

LIFTING AND TILTING DEVICE

5 The present invention relates to apparatus for lifting an open top container and then tilting it to dump the contents. The invention finds particular application in the field of refuse disposal, but is suitable for any application involving such a lifting and tilting operation.

10 Certain refuse disposal operations involve lifting a bin from near ground level to one meter also above the ground in order to empty its contents into a hopper at a refuse dump. This is a strenuous operation to do manually and requires two men. Mechanised lifters have therefore been
15 used to facilitate the task. These comprise an adapted fork lift mechanism which includes a carriage on which a bin carrier is rotatably mounted. The bin carrier includes a clamping mechanism comprising a pair of arms which extend around the bin in use, and are tightened
20 onto it. The carriage is then lifted to the required height by manual cranking, or hydraulically. The bin carrier is then rotated by a separate hydraulic actuator or crank handle, to tilt the bin and empty its contents out.

25 This is a time consuming operation because the operator must actuate three separate phases of the dumping procedure individually (i.e. clamping, lifting and tilting). The three operations must, of course, also be
30 actuated individually in reverse order to return the bin to ground level after the dumping operation. The apparatus is also cumbersome and expensive because it involves separate lifting, rotating and clamping mechanisms. A further disadvantage is that the clamp

tends to damage the bins.

5 It is an object of the invention to alleviate some or all of the above, and possibly other problems associated with the known lifting and tilting device.

10 In accordance with the present invention a device for lifting and tilting a container comprises a carriage which is mounted to be movable on a frame in a vertical direction, a sub frame which is pivotally mounted on the carriage for pivotal movement about a substantially horizontal first pivot axis and which includes means for mounting a container, blocking means arranged on one side of the first pivot axis to be engaged by one side of the sub frame as it moves upwardly to cause the sub frame to rotate about the first pivot axis as the carriage continues to move upwardly, a pivot member provided on the said one side of the first pivot axis which is engaged by the said one side of the sub frame and which provides a second pivot axis about which the sub frame rotates as the carriage continues to move upwardly, and means for raising and lowering the carriage on the frame.

25 In the above and subsequent paragraphs, words such as "vertical" and "upward" relating to the sub frame should be interpreted as applying to the sub frame when it is in an upright position i.e. not tilted.

30 The device lifts and tilts a container in a single operation, since the action of lifting the container automatically causes it to tilt when it encounters the blocking means. The device preferably includes guide means for substantially preventing rotation of the sub

frame when it is below the point at which it engages the blocking means. The guide means may comprise a roller on each side of the sub frame which engages with a respective vertically extending guide surface fixed relative to the frame, the rollers being vertically offset from each other. Preferably, the blocking means is in the path of the lower of the two rollers. Thus, the sub frame is caused to rotate initially by the lower roller engaging the blocking means and being unable to progress any further upwardly whilst the centre of the sub frame continues to move upwards.

This arrangement of offset rollers prevents rotation only in one direction, and it is therefore desirable to include further guide means to prevent rotation of the sub frame in the other direction when it is below the point at which the blocking means is engaged. Preferably, therefore, the sub frame includes a vertically extending guide member which cooperates with the pivot member to provide all or part of the said guide means. Such an arrangement of course no longer restrains rotation, once the first pivot axis has been raised above the second pivot axis.

Preferably, the guide member extends upwardly beyond the remainder of the sub frame, thereby allowing a greater range of rotation. The guide member may form part of the container mounting means.

It is preferable to provide some means for inducing the sub frame to continue to rotate once the lower roller has disengaged the blocking means as the sub frame continues its upward progress. Accordingly, the weight distribution of the sub frame is preferably uneven,

whereby the sub frame tends to rotate in one sense when unrestrained from rotation. Alternatively, a formation may be provided on the sub frame which engages with the pivot member to hold the sub frame against the pivot member whilst allowing the sub frame to slide with respect to the pivot member. The sub frame is thus forced to rotate as it is propelled upwards.

Preferably, the means for mounting a container comprise a platform for supporting the container in an upright position, from which extends a wall for supporting the container when it is tilted, and flanges extending from the wall which, in use, project over the upper rim of the container to retain it in place when tilted. The term "wall" as used here can, of course, can be taken to mean any member or combination of members which extends substantially upwardly from the platform and provides support for the container when tilted. Equally, the term "platform", as used here, may be taken to mean any member or combination of members which provides support for the container when it is in an upright position. The vertically extending guide member referred to above may constitute part of the wall.

The platform is preferably fitted with rollers to facilitate mounting a container thereon.

According to the invention, a vehicle having a lifting and tilting device as described above is also envisaged. The vehicle preferably has a carrying platform on which one or more containers may be carried, on which the device is mounted.

The following description of one embodiment of the

invention is given by way of example only with reference to the accompanying drawings in which:-

Figure 1 is a view from the front of a lifting and tilting device in accordance with the invention, with the carriage in its lowermost position;-

Figure 2 is a view from the front of the device of Figure 1, with the carriage raised and partially tilted;

Figure 3 is a view from the front of the device of Figure 1, with the carriage fully raised and fully tilted;

Figure 4 is a cross section on the Line A-A in Figure 5; and

Figure 5 is a scrap view of the front of a portion of the device, showing the carriage.

Referring firstly to Figures 1 to 3, a lifting and tilting device comprises a static frame 1 within which is mounted a sliding frame 2 which is slidable in the vertical direction within the static frame 1, on rollers 14 which are retained in channels 15 on the static frame.

Referring now to Figure 4, within the sliding frame is mounted a sliding carriage 3 (not shown in Figures 1 to 3) which is, in turn, vertically slidable with respect to the sliding frame 2 on rollers 16 retained within channels 17 in the sliding frame. A hydraulic ram 4 is mounted between the base 5 of the static frame 1 and an upper horizontal cross member 6 of the sliding frame 2. Also mounted to the cross member 6 is a pulley wheel (not shown) around which passes a chain (not shown) which is secured at one end to the base member 5 and at the other end to the sliding carriage 3.

A sub frame 7 is mounted on the sliding carriage 3 so as to be rotatable about a horizontal axis. The sub frame is mounted by means of a bearing constituted by a spigot

8 projecting from the carriage against which roller bearings 9 bear, which are kept in place by an annular bearing housing 10 projecting rearwardly from the sub frame 7. The end of the spigot 8 passes through a bronze bush 11 in the sub frame 7, and the sub frame is retained in place on the carriage by means of a lock nut 12 and washer 13 on the spigot (see Figure 4). On one side (the right in the Figures) of the sub frame is mounted an upwardly extending guide plate or bar 18.

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The sub frame 7 is prevented from rotating in an anticlockwise direction (with reference to the drawings) by offset rollers 19,20, which run on guides 21 extending from the static frame 1. Approximately half way up the static frame is a cam 22 (see Figures 1 to 3 and 5), in the path of the right hand (lower) roller 19 on the sub frame.

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The guide bar 18 on the sub frame 7 passes to the left (in the drawings) of a pivot member 23 mounted on the static frame. Engagement between the guide bar 18 and pivot member 23 prevents clockwise rotation (with reference to the drawings) while the axis of the pivot 8 between the sub frame and the carriage remains below the pivot member 23.

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The sub frame also incorporates means for supporting and securing a container, in this case a refuse bin. The supporting and securing means are not shown in the drawings, but may comprise simply a platform on which a bin may rest, with an upwardly extending wall to support the bin when it is tilted, and a flange projecting over the edge of the bin from the wall, to prevent it sliding when tilted. The wall, or a portion of it, in fact

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serves as the guide bar or plate 18 in this embodiment, although this need not be the case. The wall extends upwardly higher than the bin, and has plates on each side, to act as a chute for refuse when it is tipped from the bin.

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The lifting and tilting apparatus is normally mounted on the rear of a battery operated cart, which also has a carrying platform on which a number of bins may be carried.

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In operation, a full bin is loaded onto the supporting and securing means (the platform) of a lift and tilt device mounted to the back of the cart. The hydraulic ram 4 is actuated to lift the bin to the height of the carrying platform on the cart, and the bin is then pushed across onto the carrying platform. This operation is repeated for a number of bins, and the load is then driven to a refuse dump. The bins are then, one by one, loaded onto the lifting and tilting device to have their contents discharged into a hopper whose opening is about one meter from ground level.

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When the ram 4 is actuated, the sliding frame 2 is propelled upwards with respect to the fixed frame 1. As the sliding frame moves upwards, the chain is pulled over the pulley and pulls the carriage 3 upwards with respect to the sliding frame 2.

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As the carriage 3 is propelled upwards, it is prevented from anticlockwise rotation by virtue of the offset rollers 19,20 engaging in the guides 21 and from clockwise rotation by the guide bar or plate 18 engaging with the pivot member 23. At a certain height, the lower

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of the two offset rollers 19,20 (the right hand roller in the drawings) engages with the cam 22 on the static frame 1 and is prevented from moving upwards any further. At this point the pivot 8 between the carriage 3 and sub frame 7 is at the same height as, or above, the pivot member 23. As the sub frame is propelled further upwards, it is forced to rotate in a clockwise direction, the pivot 23 limiting the extent of the rotation as the guide bar or plate 18 rests on it and pivots around it. After the sub frame has rotated through a small angle, the lower of the offset rollers 19,20 disengages from the cam 22. However, the sub frame is weighted to be slightly unbalanced to the right (in the drawings). This causes the clockwise rotation to continue as the carriage moves upwards, after the lower offset roller has disengaged from the cam 22. Ultimately, the sub frame is tilted through more than 90° and the contents of the bin are discharged.

To lower the empty bin, the hydraulic ram is deactivated and the whole return operation is effected by gravity, although damped by the resistance provided by the hydraulic system.

In a modification of the device, cooperating formations could be provided on the guide member and the pivot member 23 to slidably retain the guide member 18 against the pivot member 23. As the sub frame is propelled upwards, one side of it is tied to the pivot member, forcing it to continue to rotate after the offset roller 19 has disengaged from the cam 22. This arrangement could be substituted for, or used in addition to, an unbalanced sub frame.

In a further modification, a projection may be provided on the side of the guide bar or plate 18 to engage the pivot member 23 to obstruct upward progress of the sub frame. In this modification, the cam 22 is replaced by the pivot member 23 and may be dispensed with.

As the sub frame progresses upwards, one side of it is tied to the pivot member, forcing it to continue to rotate after the offset roller 19 has disengaged from the cam 22. This arrangement could be substituted for, or used in addition to, an unbalanced sub frame

CLAIMS

1. A device for lifting and tilting a container, comprising a carriage which is mounted to be movable on a frame in a vertical direction, a sub frame which is pivotally mounted on the carriage for pivotal movement about a substantially horizontal first pivot axis and which includes means for mounting a container, blocking means arranged on one side of the first pivot axis to be engaged by one side of the sub frame as it moves upwardly to cause the sub frame to rotate about the first pivot axis as the carriage continues to move upwardly, a pivot member provided on the said one side of the first pivot axis which is engaged by the said one side of the sub frame and which provides a second pivot axis about which the sub frame rotates as the carriage continues to move upwardly, and means for raising and lowering the carriage on the frame.
2. A device as claimed in Claim 1 including guide means for substantially preventing rotation of the sub frame when it is below the point at which it engages the blocking means.
3. A device as claimed in Claim 2 in which the guide means comprise a roller on each side of the sub frame which engages with a respective vertically extending guide surface fixed relative to the frame, the rollers being vertically offset from each other.
4. A device as claimed in Claim 3 in which the blocking means is in the path of the lower of the two rollers.
5. A device as claimed in any one of Claims 2 to 4 in



which the sub frame includes a vertically extending guide member which cooperates with the pivot member, to provide all or part of the said guide means.

5 6. A device as claimed in Claim 5 in which the guide member extends upwardly beyond the remainder of the sub frame.

10 7. A device as claimed in any preceding claim in which the weight distribution of the sub frame is uneven, whereby the sub frame tends to rotate in one sense when unrestrained from rotation.

15 8. A device as claimed in any preceding claim in which the means for mounting a container comprise a platform for supporting the container in an upright position, from which extends a wall for supporting the container when it is tilted and flanges extending from the wall which, in use, project over the upper rim of the container to
20 retain it in place when tilted.

25 9. A device as claimed in Claim 8 in which the platform is fitted with rollers to facilitate mounting a container thereon.

30 10. A vehicle having a device as claimed in any one of the preceding claims mounted thereon.

35 11. A vehicle as claimed in Claim 10 having a carrying platform on which one or more containers may be carried, the device being mounted on the carrying platform.

40 12. A device substantially as specifically herein described with reference to the accompanying drawings.