. Although the main and locking arm are referred to as “arms” and in the example are elongate, they may be any shape.

There is provided means to bias the locking arm to an extended position which is that shown in figure 2a i.e. to bias the locking arm clockwise, to the position fully extended as shown in figure 2a. This may be by spring means such as a torsional spring at the location of the pivot point 9. The skilled person would be aware of various ways this may be achieved and another example disclosed hereafter describe an alternative mechanism to bias the locking arm in an open position.

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In operation the mechanism is placed close to i.e. adjacent to a bin 1, the bin including a lip 2. Figure 2 shows the top (lip) portion of the container or bin with the lip. The main arm (and thus the locking arm additionally) is then moved downwards shown by the large arrow F in figure 2b as a result of actuation (e.g. along a guide rail or track) from the raised position of figure 2a to that shown in figure 2b where the distal (tip) portion of the locking arm brushes to contact the to contact the outer surface of the perimeter (lip portion) 23 of the bin such that, on continued downward movement, the perimeter/lip portion forces the locking arm anticlockwise against the biasing means. In other words, as the locking arm moves down, the tip 21 contacts the bin lip and as it brushes past the lip, the bin lip will push the locking arm inwards, i.e. towards the main arm by anti-clockwise rotation shown by arrow D.

Eventually, further downward movement of the main arm and thus locking arm causes a point to be reached where allowing the locking arm to goes below the bin lip bottom surface 11 as it continues to travel downwards. So, in other words, as the distal end (tip) of the locking arm passes the end of the bin lip, the locking arm will move away from the main arm, by virtue of the (e.g. spring) biasing means i.e. rotate clockwise in the direction of arrow E shown in figure 2c such that the distal end of the locking arm moves to a position under the rim i.e. underneath recess 12 of the U-shaped lip 2. This may provide an engagement or locking position where the distal tip of the locking arm contacts the underside of the lip; e.g. the tip is wedged in the lip recess. Alternatively or additionally. subsequent

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upward movement of the main arm causes the distal tip of the locking arm to move upwards to contact the bottom of the lip in an engagement/locking position. In other words, subsequent upward movement of the main arm causes the distal tip of the locking arm to move upwards to contact the bottom of the lip in an engagement/locking position if not already in a locking position.

In such (e.g. locking) positions the bin can be raised. The main arm is then actuated upwards as shown by arrow F which lifts the bin upwards on the locking arm as shown in figure 2d. So in other words subsequent or further upward movement of the main arm causes consequential upward movement of the distal tip of the locking arm in the locking position so as to raise the container/bin.

Figure 2e shows the arrangement in a raised position where the bin has been lifted by the mechanism to a top position. The lug has moved to its furthest extent along line X. The main arm may have pivot means 23 such that it is rotatable about a pivot point 13 allowing the mechanism and with bin to be rotated i.e. anticlockwise to tip and thus empty the bin as shown by arrow G.

The lip portion of (rubbish) containers is usually formed as the perimeter of the open-ended container at the top. However, reference to the lip portion should be understood as any engagement lip, and may be located anywhere on the container/bin.

Figure 3 shows an alternative design. Like components have identical reference numerals to figure 2. The main arm is slidable up and down along a main track 14 disposed vertically e.g. and arranged on the back of a refuse truck with two guide rails 15. The main arm at the base may include a bush, bearing or lug 16 may be located between two guide rails of the track in order to guide the mechanism i.e. the main arm and thus the locking arm vertically along a defined vertical axis, as well as allowing rotation of the arm relative to the rail. Means to bias the locking arm outwards i.e. to the extended position, comprises a tension spring 17 disposed between a point on the locking arm and a point on the main arm. In the figure two lugs are provided: one 18 extending from the side arm and one 19 extending from

the main arm provide end connection for the spring and the tension spring is located between points distal point on the lugs.

5 The bearing of the lug 16 may also serve as the pivot point 13 to allow rotation as described above.

While the examples of Figures 2 and 3 illustrate axis 20 being disposed vertically, (or generally/substantially vertically) it will be appreciated that it is not a significant design feature that the axis be disposed vertically but, rather, that the
 10 main arm is configured to be actuated to provide lift. Orienting the axis for the main arm to move (substantially) vertically is just one arrangement. In this respect, the main arm can be configured, for example, to be actuated in first and second directions along the first axis, thereby to provide lift or to be “lowered”, i.e. moved in the direction opposite to that in which lift is provided. Thus, while a
 15 vertical component may be required in the movement of the arm along such an axis, the axis need not be disposed vertically. It will also be appreciated that it is not required that the arm be moved linearly along an axis thereby to provide the lift.

20 Figure 4a, b, and c shows further examples where the main arm includes an optional additional support portion in the form of support arm/portion 30, which extends outwards and includes a lip portion 31. When the main arm is brought down for the side arm to engage the container/bin lip, the support arm 30 (portion) of the main arm moves down consequently, such that it envelops the top rim/lip of
 25 the bin/container, so as to provide a support surface 32 as seen in figure 4b. This limits any movement of the bin relative to the support arm in the engaged position. In particular this limits rotation of the bin away from the main arm about a pivot point at the distal tip of the side arm. This is particularly useful when the bin is being maneuvered to empty it, i.e. when the main arm is rotated to empty
 30 the bin after it has been lifted. The support portion/support arm 30 thus in examples, may be hook-formed. In figures 4a and 4b, the support arm generally is in the form of an inverted “U” or “L” or a portion of an inverted “U” or “L”. Figure 4c shows an example where the support arm 30 has generally straight

edges. Preferably the support arm 30 has a looped (curved) portion as shown figures 4a and 4b as this helps to accommodate the side arm better. The important point is that support arm can envelop i.e. surround the rim of the bin or container to provide a support surface on the inner edge of the bin rim.

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Figure 5 shows an example where there is optionally provided a manual engagement lever/arm 33 which is attached to the side arm 8. This allows refuse personnel to move the side arm about pivot point 9 towards the main arm away from the bin, against the action of the biasing spring. This can be done e.g. in a process to disengage the bin from the mechanism once the bin has been lowered after emptying; the main arm 4 is lowered such that the distal tip of the side arm moves down and thus away from under the lip of the bin and then the lever 33 is manually pushed towards the main arm in order to complete the disengagement process. The arm main 4 can then be lifted up whilst the lever is manually urged towards the main arm (e.g. for a short time) such that the side arm moves up to become free completely of the bin and prevent re-engagement therewith.

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The apparatus or mechanism described above may include various sensors such as positional or angular sensors as well as contact sensors to allow the determination of the various stages described above, thus providing information e.g. to control the actuation of the main arm (e.g. up or down).

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CLAIMS

1. A container handling apparatus adapted to engage with and lift a container, said container including a lip, comprising:
 - 5 a main arm configured to be actuated up and down a first axis;
 - a locking arm connected to said main arm via a pivot point, and adapted to rotate around a rotational axis about said pivot point, to and from a first extended position away from the main arm;
 - biasing means arranged to urge the locking arm around the rotational axis to said
 - 10 first extended position.
2. An apparatus as claimed in claim 1 where said first axis is substantially vertical.
- 15 3. An apparatus as claimed in claim 1 or 2 wherein said rotational axis is substantially perpendicular to said first axis
4. An apparatus as claimed in claim 1 to 3 wherein the distal tip portion of said locking arm is above said pivot point.
- 20 5. An apparatus as claimed in claims 1 to 4 wherein said biasing means comprises spring means.
6. An apparatus as claimed on claim 1 wherein said biasing means comprises
- 25 a tension spring whose ends connects to a point on the main arm and a point on side arm.
7. An apparatus as claimed in claims 1 to 6 including a guide rail or track adapted to guide said main arm up and down along said fist axis.
- 30 8. An apparatus as claimed in claims 1 to 7 configured such that on downward actuation of the main arm, with the locking arm in its extended first position, causes consequential downward movement of distal portion of the locking arm so as to

contact/engage the lip portion of an adjacently placed container, causing the locking arm to be pushed by said lip around the rotation axis towards said main arm.

9. An apparatus as claimed in claim 8, configured such that further downward
5 movement of said main arm causes the distal tip of said locking arm to brush against the lip until a point is reached where the distal tip of the locking arm is urged by the biasing means back away from the main arm to a position underneath the lip.

10. An apparatus as claimed in claim 9 wherein said position underneath the lip
10 is an engagement/locking position where the distal tip of the locking arm contacts the underside of the lip.

11. An apparatus as claimed in claim 9 further configured such that subsequent
upward movement of the main arm causes the distal tip of the locking arm to move
15 upwards to contact the bottom of the lip in an engagement/locking position.

12. An apparatus as claimed in claims 9 to 11 configured such that subsequent
or further upward movement of the main arm causes consequential upward
movement of the distal tip of the locking arm in the locking position so as to raise
20 the container.

13. An apparatus as claimed in claim 10 to 12 wherein the tip of the locking arm
and/or the lip of the container are so formed such that in said locking position, the
tip of said side arm is wedged under the lip.
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14. An apparatus as claimed in claim 13 further configured such that the main
arm is configured to be rotatable about a rotational axis, said second rotational axis
substantially perpendicular to said first axis.

30 15. An apparatus as claimed in claims 1 to 14 where said main arm includes a support portion or support arm extending therefrom and adapted to envelop the top rim of an adjacent container when said main arm is lowered.

16. An apparatus as claimed in claim 1 to 15 wherein said side arm includes a manual lever.

17. A container handling apparatus adapted to engage with and lift a container,
5 said container including a lip, comprising:
a main arm configured to be lowered and raised;
a locking arm connected to said main arm via a pivot point, and adapted to rotate around a rotational axis about said pivot point, to and from a first extended position away from the main arm;
10 biasing means arranged to urge the locking arm around the rotational axis to said first extended position.

18. A truck including a truck receptacle located thereon and an apparatus as claimed in claims 1 to 17 adjacent to said receptacle.

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19. A method of lifting a container, said container including a lip, comprising the steps of:
a) placing an apparatus according to any of claims 1 to 17 and/or said container adjacent to each other,
20 b) actuating said main arm downwards such the distal tip of said locking arm moves downwards to contact said lip, and such that further movement of said main arm downwards causes the locking arm to be pushed against said biasing means by said lip, to a position away from said extended position,
c) continuing to actuate said main arm downwards to point where the tip of the
25 locking arm is urged by said biasing means to a position underneath said lip;
d) subsequently actuating said main arm upwards.

20. A method as claimed in claim 19 wherein said position underneath said lip is a locking/engagement position.

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21. A method as claimed in claim 19 wherein in step d) consequential movement upwards of the tip of the locking arm causes it to contact the underside of the lip in a locking/engagement position.

22. A method as claimed in claims 19 to 21 wherein in step d) continued upward movement of said main arm causes container to be lifted via contact of the distal tip portion of said locking arm and the underside of said lip.