LIFT TIPPER, ESPECIALLY FOR REFUSE BINS
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The object of the invention is to provide a lift tipper, especially for refuse bins, which, in spite of the rough handling when emptying the refuse bin, operates in a reliable manner without requiring appreciable servicing and is of simple and material-saving construction so that it can be easily produced.

The invention provides a lift tipper, especially for refuse bins, which comprises in combination with a chute, a swing arm for swinging a refuse bin into the chute, a lifting carriage arranged for hanging the refuse bin thereon and guided along said swing arm, a lifting device for mechanically raising said carriage and said refuse bin, said swing arm composed of two channel iron members placed back to back, inwardly directed guiding elements mounted on said lifting carriage and engaging in the lateral longitudinal channels between the flanges of said channel iron members, an eye arranged at the upper end of said swing arm, an abutment for the carriage provided on said swing arm below said eye, a carrierg on said swing arm, two cylinders fixed on said carrier one on each side of said swing arm, pins bolted under the action of a pressure medium in said cylinders and each provided with a pivot rod, two legs on said carriage in engagement with said pivot rods, two hooks provided with abutments and arranged on the upper end of said carriage for hanging the refuse bin thereon, and an upper elastic bearing member and a lower elastic bearing bracket provided on said carriage and constituting rest for the refuse bin.

The carriage can be composed of a channel iron embracing the swing arm on three sides, and the guiding elements are fixed on the flanges of the channel iron of said carriage so that they engage in the longitudinal channels of the two channel irons of the swing arm on both sides thereof.

Lift tipplers for refuse bins are known in which the shaft for the swing arm is arranged in front of the shaft of the front plate, that is parallel to the swing axis of the front plate on the chute. The swing arm of these lift tipplers is composed of two parts and provided at its upper end with two eyes which are fixed on the shaft.

The two halves of the swing arm are provided with longitudinal grooves facing each other in which a T-shaped sliding member can be moved with the lifting bracket. The lifting movement is effected by one or two lifting cylinders which can also be constructed as telescopic cylinders. The refuse bin is placed on the bracket and, after the upward movement followed by the swinging movement, hangs with its eyes in the hooks arranged on the front plate, whereupon the further said movement of all these parts into the chute for emptying the refuse bin takes place.

Lift tipplers are also known in which ropes are used. In these cases a cylinder is arranged on the right and left of the side wall of the chute and the pistons of these cylinders have piston rods on the lower free end of each of which one end of one of the ropes is fixed. The ropes are guided over pulleys and fixed at their outer ends to the carriage. In this form of construction the carriage is provided with three rollers on each side.

As the carriage is raised, these rollers run in U-shaped rails until the carriage has reached its upper end position. The rails are provided with apertures so that the rollers can pass out of the stationary rails during the subsequent swinging movement of the carriage with the refuse bin.

Lift tipplers are also known which consist of a swing frame composed of two U-shaped rails between which the carriage is guided up and down. The frame is swung with the carriage and the refuse bin hanging thereon in a known manner until the refuse bin, the front plate and the other parts arrive in the emptying positions.

Finally, lift tipplers are known which are equipped with a rolling piston. The swing arm consists of two or four channel irons on one side of which parallel round bars are arranged on which the carriage slides and up with the refuse bin.

All these known forms of construction require a great deal of material and working hours for their production and are consequently expensive. The complicated construction of these types also demands careful servicing without it being possible to obtain sufficiently reliable operation with these devices.

Some preferred embodiments of the invention will now be described by way of example and with reference to the accompanying drawings, in which:

FIG. 1 is a front elevation of the chute of a refuse collecting vehicle with a front plate, a return mechanism for the front plate, a tipping and lifting device including a swing arm and a carriage;

FIG. 2 is a side elevation of the swing arm arranged on the chute, with one of the cylinders for lifting the carriage;

FIGS. 3 and 3a are front elevation and side elevation views, respectively, of the swing arm;

FIGS. 4, 4a and 4b are front elevation, side elevation and top plan views, respectively, of the carriage;

FIGS. 5, 5a and 5b are front elevation, side elevation and top plan views, respectively, of a modified form of construction of the guiding elements of the carriage;

FIG. 6 is a front elevation, partly in section, of a form of construction of the upper bearing of a cylinder for lifting the carriage;

FIG. 7 is an enlarged elevation view of parts broken away and shown in section, and shows a form of construction, wherein the cylinder for lifting the carriage is a telescopic cylinder, and

FIG. 8 is a side elevation of the chute with the lifting device holding a refuse bin in an inverted position for dumping through the chute, a portion of the chute being broken away and shown in section.

As shown in FIG. 1, a known chute 1, which can be mounted for example on a refuse collecting vehicle, not shown, consists of two side walls 2 between which the swing front plate 3 is arranged. The special structure, mounting, location and operation of the front plate 3 do not pertain to the subject matter of the present invention and may be of the construction described in applicant's pending U.S. application, Serial No. 866,414, now Patent No. 3,055,561. The central aperture of the front plate 3 is closed from the rear by a closing flap, as shown in FIGS. 2, 2a and 11 of applicant's prior patent, No. 2,834,490, granted May 13, 1958. This closing flap opens automatically during the swinging-in movement of the front plate 3 by means of a linkage which also may be constructed as shown in FIGS. 2, 2a and 11 of the aforementioned patent, No. 2,834,490.

On one of the two side walls 2 of the chute 1 a known tipper 4 is fitted which effects the swinging movement. The tipper 4 is connected by means of a shaft 5 with a swing arm 7 keyed by means of an eye 10 on the shaft 5. The eye 10 is arranged in a known manner, in an aperture in the lower end of the lower front plate 3 in the center line thereof so that the front plate 3 and the swing arm 7 are coaxially mounted and have a common swing or swivel axis.
On the other side wall 2 of the chute 1 a known returning device 6 operated by a pressure medium is arranged and effectually swings the sliding of the front plate 3 and the other parts including the refuse bin, after it has been emptied, out of the swing-in positions in the chute 1 back into the initial positions.

The swing arm 7 is formed, as shown in FIGS. 1 to 3, of two channel irons 8 and 9 arranged back to back and connected one with the other, for example, by welding so that the longitudinal channels of the irons 8 and 9 face outwardly. The swing arm 7 is provided with an abutment 11 underneath the eye 10 arranged at its upper end, which abutment 11 serves for limiting the upward stroke of a lifting carriage 20 in the manner hereinafter described. The swing arm 7 also has a carrier 12 at its upper end below the eye 10, for fixing two cylinders 13 arranged laterally on the right and left of the swing arm 7. These cylinders 13 have piston rods 15 which engage two lugs 19 on the carriage 20.

As shown in FIGS. 1 and 2, the two cylinders 13 have each at their upper end an eye by which they are fixed on the left ends of the carrier 12.

According to another form of construction which is illustrated in FIG. 6, each of the two cylinders 13 has a bearing 37 which is provided with a bushing 36 and fixed laterally adjacent the upper end of the cylinder. The carrier 12, which in this case is made correspondingly shorter, is equipped at both its free ends with short axles which are provided with a circumferential groove of accurate cross-section to facilitate the manufacture thereof. A horizontal bore is provided in the bottom of the bearing 37 and in the bushing 36 and forms with the groove a transverse channel of circular cross-section. A longitudinally slotted sleeve is inserted in this channel and constitutes a clamping pin 38 holding the parts in position. By the arrangement of the bushing 36, damage to the parts by the unavoidable vibration occurring during the working operation and by seizing resulting therefrom, is reliably avoided.

In the form of construction described above, the two cylinders 13 are arranged farther up, that is higher in relation to the shaft 5, so that an advantageous extension of the stroke by 40 to 80 mm. is obtained.

Each of the two cylinders 13 has a piston 14 with the piston rod 15 which is guided in the lower end of its cylinder 13 in a packing 16. The two cylinders 13 are connected at their upper end by a pipe or tube 17 with an outlet leading into the open and provided with a filter. At their lower ends the cylinders 13 are interconnected by a common feed pipe 18 which serves for feeding the pressure medium.

Below the upper dead center position of the piston 14 a connection 34 is provided in the wall of one of the cylinders 13 from which connection a flexible conduit, not shown in the drawings, leads to the tipper 4.

The carriage 20 is equipped at its upper end with two hooks 27 on which hooks 27 the refuse bin is hung. Abutments 28 are formed on the hooks 27 for cooperation with the front plate 3, as will be explained hereinafter.

The carriage 20 also has an upper elastic bearing member 25 and a lower elastic bearing bracket 26 for the refuse bin.

The carriage 20 is made from a channel iron which embraces the swing arm 7 on three sides. Guide elements 22 or 23 are mounted on the flanges of the channel iron of the carriage 20 in such a manner that they engage in the lateral longitudinal channels between the flanges of the channel irons 8 and 9 of the swing arm 7 from both sides. The guide elements may, as shown in FIG. 4, consist in a known manner of rollers 22 which are mounted on pins 21 fixed on the flanges of the channel iron. According to another form of construction the guiding elements 23 of the carriage 20 may consist of sliding members and, according to yet another form of construction, not shown, rolling devices may be used as guide elements, which are known in engineering as roller rails or needle-hand cotes or flat cotes.

As shown in FIG. 7, the cylinders for lifting the carriage 20 can be constructed as telescopic cylinders. In this form of construction a second cylinder 31 is provided in the cylinder 13 and is guided in a packing 30 arranged at the lower end of the cylinder 13. The upper end of the cylinder 31 is equipped with a piston 29 provided with a circumferential packing. The piston 14 is arranged in the cylinder 31 with its piston rod 15 guided in the packing 29. Below the lower dead center position of the piston 14 the cylinder 31 has a connection 32 for the conduit which feeds the pressure medium.

At the upper end of the cylinder 31 an outlet 33 is arranged below the upper dead center position of the piston 14. A connection 35 at the upper end of the cylinder 13 serves for connecting to the pipe or tube 17.

The lift tipper operates in the following manner:

If the pressure medium is opened, the pressure medium flows through the feed pipe 18 simultaneously into the two cylinders 13 so that the pistons 14 slide upwardly with their piston rods 15 and raise the carriage 20 together with the refuse bin hanging thereon, until the carriage 20 strikes against the abutment 11 arranged on the swing arm. During the upward movement of the air above the piston 14 is forced into the open through the connecting pipe or tube 17 with the outlet. As soon as the carriage 20 has completed its upward stroke, the feed to the tipper 4 is automatically opened to the pressure medium. The tipper 4 rotates the shaft 5 and thereby swings the swing arm 7 fixed on the shaft 5 by its eye 10. The swing arm 7 with the carriage 20 and the refuse bin hung thereon thus carries out an arcuate movement until the refuse bin comes to rest with its upper edge on the front plate 3. The abutments 28 formed on the hooks 27 are so constructed that at the moment when the upper edge of the refuse bin reaches the front plate 3, the abutments 25 engage the outer face of the front plate 3. If desired, the abutments 25 may also be constructed so that they engage the outer face of the front plate 3 shortly before the refuse bin comes to rest thereon. In any case, the force transmitted from the tipper 4 through the shaft 5 to the swing arm 7 is further transmitted from the abutments 28 to the front plate 3 to reduce the wear on the upper edge of the refuse bin and the marginal portion of the front plate surrounding the aperture of the front plate. During the continued swinging movement of the swing arm 7, the abutments 28 cause the front plate 3 to swing about the longitudinal axis of the shaft 5 with the front plate, the shaft 5 and the swing arm 7 swinging jointly as a unit. This swinging movement takes place against the action of the return device 6 until the front plate 3 strikes a cushion means 40 arranged in the chute 1, as shown in FIGURE 8. This cooperation of the abutments 28 with the front plate 3 prevents the force of the tipper 4 from being transmitted to the front plate 3 by the refuse bin and its upper edge, so that hard blows or shocks do not occur and damage to the refuse bin is avoided.

During the swinging-in of the front plate 3, the closing flap 41 is opened by its linkage 42, 43 and 44 (FIG- URE 8). At the same time, the closure flap 41 is a lug 45 to which the lid of the refuse bin is connected which opens the lid of the refuse bin so that the refuse can slide from the refuse bin through the front plate into the refuse collecting receptacle (not shown).

During the upward stroke of the carriage 20 this is reliably guided by the guide elements 22 or 23 in the longitudinal channels of the channel iron 8 and 9 of the swing arm 7 and during the above-described swinging movement is held in its upper extreme position.

After the emptying of the refuse bin, the returning device 6 effects the swinging back of the front plate 3 and the other parts into their initial positions. As soon as the
swing arm 7 has reached its initial position, the pressure medium escapes from the two cylinders 13 and the carriage 20 slides down with the refuse bin hanging thereon, into its lower extreme position. During this downward movement of the carriage 20, the two pistons 14 move out of their upper dead center positions in the cylinders 13 into their lower dead center positions. Thereby air is sucked into the cylinders 13 from the atmosphere through the filter of the outlet of the upper connecting pipe 17. The filter prevents dust and particles of dirt from entering the cylinders 13 so that wear is as far as possible avoided.

The operation of the form of construction in which the cylinders of the lifting device are constructed as telescopic cylinders is as follows:

The pressure medium flows through the connection 32 into the cylinder 31 and forces the piston 14 with the piston rod 15 upwardly so that the carriage is raised. Before the piston 14 reaches its upper dead center position in the cylinder 31, it brushes over the outlet 33 in the cylinder 31. The pressure medium then flows out of the outlet 33 into the cylinder 13 and acts on the lower annular face of the piston 29. This causes the cylinder 31 to move upwardly in the cylinder 13. As soon as the piston 29 brushes over the connection 34, which is arranged at the upper end of the cylinder 13, before reaching its upper dead center position, pressure medium flows out from the cylinder 13 through a conduit, not shown, to the tipper 4. This measure, known per se, causes the tipper 4 to automatically commence swinging the swing arm 7 and the other parts, as soon as the vertical lifting movement of the carriage 20 with the refuse bin hanging thereon, is terminated.

Another special advantage of this arrangement consists in that the swing arm 7 with the parts coordinated therewith can easily be exchanged. This is effected by pushing out the shaft 5 laterally, with the result that the eye 10 of the swing arm 7 is accessible and the swing arm 7 can be pulled out through the lower aperture in the front plate 3. If necessary, the chute 1 equipped with an ordinary swing arm without lifting device can be exchanged for a swing arm 7 with lifting cylinders, lifting carriage and so on, and vice versa.

By constructing the cylinders 13 as telescopic cylinders a longer stroke can be attained. Thus smaller refuse bins, for example of 50 or 90 liters capacity, which are low, can be lifted, swung in and emptied.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiments are therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

We claim:

1. Lift tipper, especially for refuse bins, comprising in combination with a chute a swing arm for swinging a refuse bin into the chute, a lifting carriage arranged for hanging the refuse bin thereon and guided along said swing arm, power means for mechanically swinging said swing arm, said carriage, and said refuse bin, said swing arm composed of two channel irons placed back to back, inwardly directed guiding elements mounted on said lifting carriage and engaging in the lateral longitudinal channels between the flanges of said channel irons, an eye arranged at the upper end of said swing arm, an abutment for the carriage provided on said swing arm below said eye, a carrier on said swing arm, two cylinders fixed on said carrier one on each side of said swing arm, pistons slidably under the action of a pressure medium in said cylinders and each provided with a piston rod, two hooks provided with abutments and arranged on the upper end of said carriage for hanging the refuse bin thereon, and an upper elastic bearing member and a lower elastic bearing bracket provided on said carriage and constituting rests for the refuse bin.

2. Lift tipper as claimed in claim 1, wherein the carriage is composed of a channel iron embracing the swing arm on three sides, and the guide elements are fixed on the flanges of the channel iron of said carriage so that they engage in the longitudinal channels of the two channel iron of the swing arm on both sides thereof.

3. Lift tipper as claimed in claim 1, wherein the guide elements consist of sliding members.

4. Lift tipper as claimed in claim 1, wherein the guide elements consist of rollers mounted on pins.

5. Lift tipper as claimed in claim 1, wherein the cylinders are connected at their upper ends by a passage with an outlet leading into the open and provided with a filter and are connected at their lower ends by a common feed pipe for the pressure medium.

6. Lift tipper as claimed in claim 1, wherein each cylinder has at its upper end a laterally arranged bearing provided with a bushing, which bearing surrounds the free end of the carrier, whereby a clamping pin holds the parts in their positions.

7. Lift tipper as claimed in claim 1, wherein the cylinders are constructed as telescopic cylinders.

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