Nov. 22, 1966 J. NAAB 3,286,860
APPARATUS FOR LIFTING AND TILTING CONTAINERS
FOR EMPTYING THEM INTO A RECEIVER
Filed Feb. 15, 1965 2 Sheets-Sheet 1

Fig.1

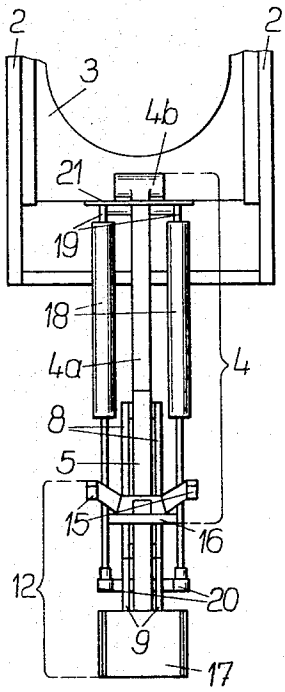

Fig.2

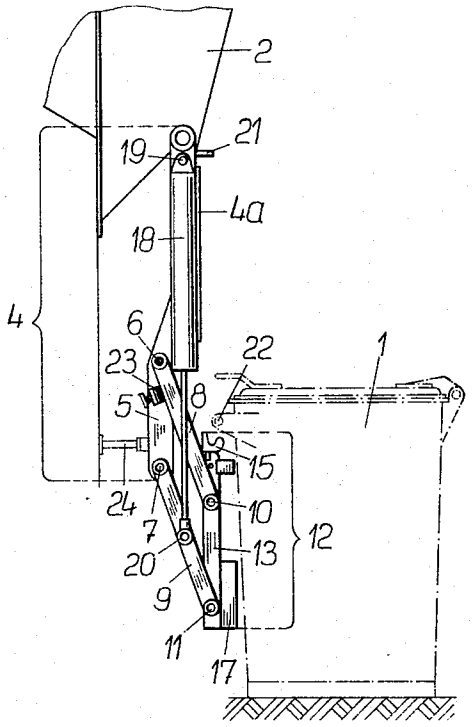

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Fig. 3

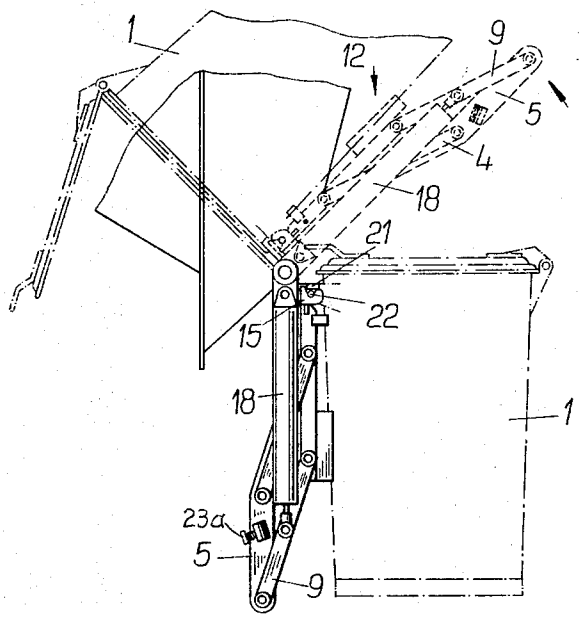


Fig. 4

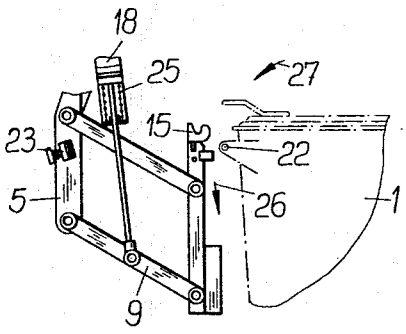
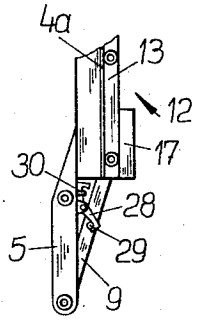


Fig. 5



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APPARATUS FOR LIFTING AND TILTING CONTAINERS FOR EMPTYING THEM INTO A RECEIVER

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7 Claims. (Cl. 214—303)

This invention relates to apparatus for lifting and tilting containers for emptying them into a receiver. The invention relates more particularly to a lifting and tilting device for a dust cart by means of which dustbins are emptied into a receiver which is closed at the back by a front plate swingable about a horizontal axis, this front plane swinging together with the dustbin into the opening of the receiver during part of the tipping movement. Tipping back, lowering and putting down the empty bin then takes place in reverse sequence of movements.

The usual kind of device used on a dust cart for lifting and tilting a dustbin have a swingable arm which is mounted on the housing of the receiver and on which a lifting carriage for the dustbin is mounted to run or slide in the longitudinal direction. These known devices have disadvantages. The guide elements and the guide path on the lifting carriage or its swingable arm are constantly exposed to the risk of considerable soiling when in operation and are therefore found in practice to wear rapidly. When a dustbin is swung into position and placed against the front plate and when it is tilted to its final position and when it is swung back and the swingable arm returns to its position of rest, considerable impacts are imparted from the lifting carriage to the swingable arm through the guide elements and paths and conversely, with the result that these parts are exposed to considerable stresses and are especially liable to breakage and other damage in operation.

The swingable arm must be of length such that it provides a sufficiently long path of guidance for the lifting carriage, with the result that there is only a slight ground clearance, i.e. in the position of rest there is only a small vertical distance between the bottom and the ground. This is a disadvantage especially in the case of heavy dust carts because these require a relatively long vertical path for the movement of the springs of the vehicle while on the other hand the swingable arm must extend downwardly so far that even when the dust cart is empty, the lifting carriage must be able to move below the suspension devices on the dustbins.

There is also known an apparatus for lifting and tilting a refuse container in which a lifting framework designed to receive the container is suspended on a guide linkage, in the form of a parallelogram linkage, attached to the rear wall of a vehicle. This appartus however does not provide a swingable arm but only an arrangement for swingably attaching the lifting and tilting device to the upper link. Consequently the forces necessary for the tilting movement and the control of these forces must be transmitted to the swingable connection between the upper link and the lifting and tilting device, in other words at a point which is most heavily exposed to wear and the risk of damage. At the same time, the control devices required for such an arrangement are especially difficult and liable to be soiled and damaged. In particular, this known lifting and tilting device provides no possibility for co-operation with a front plate forming the closure for the receiver of the contents of the refuse containers.

It is therefore an object of the invention to obviate the disadvantages of a lifting carriage which runs or slides on a swingable arm by using a guide linkage but without

dispensing with the special advantages of the well tried lifting and tilting devices with swingable arm or introducing the disadvantages of the known guide linkage of a lifting and tilting device.

According to the invention, this problem is solved in that the lifting and tilting framework is attached with its guide linkage to the lower part of the swingable arm such that in its upper end position, where its height with respect to the receiver is predetermined by the emptying process which consists in merely tilting it, its rear surface bears against the swingable arm, and the lifting and tilting framework has a lifting device which is independent of the tilting device which acts on the swingable arm. This provides the special advantage that the swingable arm can be relatively short; in practice so short that it no longer projects beyond the lower part of the dustbin as is inevitably the case with the swingable arm of the usual lifting and tilting devices. The ground clearance, which depends on the position of the lower end of the swingable arm, is thereby considerably increased, and particularly the risk of accident inherent in the hitherto known devices, due to the part of the arm projecting below the lifted dustbin, is eliminated. Owing to the fact that, according to the invention, the lifting and tilting frame bears with its rear surface against the swingable arm when the dustbin is in the raised position, it provides a very firm, resistant and positive connection between the dustbin and the swingable arm in which there are no bearing or guide elements subject to special wear and tear or forceful impacts.

The firm connection between the lifting and tilting frame and the swingable arm provides a secure and clearly defined starting position of the lifted dustbin for the tilting movement which follows the lifting movement. At the same time, the contact between the rear of the lifting and tilting frame and the swingable arm also provides a secure and accurate transmission of the tilting movement from the swingable arm to the dustbin without the use of special locking devices, this transmission being ensured during the entire process of swinging the bin into position and swinging it back again. The contact of the rear of the lifting and tilting frame with the swingable arm can be cushioned and thus damped against the transmission of impacts, which was, of course, extremely difficult if not impossible in the known moving or sliding guides of a lifting carriage on the swingable arm.

Another important advantage of the invention is that the pneumatic or hydraulic power-producing mechanisms, which in principle have proved to be satisfactory, and the control devices and control systems, which have also proved their value, can be used in the apparatus according to the invention, if necessary with slight modifications. Thus, for example the lifting device may comprise at least one pneumatically or hydraulically actuated cylinder and piston arrangement which is attached with its top end to the swingable arm and its lower end to a link. Within the scope of the invention, this even provides the further advantage that this lifting cylinder, or system of lifting cylinders, need no longer be adjusted so accurately to the path of movement of a lifting cylinder, and theerfore the means for pivoting the cylinder or piston rod can be simpler in construction and more resistant than in the known lifting cylinders for a lifting carriage.

It is advatageous to construct the guide linkage as a parallelogram linkage to ensure as far as possible a uniform support of the rear of the lifting and tilting frame against the upper part of the swingable arm.

The swingable arm itself may advantageously be set back in its lower part, which carries the bearings for the guide linkage, against the upper part which serves as

abutment for the lifting and tilting frame. The links thereby always remain within a certain angular range with respect to the swingable arm and the lifting and tilting frame, which ensures that the force of the lifting cylinder or cylinders will act at a suitable angle. The torque exerted on the links by the lifting cylinder results also, in the raised position of the dustbin, in a considerable horizontal component of force with which the lifting and tilting frame is pressed against the swingable arm. This component of force represents the minimum pressure which is further enhanced by the action of gravity on the dustbin when it is swung into position and back. The special design of the swingable arm provides the further advantage that the lifting cylinders arranged at the side of the arm can extend substantially parallel to it. The swingable arm, the lifting cylinders, the linkages and the lifting and tilting frame thus form a compact unit which is a special advantage in operation. No projecting parts, which would be especially liable to cause accidents, are required. Finally, it is also achieved that the path of movement in the form of a circular arc extending backwards, the shape of which is determined by the linkages, is relatively flat so that again the risk of accident is eliminated. On the contrary, the movement along the path of a circular arc of the lifting and tilting frame and hence of the suspension hooks attached thereto provides for the dustbin the advantage that the hooks will firmly grip from below and the front the corresponding suspension devices which are provided on the dustbin at a short distance behind the lifting and tilting device.

In one embodiment of the invention, the gripping of the the suspension device of the dustbin by the suspension hooks of the lifting and tilting frame may also be effected in that the lifting and tilting frame is slightly pressed downwards for that purpose and the suspension devices on the dustbin can then be introduced ito the suspension hooks. A spring which provides resilience for the lowermost part of the movement of the lifting and tilting frame may be inserted into at least one lifting cylinder for this purpose.

Embodiments of the invention will now be described by way of example, with reference to the accompanying drawings, in which:

FIGURE 1 is a rear elevation of a lifting and tilting apparatus, with a receiver for dustbin contents, partly in section;

FIGURE 2 is a side elevation;

FIGURE 3 is a side elevation, showing the apparatus in the raised position;

FIGURE 4 is a detail side elevation of a second embodiment of the invention, with the lifting cylinders partly in section; and

FIGURE 5 is a detail side elevation of a third embodiment of the invention, showing part of the swingable arm with the raised lifting and tilting frame in vertical section.

The embodiments shown comprise an apparatus for emptying a dustbin **1** into a dust cart, in which the dustbin **1** is first raised from the ground and then emptied by tilting it into a receiver and then swung back from the receiver and put down again on the ground. The receiver is provided for this purpose with two side walls **2** and a front plate **3** which can be swung inwards and which covers the rear opening of the receiver and is swingable on the lower part of the receiver about a horizontal axis.

The apparatus for lifting and tilting the dustbin comprises a swingable arm **4** which is mounted by means of a fishplate **4***b* so that it is swingable coaxially in the front plate **3**. Approximately along its lower third, the arm is reduced in thickness, and in its lower part **5** it is set back towards the rear wall of the dust cart or the receiver. This lower part **5** which together with the upper part forms the solid continuous swingable arm **4** carries two parallel pairs of links **8** and **9** which are arranged above one another and swingably mounted at **6** and **7** respectively. These pairs of links carry at their front end, by means of joints **10** and **11**, the lifting and tilting frame **12** which is constantly kept by them in a position parallel to the arm **4**, at least to the upper part of the arm **4**.

The lifting and tilting framework **12** comprises a frame or support **13** the length of which is adjusted to the upper part of the swingable arm **4** (see FIGURES 3 and 5). The width of the frame or support **13** may be slightly greater than the upper part of the arm **4** and if desired it may be provided with flanges to extend over the arm. At its rear surface, the frame or support **13** may carry a supporting cushion with which it bears against the upper part of the arm **4**. It is still more suitable to arrange the cushion **4***a* on the upper part of the arm **4**.

As shown, the lifting and tilting frame **12** may, like the known lifting carriages, be equipped in its upper part with suspension hooks **15** for the dustbin and below these with a supporting stirrup **16** and at its lower end with an abutment **17** for the dustbin. The stirrup **16** may be covered with a slightly harder rubber and the abutment **17** with a softer rubber. It is especially advantageous to provide the abutment **17** with a replaceable three-layered cover in which the lowermost layer is formed by a metal plate, the middle layer by a layer of rubber vulcanised on to the metal plate and the uppermost layer by a soft rubber sheet. To lift the lifting and tilting frame **12** with respect to the arm **4**, a pair of lifting cylinders **18** are provided which are pivoted at their upper end, at **19**, to the swingable arm whilst their piston rods are pivoted at **20** approximately at the middle of the lower pair of links **9**. The point of contact **20** on the lower pair of links **9** can to a large extent be selected according to the particular requirements.

Attached to the upper part of the arm **4** is a closure plate **21** against which the eyelets **22** of the dustbin **1**, which are suspended in the suspension hooks **15**, press from below when the lifting and tilting frame **12** is in its uppermost position. This effectively closes the suspension hooks **15** and secures the eyelets **22** against slipping out of the hooks **15**.

Whereas the upward movement of the lifting and tilting frame **12** is limited by its abutment against the rear surface of the upper part of the swingable arm, the downward movement is limited by the provision of abutment buffers **23** on the lower part **5** of the swingable arm, against which the links **8** of the upper pair come to rest. The position of rest of the swingable arm **4** and its end position with respect to the backward swinging movement is determined in the usual way by an abutment buffer **24** on the rear wall of the vehicle. The buffer **23** may be adjustable to compensate for any variation in the level of the apparatus which may be necessitated by the particular vehicle used.

The apparatus operates as follows:

As shown in FIGURE 2, the dustbin **1** to be emptied is first placed behind the lifting and tilting device. On actuating the main control valve (of any known pneumatic or hydraulic control system for such devices) the pistons of the lifting cylinders **18** are first supplied with pressure fluid from below and thereby the two pairs of links **8** and **9** are pulled upwards or swung about their pivots **6** and **7** respectively until the frame or support **13** of the lifting and tilting framework **12** bears against the cushioning **4***a* on the rear surface of the upper part of the arm **4**. Due to the continued pull exerted by the lifting cylinders **18**, the lifting and tilting device **12** is held in firm abutment against the upper part **4***a* of the arm **4**. Starting from this raised position, the dustbin can be swung to its correct end position with respect to the front plate **3**, which can be determined in the usual manner by abutment buffers, simply by tilting the arm **4** in any known manner, for example by means of a tilting device

(not shown) which is arranged at the side of the receiver **2** and which acts by means of a swingable shaft and the fishplate *4b*.

The backward swinging movement is again effected in the usual manner, the constant pull exerted by the lifting cylinders **18** keeping the lifting and tilting device **12** in firm contact with the swingable arm **4**. When the arm **4** has returned to its position of rest against the abutment buffer **24**, the hydraulic pressure exerted on the lower surface of the pistons in the cylinders **18** is eliminated and hydraulic pressure is now exerted on the upper surfaces of these pistons, which again takes place by the usual arrangement used in lifting and tilting devices. In this process, the pairs of links **8** and **9** are again swung downwards by the force of the piston rods moving outwards or by the weight of the dustbin until at least one of the links **8** of the upper pair makes contact with the stop **23**. In this position, the suspension hooks **15** are lowered to below the fishplates **22** of the dustbin **1** and the dustbin **1** is thus released to be carried away.

If it is desired to damp the impact of the empty dustbin on the ground as it is put down or if it is desired to introduce the fishplates **22** of the dustbin **1** into the suspension hooks **15** by hand so that this will be effected with special care, a spring **25** may be inserted into the lower part of at least one of the lifting cylinders **18**, as shown in FIGURE 4, so that the pairs of links **8** and **9** are held in a yielding fashion below their lower end position.

The above-described operation of the apparatus is then merely modified by an initial and a final movement by hand, as follows: when the dustbin **1** has been placed behind the lifting and tilting device, the lifting and tilting frame **12** is pressed downwards in the direction of the arrow **26** by means of a handle to be attached to it, and the dustbin is inclined slightly forwardly in the direction of the arrow **27** so that its eyelets **22** are situated above the suspension hooks **15**. If the lifting and tilting frame **12** is then released, the suspension hooks **15** are placed into the eyelets **22** from below by the action of the spring **35**. The procedure described above can then be continued. When empty dustbin **1** has been put down, the lifting and tilting frame **12** should then be pressed downwards slightly by means of its handle, and the dustbin **1** should be tilted slightly backwards so that the suspension hooks **15** are released from the eyelets **22**.

For longer journeys of the dust cart, for example to the depot, it is advisable to keep the lifting and tilting frame firmly attached to the upper part of the swingable arm **4** even when the lifting cylinders **18** are not under hydraulic pressure, so that the dust cart can be driven either with the arm **4** hanging down or with the arm raised and secured to the housing of the receiver by a chain. As shown in FIGURE 5 the lifting and tilting frame **12** can be held in its raised position with respect to the arm **4** by providing a swingable locking hook **28** on the lower part **5** of the arm **4**, which hook fits over a locking bolt or transverse rod **29** of the lower pair of links **9**. In normal operation, this locking hook **28** is held in the inoperative position by a spring fitted or other securing means **30**. The locking hook **28** may be so designed that in its inoperative position it automatically fits over the bolt or the transverse rod **29** when the links **9** are swung upwards. In such a case, locking can be effected by merely releasing the hook **28** from its holder **30** before the lifting cylinders **18** are put into operation. However, the lifting cylinders **18** must be put under hydraulic pressure to release the locking arrangement, the pressure in the cylinders removing the load on the hook **28** so that the hook can be lifted from the locking bolt or rod **29** and introduced into its holder **30**.

I claim:

1. An apparatus for lifting and tilting containers comprising, in combination:

(a) a lifting and tilting frame cooperable with a container to carry the same,

(b) a tilt arm, and pivot means on the upper end of the arm for swingably mounting the latter on a supporting structure,

(c) guide linkage means connecting the frame to the lower portion of the tilt arm to enable the frame and a container carried thereby to be shifted on the arm between lowered and raised positions while remaining substantially upright,

(d) said linkage means enabling the frame for the raised position of the latter to forcibly abut the tilt arm, and

(e) a power-operated lifting means comprising an elongate cylinder and piston device connected to the arm and to the frame to effect movement of the latter from the lowered to the raised position thereof independently of the pivotal position of the said tilt arm,

(f) said cylinder and piston device being disposed substantially in the same plane containing the tilt arm for all pivotal positions of the latter.

2. The invention as defined in caim **1** wherein:

(a) the cylinder and piston device has an upper end connected to the tilt arm,

(b) said linkage means comprising a plurality of link members,

(c) a lower end of the cylinder and piston device being connected to one of said link members.

3. The invention as defined in claim **2**, wherein:

(a) a spring means is provided in the cylinder of the lifting means, to cushion the lifting and tilting frame in the lower range of its movement.

4. The invention as defined in claim **1**, wherein:

(a) a stop means is provided on the tilt arm, for limiting downward movement of the lifting and tilting frame, and

(b) means for adjustably positioning the said stop means on the tilt arm, to compensate for variations in the installed height of the arm.

5. The invention as defined in claim **1**, wherein:

(a) the tilt arm has a set-back lower portion to which the guide linkage means connects,

(b) the upper portion of the tilt arm constituting an abutment for forcibly abutting the lifting and tilting frame.

6. The invention as defined in claim **1**, wherein:

(a) the upper portion of the lifting and tilting frame has hooks for engagement with a projection on the container,

(b) said tilt arm having a clamp plate on its upper portion for engagement with said container projection when the frame and container carried thereby are in the raised positions.

7. The invention as defined in claim **1**, wherein:

(a) a releasable lock means are provided on the tilt arm, for locking the lifting and tilting frame in its raised position on the arm.

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