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## Kickbar assembly


### Abstract

A kickbar assembly for use in lifting and dumping a refuse container into a hopper of a rear load refuse vehicle, the kickbar assembly comprising: a pair of base frames configured to be connected to side walls of the refuse vehicle, an elongated generally U-shaped lifting implement having a pair of opposed ends pivotably connected to the respective base frames, a pair of electrically powered linear actuators, each of the linear actuators being pivotably connected to one of the respective base frames and one of the respective opposed ends of the lifting implement, the lifting implement being pivotably connected to the base, wherein the linear actuators move the lifting implement from a refuse container engaging lower position to an upper position to dump contents from the refuse container into the hopper, and further move the lifting implement to the lower position to return the refuse container to the ground surface.



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## Background/Summary

BACKGROUND

Field of the Disclosure

(1) The present disclosure relates to lifting devices for rear load refuse vehicles. More particularly, the present disclosure relates to improved kickbar assembly apparatus and methods of use, including electrically powered kickbar assemblies for use in lifting and dumping refuse containers.

Description of Related Art

(2) Various lifting devices have been utilized for lifting refuse containers to dump such containers, typically into a refuse collection vehicle, such as may be commonly referred to as a refuse vehicle or garbage truck. Such lifting devices permit lifting of larger containers that are too large to be handled manually by a refuse vehicle operator.

(3) Those familiar with refuse vehicles know that an operator may dump large bins from commercial refuse generators into a rear hopper that defines a refuse collection cavity. Larger bins are handled with the help of a cable and winch or reeve cylinder. Somewhat smaller refuse containers, such as steel bins that typically range in size from 1.5 cubic yards to 4 cubic yards are frequently serviced by using a “kickbar” assembly. The kickbar assembly essentially is used to tilt a refuse container and in so doing, to lift and dump the refuse container into the hopper of a rear load refuse vehicle. A kickbar assembly can lift and dump containers faster than would be possible with a winch, and depending on the configuration, a kickbar assembly also can lift and dump smaller bins.

(4) There are many variations of kickbar assemblies, however, they utilize hydraulic power

provided by systems on a refuse vehicle. Such hydraulic kickbar assemblies enable an operator to conveniently position a kickbar assembly that is in a lower position to be adjacent a refuse container on the ground surface. The operator then may operate a lever to cause the kickbar assembly to move to an upper position, thereby lifting and dumping the contents of the refuse container into the hopper of the rear load refuse vehicle. Upon further movement of the lever, the kickbar assembly returns the refuse container to the ground surface.

SUMMARY

(5) The disclosure pertains to improved kickbar assemblies that are electrically powered. The kickbar assemblies of the present disclosure may be configured and used to lift and dump refuse containers into a refuse collection cavity defined by a hopper that is integrated into or carried by a refuse vehicle. The kickbar assemblies are configured to be connected to side walls of a rear load refuse vehicle. If a refuse vehicle is fossil fueled and has hydraulic systems, the electrically powered kickbar assemblies will advantageously forego requiring some of the hydraulic systems to be dedicated to operating a hydraulically powered kickbar assembly. The electrically powered kickbar assemblies also may be installed on refuse vehicles that are partially hydraulically powered, or installed on refuse vehicles that are exclusively electrically powered, thereby eliminating the need for hydraulic capacity altogether. The kickbar assemblies utilize a DC electrical power source, whether provided via a dedicated battery, a vehicle battery or other electrical power generating system.

(6) As disclosed herein, the kickbar assemblies of the present disclosure are electrically powered and utilize a linear actuator, which should permit a relatively reliable and compact configuration. The kickbar assemblies have at least a lower position and an upper position for dumping a refuse container.

(7) The present disclosure provides several aspects of the subject matter which may be embodied separately or together in the devices and systems described and claimed herein. These aspects may be employed alone or in combination with other aspects of the subject matter described herein, and the description of these aspects together is not intended to preclude the use of these aspects separately or the claiming of such aspects separately or in different combinations as set forth in the claims appended hereto.

(8) In one aspect, a kickbar assembly is provided for use in lifting and dumping a refuse container into a hopper of a rear load refuse vehicle, the kickbar assembly comprising: a pair of base frames configured to be connected to side walls of the refuse vehicle, an elongated generally U-shaped lifting implement having a pair of opposed ends pivotably connected to the respective base frames, a pair of electrically powered linear actuators, each of the linear actuators being pivotably connected to one of the respective base frames and one of the respective opposed ends of the lifting implement, the lifting implement being pivotably connected to the base, wherein the linear actuators move the lifting implement from a refuse container engaging lower position to an upper position to dump contents from the refuse container into the hopper, and further move the lifting implement to the lower position to return the refuse container to the ground surface.

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## Description

BRIEF DESCRIPTION OF DRAWINGS

(1) In describing the preferred example embodiments, reference is made to the accompanying drawing figures wherein like parts have like reference numerals, and wherein:

(2) FIG. **1** is a rear perspective view illustrating an example kickbar assembly having an electrically driven linear actuator and in a lower position;

(3) FIG. **2** is a rear perspective view of the example kickbar assembly of FIG. **1** in an upper position and with optional additional hook mounting structure;

(4) FIG. **3** is a side view of the example kickbar assembly of FIG. **2** in an upper position;
(5) FIG. **4** is a perspective view of an electrically powered linear actuator utilized in the example kickbar assembly;
(6) FIG. **5** is a perspective view of an exemplary operator interface for operating the example kickbar assembly;
(7) FIG. **6** is a diagrammatic view of an example controller enclosure for use in operating the example kickbar assembly;
(8) FIG. **7** is a diagrammatic perspective view of an example position sensor that indicates the position of the example kickbar assembly to the controller;
(9) FIG. **8** is a rear perspective view of the example kickbar assembly of FIG. **1** installed on a rear tailgate of a refuse collection vehicle and with the kickbar assembly in a lower position;
(10) FIGS. **9**A-**9**C are rear perspective, front and side views of a typical ANSI Type “T” container, commonly referred to as a commercial rearload container;
(11) FIG. **10** is a rear perspective view of the ANSI Type T container of FIGS. **9**A-**9**C being dumped, with the kickbar assembly of FIG. **8** in an upper position;
(12) FIG. **11** is a rear perspective view of the example kickbar assembly and rear tailgate of a refuse collection vehicle of FIG. **8**, with the kickbar assembly in a lower position and having optional forks for lifting frontload containers;
(13) FIGS. **12**A-**12**C are rear perspective, side and rear views of a typical ANSI Type “S” container, commonly referred to as a commercial frontload container;
(14) FIG. **13** is a rear perspective view of the Type S container of FIG. **12**A-**12**C being dumped, with the kickbar assembly and optional forks of FIG. **11** in an upper position;
(15) FIG. **14** is a rear perspective view of the example kickbar assembly, rear tailgate and optional forks of FIG. **11**, with further optional folding arms for lifting 1100 liter bins having trunnion pins;
(16) FIG. **15**A-**15**C are front perspective, rear and side views of a typical 1100 liter bin having trunnion pins; and
(17) FIG. **16** is a rear perspective view of the 1100 liter bin of FIGS. **15**A-**15**C being dumped, with the kickbar assembly and optional folding arms in an upper position.
(18) It should be understood that the drawings are not necessarily to scale, with some views enlarged for enhanced viewing. While some details of the example kickbar lifting devices, including details of fastening means and other plan and section views of the particular components may not be shown, such details are considered to be within the comprehension of those skilled in the art in light of the present disclosure. It also should be understood that the present disclosure and claims are not limited to the preferred embodiments illustrated.

## DESCRIPTION OF THE ILLUSTRATED EMBODIMENTS

(19) The embodiments disclosed herein are for the purpose of providing a description of the present subject matter, and it is understood that the subject matter may be embodied in various other forms and combinations not shown in detail. Therefore, specific designs and features disclosed herein are not to be interpreted as limiting the subject matter as defined in the accompanying claims.
(20) Referring generally to FIGS. **1**-**16**, it will be appreciated that kickbar assemblies of the present disclosure may be embodied in numerous configurations and for connection to various rear load refuse vehicles. For example, the kickbar assemblies may be connected to sides of a refuse vehicle. The teachings within this disclosure pertain to use of electrically powered linear actuators that may be used in kickbar assemblies having various container engaging configurations selected to lift and dump specific types of refuse containers into a hopper defining a refuse collection cavity that is carried by or integrated into a rear load refuse vehicle.
(21) For instance, FIGS. **1**-**8** and **10** illustrate an example embodiment of a kickbar assembly **10** for use in lifting and dumping a refuse container **12** having a trunnion bar. This is the case with an ANSI Type “T” refuse container **12**, shown in FIGS. **9**A-**9**C, including perspective, front and side views, and in FIG. **10** wherein the refuse container **12** is being dumped. In this example, the

kickbar assembly **10** is connected to sides of a refuse vehicle V. The refuse vehicle V includes a hopper H. In this example, the hopper H is incorporated into a refuse vehicle V and defines a collection cavity C. The kickbar assembly **10** is located so as to lift and dump the refuse container **12** over a rear sill S of the hopper H, at the rear of the rear load refuse vehicle V, which may be otherwise referred to as a garbage truck.

(22) The example kickbar assembly **10** for use in lifting and dumping a refuse container **12** into a hopper H of a rear load refuse vehicle V, includes a pair of base frames **14** configured to be connected to side walls SW of the refuse vehicle V. The kickbar assembly **10** includes an elongated generally U-shaped lifting implement **16** having a pair of opposed ends **18** pivotably connected to the respective base frames **14**, and a pair of electrically powered linear actuators **20**. Each of the linear actuators **20** is pivotably connected to one of the respective base frames **14** and one of the respective opposed ends **18** of the lifting implement **16**. The lifting implement **16** is pivotably connected to the base **14**, wherein the linear actuators **20** move the lifting implement **16** from a refuse container engaging lower position, as seen in FIGS. **1** and **8**, to an upper position, seen in FIGS. **2**, **3** and **10**, to dump contents from the refuse container **12** into the hopper H, and further move the lifting implement **16** to the lower position to return the refuse container **12** to the ground surface.

(23) Each base frame **14** further includes an inner mounting plate **24** removably mounted to the side wall SW of the refuse vehicle V. In this example, vertical mounts **26** may be welded to the side walls SW of the refuse vehicle V and may include apertures to permit the base frames **14** to be removably connected thereto, such as by use of mechanical fasteners. Each inner mounting plate **24** also is pivotably connected at **28** to a front end **30** of the linear actuator **20** and pivotably connected at **32** to a proximal end **34** of an opposed end **18** of the lifting implement **16**.

(24) Each base frame **14** of the kickbar assembly **10** also includes an outer mounting plate **36** that is pivotably connected at **28** to the front end **30** of the linear actuator **20** and pivotably connected to the proximal end **34** of the opposed end **18** of the lifting implement **16**. In the present example kickbar assembly **10**, each base frame **14** comprises a weldment, meaning a unit formed by welding together an assembly of parts. It will be appreciated that the base frame alternatively could be constructed by having individual parts fastened together via other suitable means of connection, such as by use of mechanical fasteners or the like.

(25) Each opposed end **18** of the lifting implement **16** further comprises a beam pivotably connected at a proximal end **34** to one of the respective base frames **14** and having a distal end **38** fixedly connected to an end **40** of an elongated member **42**. Each beam at one of the opposed ends **18** of the lifting implement **16** includes an extension arm **44** located between the proximal and distal ends **34**, **38** of the respective beam. In this example, a rear end **46** of the linear actuator **20** is pivotably connected at **48** to the extension arm **44** of the beam, wherein the rear end **46** of the actuator **20** includes the rear end of a movable rod **50**.

(26) From the above description of the opposed ends **18** of the lifting element **16**, it follows that each opposed end **18** of the lifting implement **16** having a beam is pivotably connected at **32** at a proximal end **34** to one of the respective base frames **14** and has a distal end **38** fixedly connected to an end **40** of an elongated member **42**. It will be appreciated that various types of electrically powered linear actuators may be used, for example, the electrically powered actuator of this example kickbar assembly **10** includes a ball screw linear actuator.

(27) An electrical control system for operating the kickbar assembly **10** includes a controller **52** and an operator interface **54**. The operator interface **54** is used by an operator to input commands. The operator interface **54** may be connected to the refuse vehicle V, to be in a convenient location to be utilized by the operator who is responsible for operating the kickbar assembly **10**. The electrical control system also includes a position sensor **56**, shown in FIG. **7**, which determines the position of the lifting implement **16** relative to the base frame **14** during operation of the kickbar assembly **10**. As best seen in FIG. **4**, the position sensor **56** is connected to the linear actuator **20**.

(28) The controller **52** of the electrical control system includes a protective enclosure that contains a logic circuit and processor, such as a microprocessor or the like. The operator interface **54** includes a plurality of electrical inputs, such as switches, buttons, and the like, associated with controlling the kickbar assembly **10**. As seen in FIG. **5**, the electrical inputs in the present example include a safety energy Stop button **60** atop the operator interface **54**, with a switch **62** having an Up position and a Down position, and a Manual/Automatic operating mode switch **64**, which are associated with movement of the lifting implement **16**. The operator interface **54** also may include indicator lights **66**, **68** which may be configured to confirm the operational modes, movements and/or positions of the lifting implement **16**.
(29) The operator input commands entered into the operator interface **54** are provided to the controller **52** via a cable or wiring **70**, an example of which is shown in FIG. **5**. It also will be appreciated that such commands alternatively may be provided wirelessly. The controller **52** is part of the electrical control system and receives and processes the operator input commands to operate the kickbar assembly **10**. The controller **52** includes an enclosure and may be mounted on or inside of the refuse vehicle V, remotely from the kickbar assembly **10**, to be protected from physical or environmental hazards.
(30) As noted, the kickbar assembly **10** includes operator electrical inputs that include at least one switch **64** to select between at least a manual mode of operation and an automatic mode of operation. The electrical control system further includes a one-touch operation circuit which provides operation of a kickbar assembly **10** for a lifting and dumping cycle of the lifting implement **16** when in the automatic mode.
(31) The controller **52** may be electrically connected to other system components in the electrical control system by wiring, such as an example power cable **72** for connection to a power source, such as a vehicle or accessory battery. The controller **52** also may be connected to each of the pair of electrically powered linear actuators **20** of the kickbar assembly **10**, such as by a control cable **74** connected to first and second electrical linear actuators **20**. Depending on the configuration of kickbar assembly **10**, the controller **52** may have a additional control cables, as needed.
(32) Each kickbar assembly **10** may use the position sensor **56** as part of the electrical control system and it is electrically connected to the operator interface **54**, such as by the cable **76**. The position sensor **56** permits the controller **52** to monitor the position of the lifting implement **16** of the kickbar assembly **10**. Thus, the controller **52** may use the position sensor **56** and linear actuator **20** to determine the position and movement of the lifting implement **16**.
(33) The operating system for the example kickbar assembly **10** is believed to include an electrical control system having a unique controls package. For example, normal control of lifting devices in the refuse removal industry utilizes handles and/or levers that must be manually operated, such as by having an operator move a lever and hold it in a command position, such as to raise a lifting device until it achieves an upper dumping position. The operator then must move and hold the lever until the refuse container is returned to the ground surface.
(34) In contrast, the present operating system for the kickbar assembly **10** permits an operator to select between manual and automatic modes of operation. When the switch **66** is used to select the automatic mode of operation, a one-touch operation circuit is started by actuation of a button associated with an “Up” movement command, wherein the lifting implement **16** is moved from a lower position to lift the refuse container **12** from a ground surface to an upper position to dump the refuse container **12**, followed by a pre-selected dwell time in the upper position before returning the refuse container **12** to the ground surface. During the lifting and dumping cycle, the operator may move away from the operator interface **54**, while monitoring operation of the kickbar assembly **10**. The operating system will automatically control the electrically powered linear actuator **20** to move the lifting implement **16** from the lower position shown in FIG. **8** to the upper position in FIG. **10**.
(35) Accordingly, the electrically powered linear actuator **20**, in combination with the position

sensor **56**, the user interface **54** and the logic circuit and processor of the controller **52** provide a unique operator control system having significant advantages. The system remembers set positions by use of the position sensor **56** and the logic circuit and processor of the controller **52**. When in the automatic mode of operation and first moving the switch **62** to the Up position, the kickbar assembly **10** may be moved from the lower position for the first lifting and dumping cycle. Thereafter, the kickbar assembly **10** will return to the same lower position and be ready for a different refuse container to be engaged for the next lifting and dumping cycle, which the operator may start by again moving the switch **62** to the Up position. This advantageously permits an operator to avoid the strain on muscles and joints associated with having to hold a lever or handle throughout a lifting and dumping cycle of a kickbar assembly. In addition, it permits the operator to move away and prepare to engage one or more other refuse containers while the kickbar assembly **10** raises the lifting implement **16** to the upper position to dump a container, dwells and then returns to the lower position, placing the container back on the ground surface. This may enable an operator to more quickly service a refuse collection route, especially in dense city environments where the next refuse containers may be only a few steps away.

(36) Using switch **64**, the system may be switched to the manual mode of operation. This permits an operator to operate the system manually, without the optional dwell time and automated return to the lower position. This may be desired when needing to make adjustments or corrections. The operator would simply manually move the switch **62** between the Up and Down positions.

(37) The kickbar assembly **10** may utilize optional components to accommodate a refuse container having a trunnion bar. As seen in FIGS. **9**A-**9**C, an ANSI Type T refuse container includes a trunnion bar **12***a* for use in engaging and controlling the container during a lifting cycle. To utilize the trunnion bar **12***a*, as shown in FIG. **8**, the kickbar assembly **10** includes a trunnion bar receiver **80** connected to the refuse vehicle V that receives the trunnion bar **12***a* of the refuse container and guides it to a resting area **82** where it serves as a pivot for the lifting implement **16** to tip the refuse container **12**. Thus, when the kickbar assembly **10** is actuated, it tilts the refuse container **12** as the lifting implement **16** is moved to the upper position to dump contents from the refuse container **12**.

(38) The kickbar assembly **10** may be outfitted with alternative optional additional components to handle refuse containers of different configurations, such as refuse containers having couplings that receive lifting hooks, such as, for example, an ANSI Type S refuse container **112**, shown in FIGS. **12**A-**12**C. As seen in FIGS. **11** and **13**, the kickbar assembly **10** may further include a pair of lift hooks **84** connected to hook mounts **86** at the respective opposed ends **18** of the lifting implement **16**. The lift hooks **84** are configured to be received by couplings **112***a* on opposed sides of the refuse container **112**. The hook mounts **86** for the pair of lift hooks **84** may include an angular position adjustment assembly **88** and bumpers **90** for engagement of the refuse container **112** when the hooks **84** engage the couplings **112***a* on the refuse container **112** and the kickbar assembly **10** is actuated to tilt and lift the refuse container **112** to an upper position to dump contents from the refuse container **112**.

(39) Still further alternative components may be utilized as a part of the kickbar assembly **10** to accommodate other refuse containers, such as a refuse container **212** having a pair of trunnion pins **212***a*, such the example an 1100 liter refuse container **212** is shown in FIGS. **15**A-**15**C. As seen in FIGS. **14** and **16**, the kickbar assembly **10** may further include a pair of lift arms **92** pivotably coupled to the lifting implement **16** at **94**. The lift arms **92** may have pin receivers **96** configured to receive trunnion pins **212***a* located on opposed sides of the refuse container **212**.

(40) Thus, the kickbar assembly **10** may be altered to accommodate collection routes that involve alternative containers. For example, the kickbar assembly **10** may be equipped to handle only refuse containers **12** having a trunnion bar, or to additionally handle containers **112** that are lifted by hooks and/or alternatively equipped to additionally handle containers **212** that are lifted by lift arms.

(41) As noted, the embodiments disclosed herein are for the purpose of providing a description of

the present subject matter, and it is understood that the subject matter may be embodied in various other forms and combinations not shown in detail. Therefore, specific designs and features disclosed herein are not to be interpreted as limiting the subject matter as defined in the accompanying claims.

## Claims

1. A kickbar assembly for use in lifting and dumping a refuse container into a hopper of a rear load refuse vehicle, the kickbar assembly comprising: a pair of base frames configured to be connected to side walls of the refuse vehicle; an elongated generally U-shaped lifting implement having a pair of opposed ends pivotably connected to the respective base frames; a pair of electrically powered linear actuators; each of the linear actuators being pivotably connected to one of the respective base frames and one of the respective opposed ends of the lifting implement; the lifting implement being pivotably connected to the base; wherein the linear actuators move the lifting implement from a refuse container engaging lower position to an upper position to dump contents from the refuse container into the hopper, and further move the lifting implement to the lower position to return the refuse container to the ground surface.
2. The kickbar assembly of claim 1, wherein each base frame further comprises an inner mounting plate removably mounted to the respective side wall of the refuse vehicle and being pivotably connected to a front end of the linear actuator and pivotably connected to a proximal end of an opposed end of the lifting implement.
3. The kickbar assembly of claim 2, wherein each base frame further comprises an outer mounting plate being pivotably connected to the front end of the linear actuator and pivotably connected to the proximal end of said opposed end of the lifting implement.
4. The kickbar assembly of claim 3, wherein each base frame further comprises a weldment.
5. The kickbar assembly of claim 1, wherein each opposed end of the lifting implement further comprises a beam pivotably connected at a proximal end to one of the respective base frames and having a distal end fixedly connected to an end of an elongated member.
6. The kickbar assembly of claim 5, wherein each beam at one of the opposed ends of the lifting implement further comprises an extension arm located between the proximal and distal ends of the respective beam, with a rear end of the linear actuator pivotably connected to the extension arm of the beam.
7. The kickbar assembly of claim 6, wherein the rear end of the actuator further comprises a rear end of a movable rod.
8. The kickbar assembly of claim 1, wherein each opposed end of the lifting implement further comprises a beam pivotably connected at a proximal end to one of the respective base frames and having a distal end fixedly connected to an end of an elongated member.
9. The kickbar assembly of claim 1, wherein the electrically powered linear actuator further comprises a ball screw linear actuator.
10. The kickbar assembly of claim 1, further comprises an electrical control system for operating the kickbar assembly and which comprises a controller and an operator interface.
11. The kickbar assembly of claim 10, wherein the electrical control system further comprises a position sensor that determines the position of the lifting implement relative to the base frame during operation of the kickbar assembly.
12. The kickbar assembly of claim 11, wherein the position sensor is connected to the linear actuator.
13. The kickbar assembly of claim 12, wherein the controller further comprises a logic circuit and processor.
14. The kickbar assembly of claim 10, wherein the operator interface further comprises a plurality of electrical inputs associated with controlling the lifting device.

15. The kickbar assembly of claim 14, wherein the electrical inputs further comprise a “Stop” button associated with lifting implement movement commands.
16. The kickbar assembly of claim 14, wherein the electrical inputs further comprise a switch associated with lifting implement movement commands that includes at least “Up” and “Down” positions.
17. The kickbar assembly of claim 16, wherein the electrical inputs further comprise at least one switch to select between at least a manual mode of operation and an automatic mode of operation.
18. The kickbar assembly of claim 17, wherein the electrical control system further comprises a one-touch operation circuit which provides operation of a lifting and dumping cycle of the lifting implement when in the automatic mode.
19. The kickbar assembly of claim 17, wherein when the switch is used to select the automatic mode of operation, a one-touch operation circuit is started by actuation of a switch associated with an “Up” movement command, wherein the lifting implement is moved from a lower position to lift the refuse container from a ground surface to an upper position to dump the refuse container, followed by a pre-selected dwell time in the upper position before returning the refuse container to the ground surface.
20. The kickbar assembly of claim 1, further comprising a trunnion bar receiver connected to the refuse vehicle that receives a trunnion bar of a refuse container when the kickbar assembly is actuated and tilts the refuse container as the lifting implement is moved to the upper position to dump contents from the refuse container.
21. The kickbar assembly of claim 1, further comprising a pair of lift hooks connected to hook mounts at the respective opposed ends of the lifting implement, with the lift hooks being configured to be received by couplings on opposed sides a refuse container.
22. The kickbar assembly of claim 21, wherein the hook mounts for the pair of lift hooks further comprise an angular position adjustment assembly and bumpers for engagement of the refuse container when the hooks engage the couplings on the refuse container and the kickbar assembly is actuated to tilt and lift the refuse container to an upper position to dump contents from the refuse container.
23. The kickbar assembly of claim 1, further comprising a pair of lift arms pivotably coupled to the lifting implement.
24. The kickbar assembly of claim 23, wherein the lift arms further comprise pin receivers configured to receive trunnion pins on a refuse container.