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B65F 3/08 3/00

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(54) Abstract Title
Hoist for refuse containers

(57) A bin hoist comprises bin-holding means and means for moving the bin-holding means so as to lift and tip a bin, wherein there is provided means for constraining the bin when it is lifted and tipped, the constraining means comprising buffer means 60,61 which consists of fluid pressure shock absorbing means. The buffer means 60, which is identical to buffer means 61, preferably comprises at least one buffer element 68 which is made of deformable material, such as a flexible plastic, and defines a closed space containing a fluid under pressure. A valve may be provided to enable the pressure of the fluid to be adjusted as required. The buffer element 68 is preferably pivotably mounted 64,65 to brackets 66,67 on the frame 11 via two spaced parallel members 62,63, so as to remain in contact with the bin as it is tipped.

Also disclosed is a mechanism for capturing a bin on a bin hoist, comprising first capturing means 46,47 engagable beneath a bin top flange, and a second capturing means 55 engagable with an upper surface of the bin top flange, so that the bin flange can be captured between the first 46,47 and second 55 capturing means. The first capturing means 46,47 engages the lower edge of the bin flange, and lifting means then lifts the first capturing means with the bin towards the second capturing means 55, thereby capturing the bin flange. The lifting means performs this action in two movements, in which the first capturing means 46,47 is initially lifted from its first lowered position (Figure 1) to an intermediate position (Figure 2) and is then lifted to its final capturing position (Figure 3).

Figures 6 and 7 show the bin hoist in operation with two different types of bin.

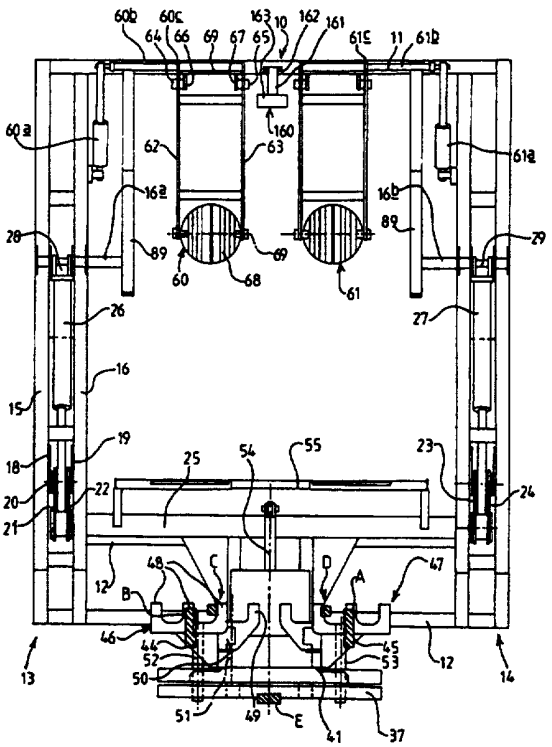

FIG 1

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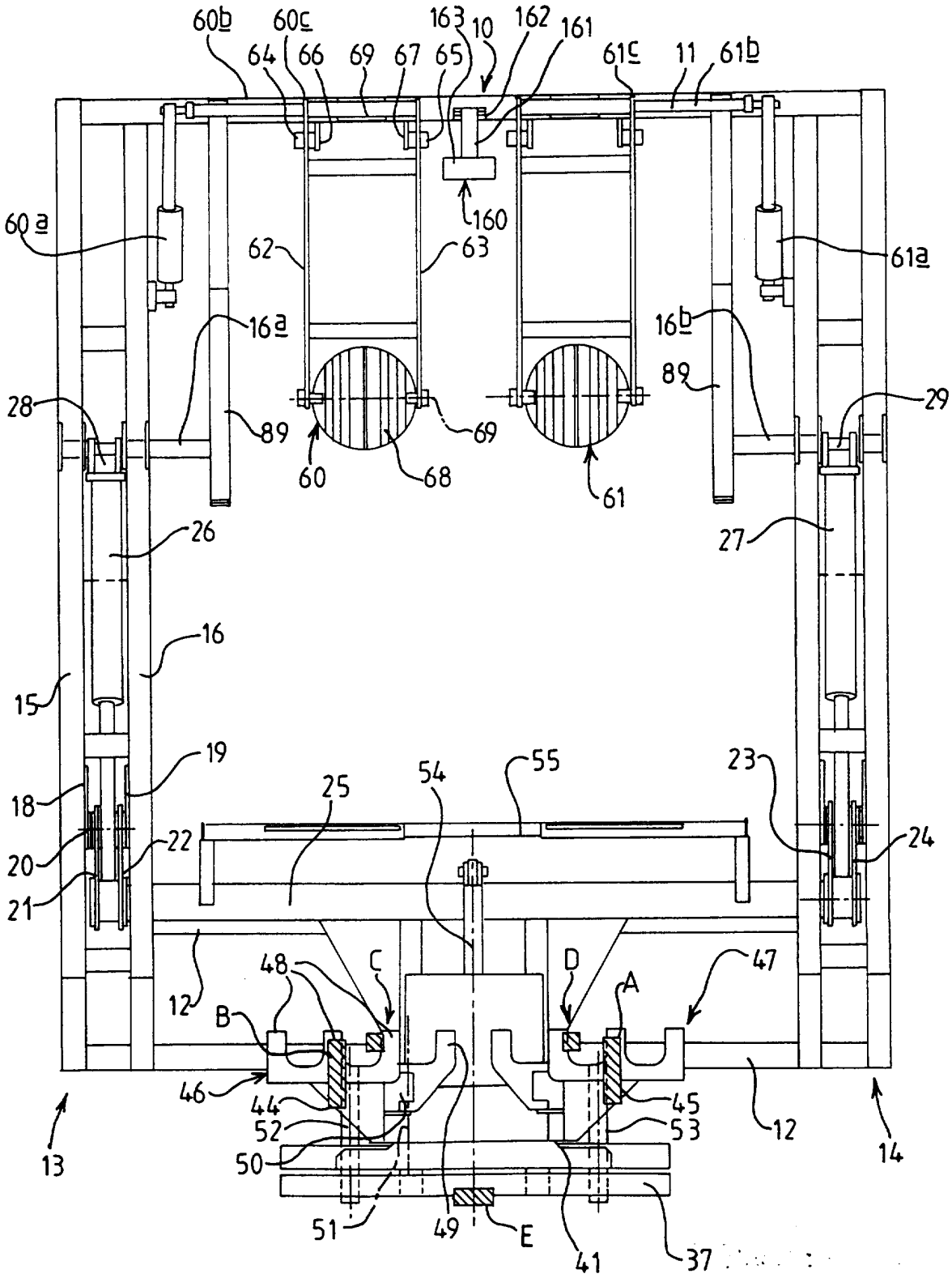
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61a
16a
16b
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C
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49
E
41
37

FIG 1

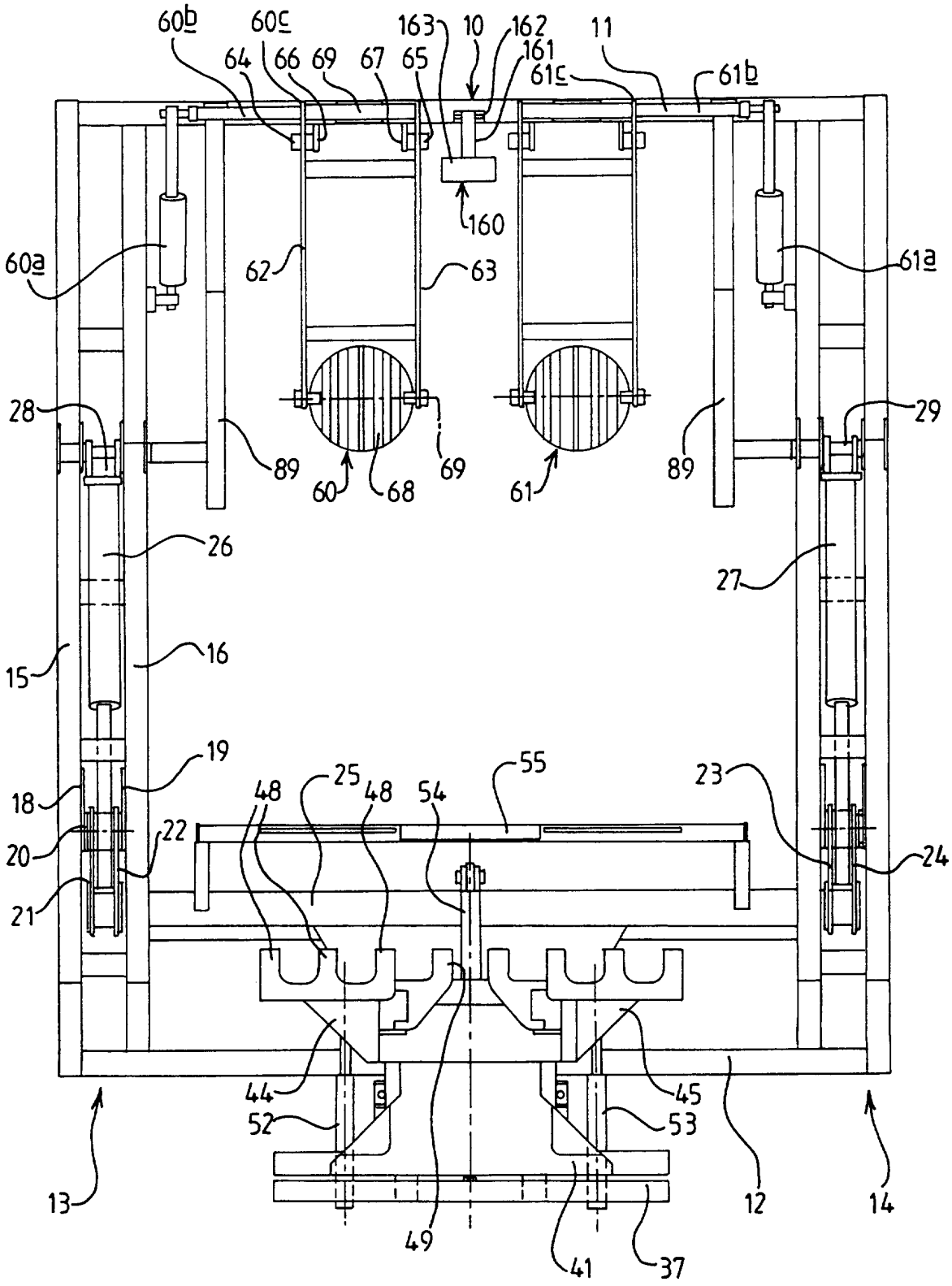
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FIG 2

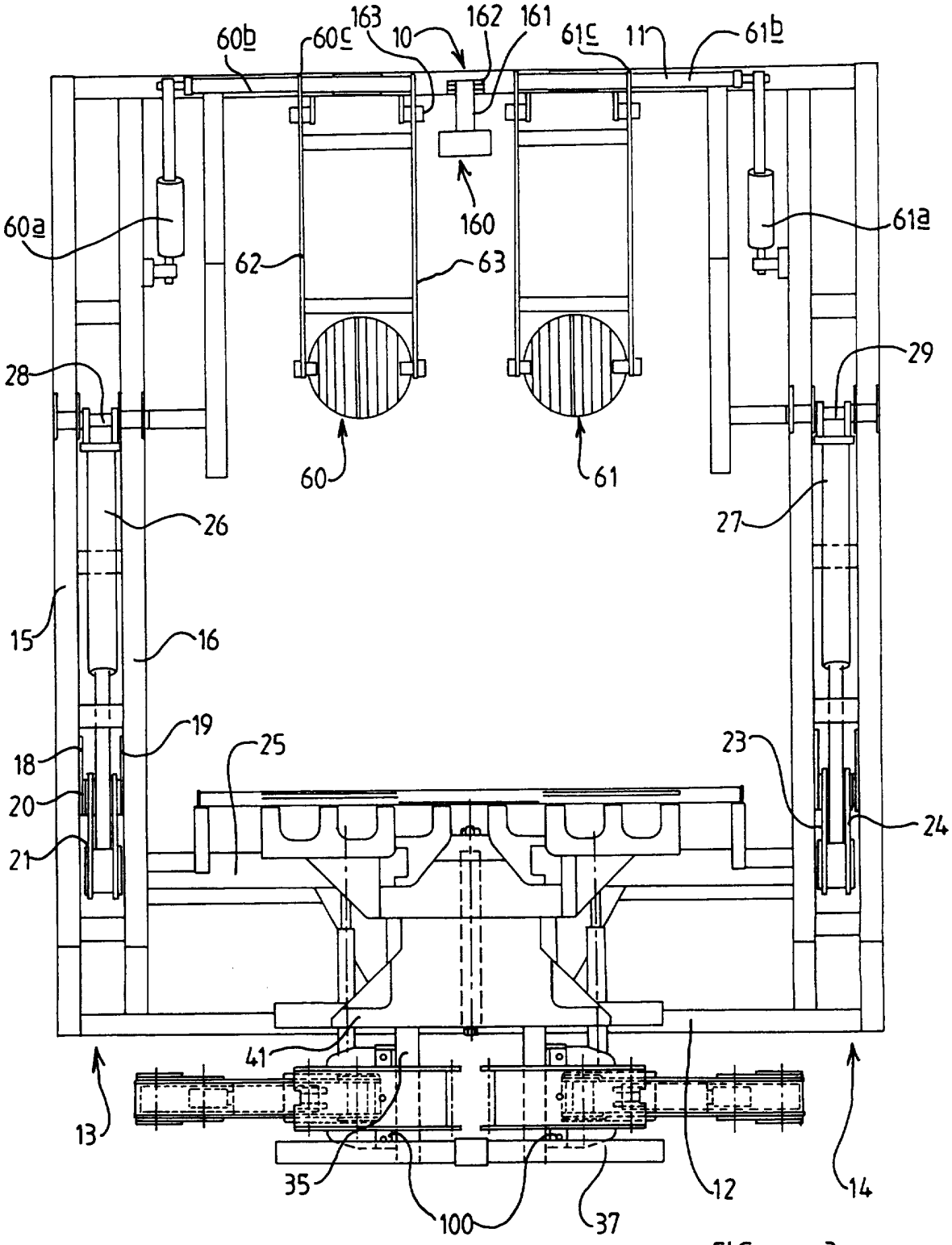
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FIG 3

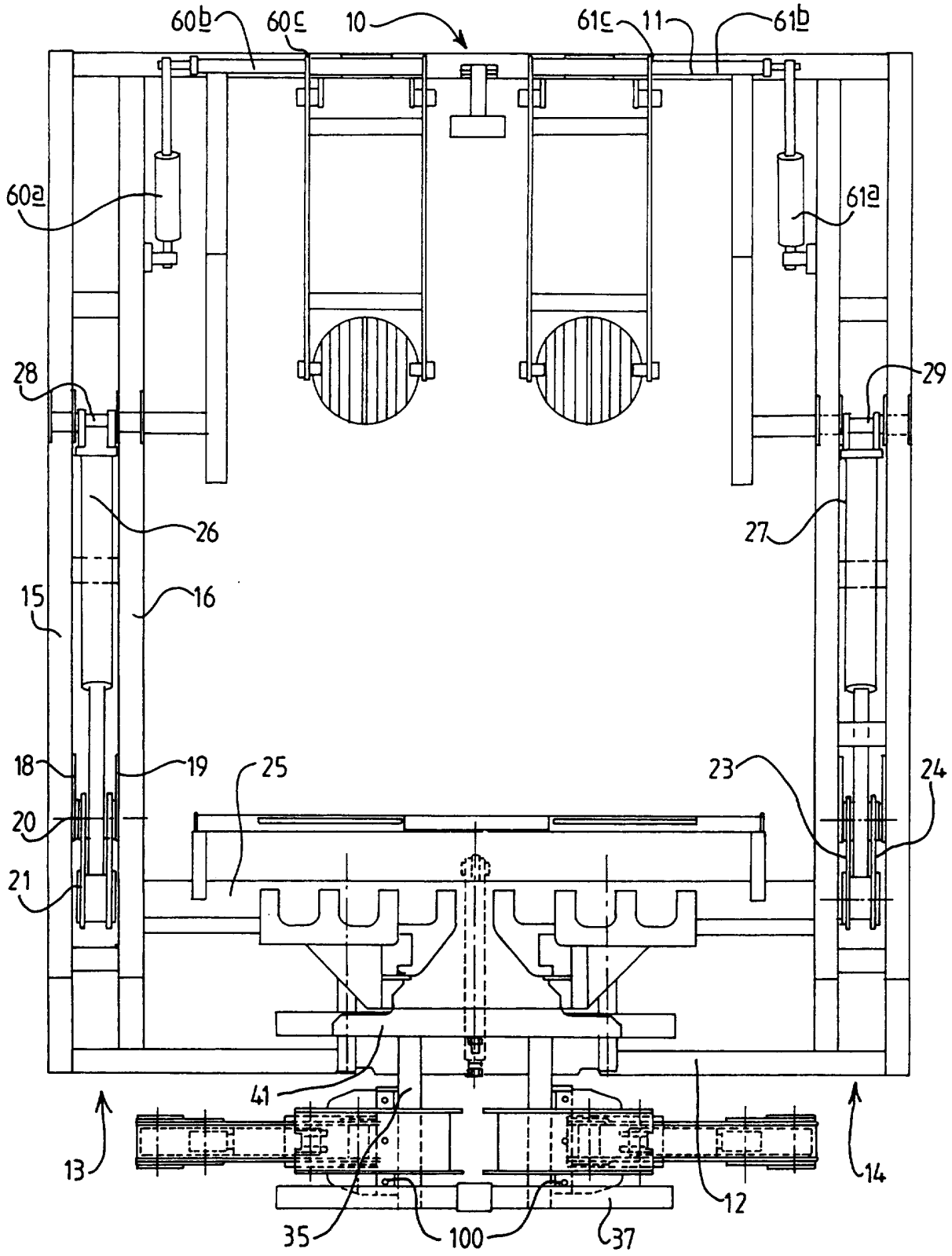
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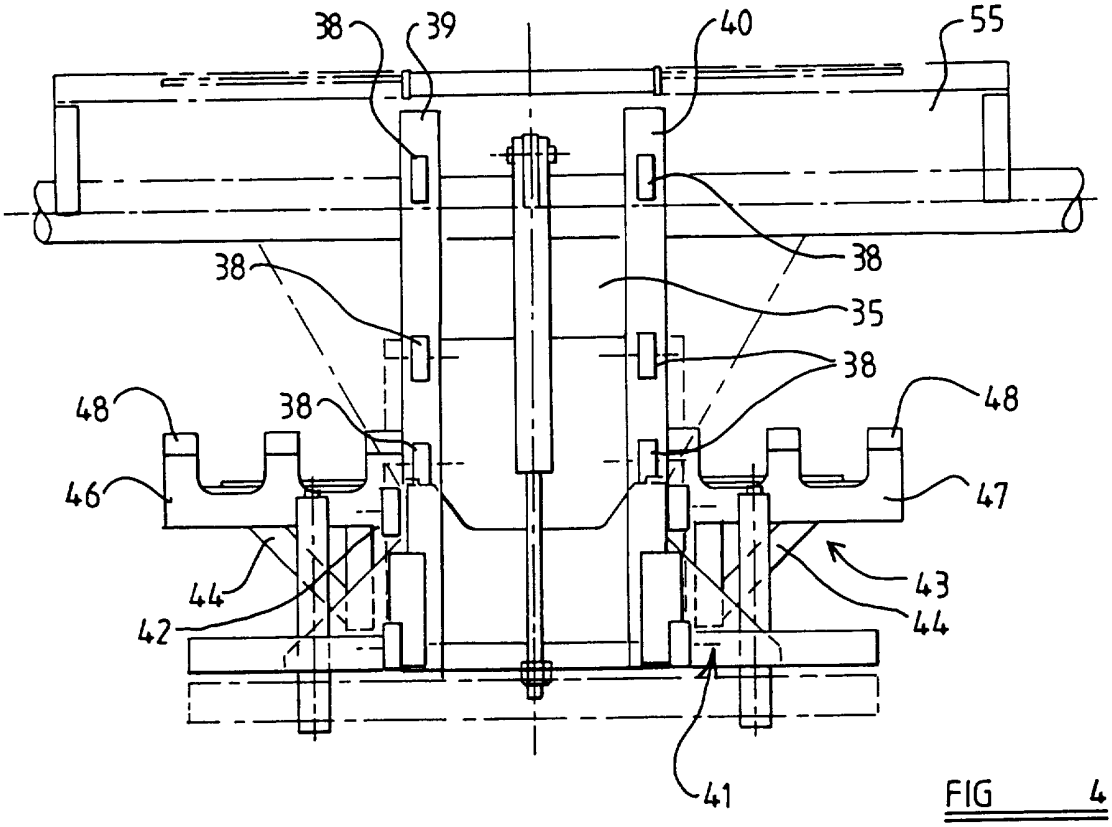
FIG 3a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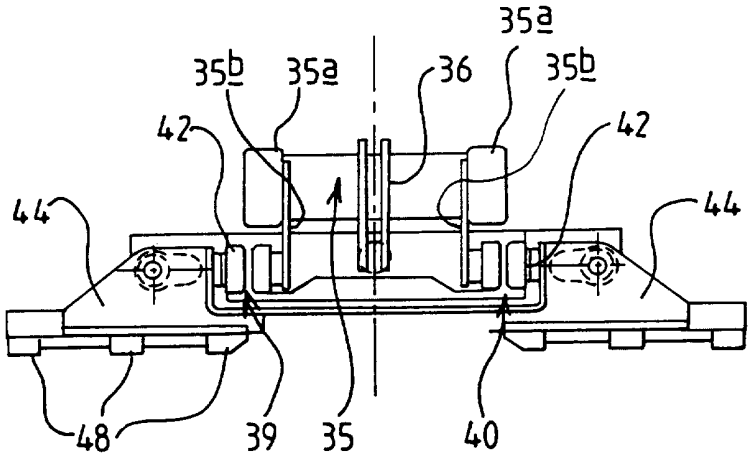
44
41

FIG 4


35a
35b
35a
36
35b
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35
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FIG 5

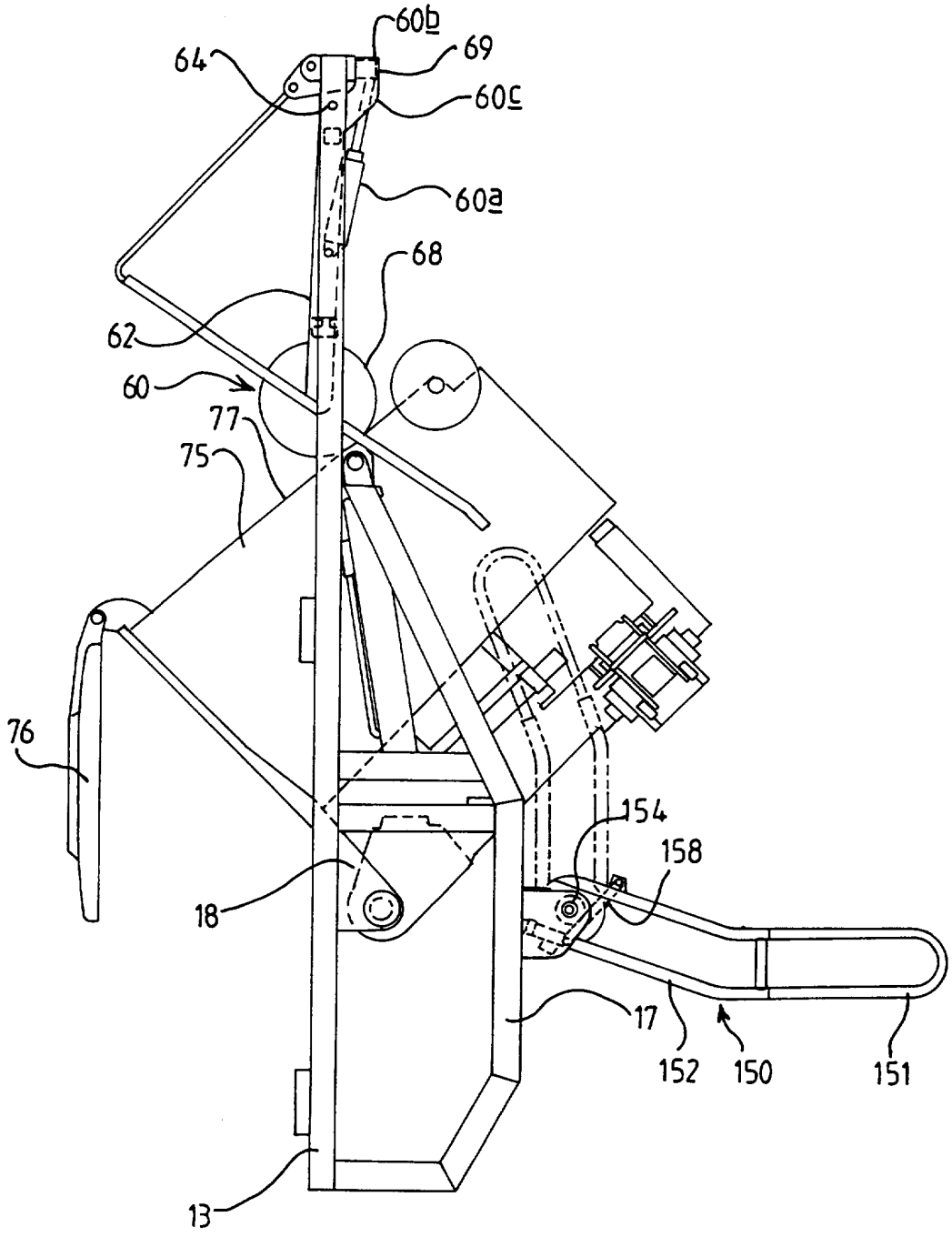


FIG 6

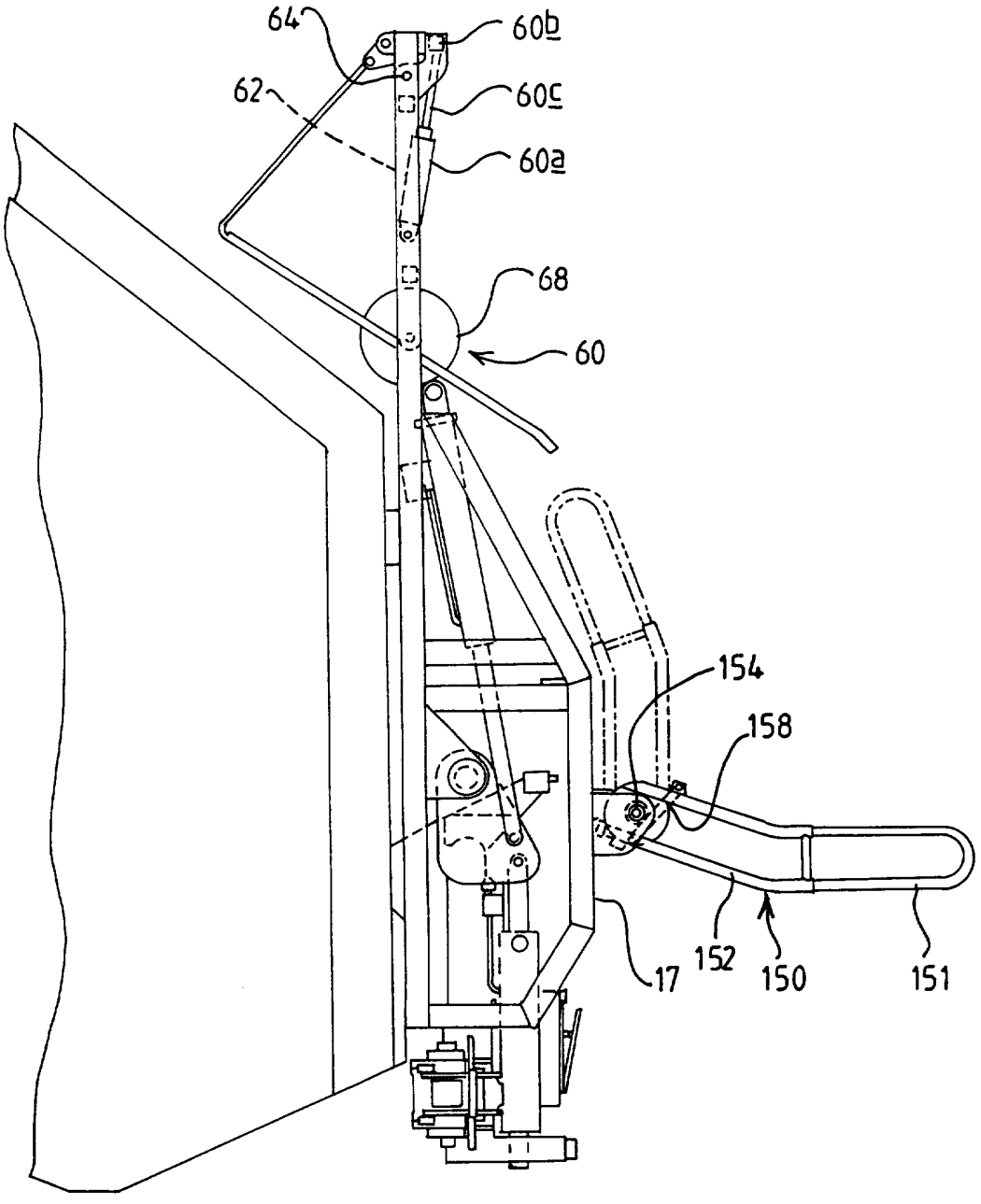


FIG 6a

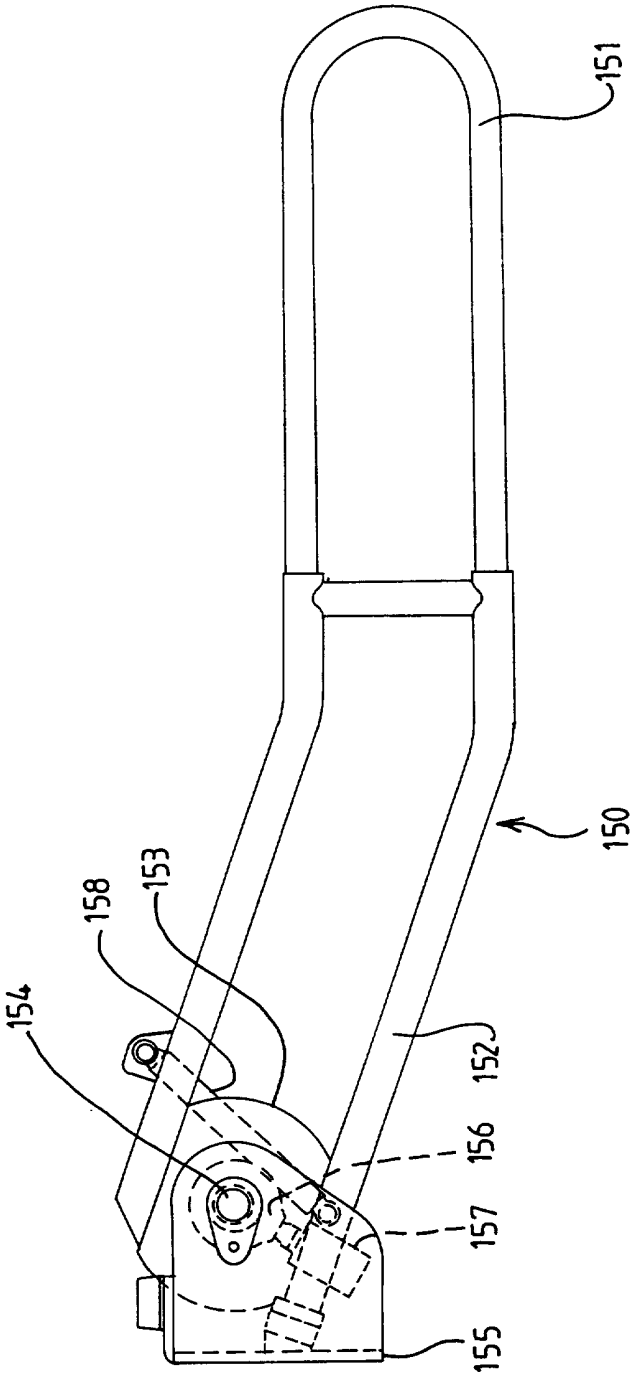


FIG 6b

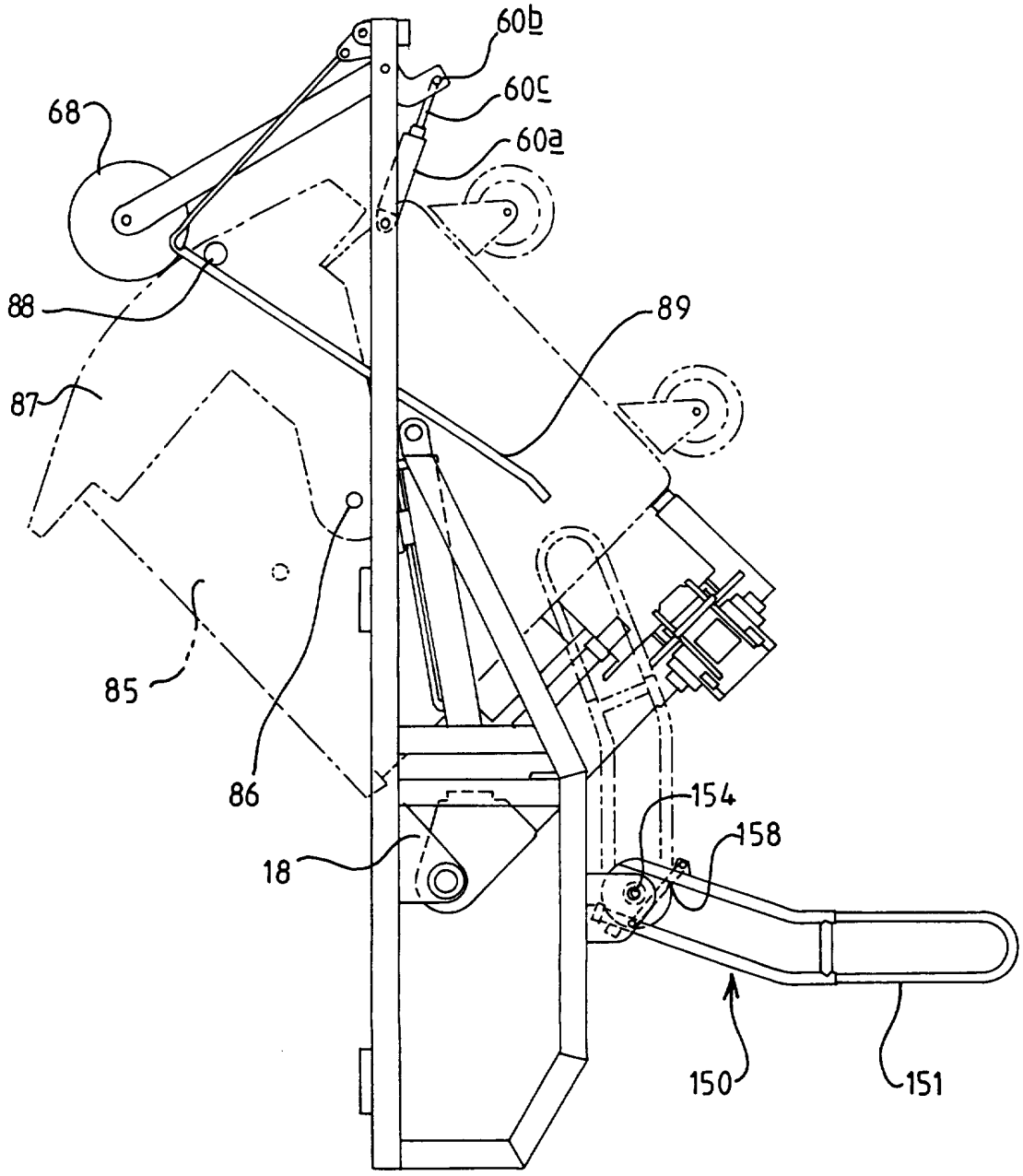


FIG 7

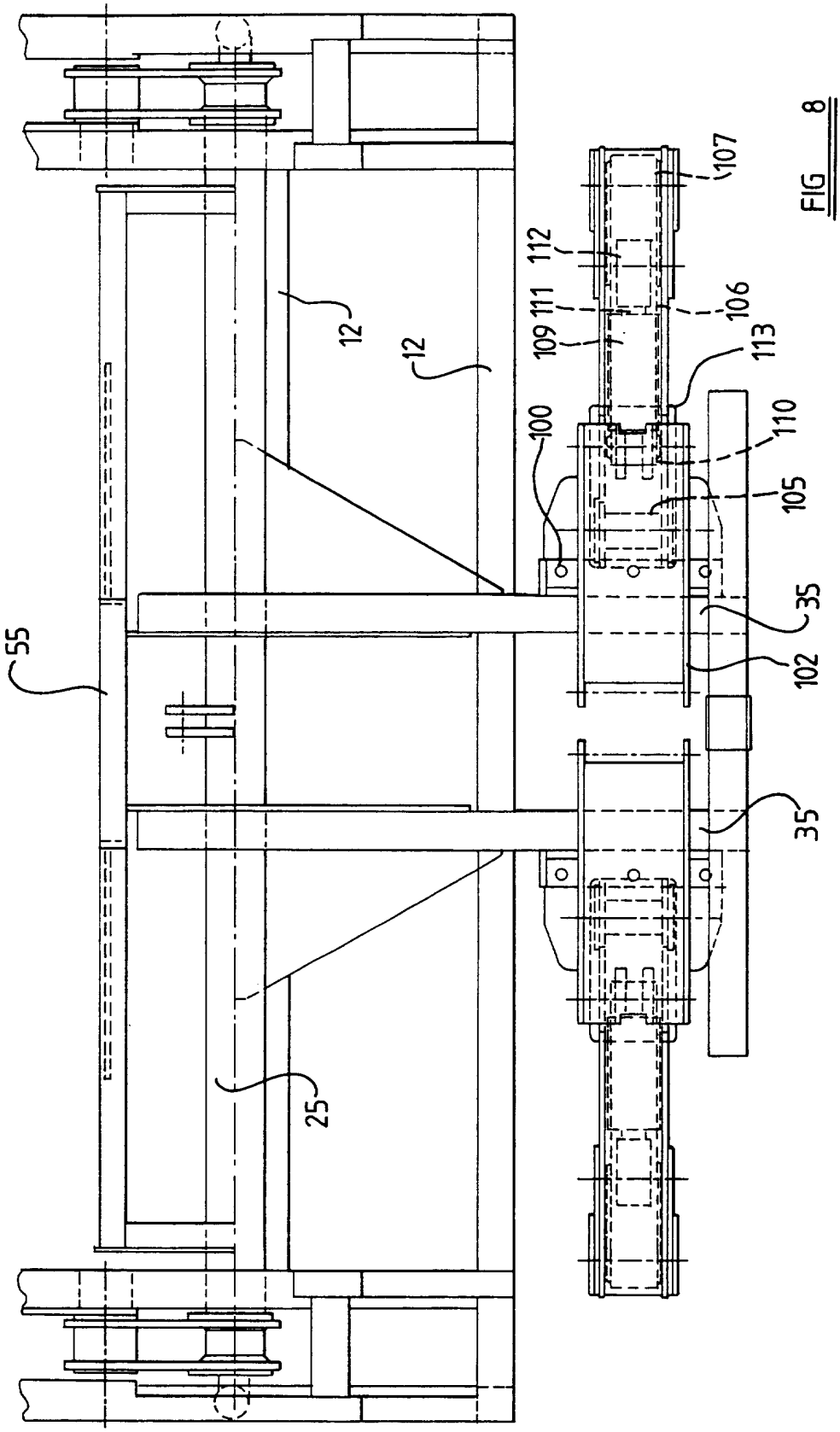
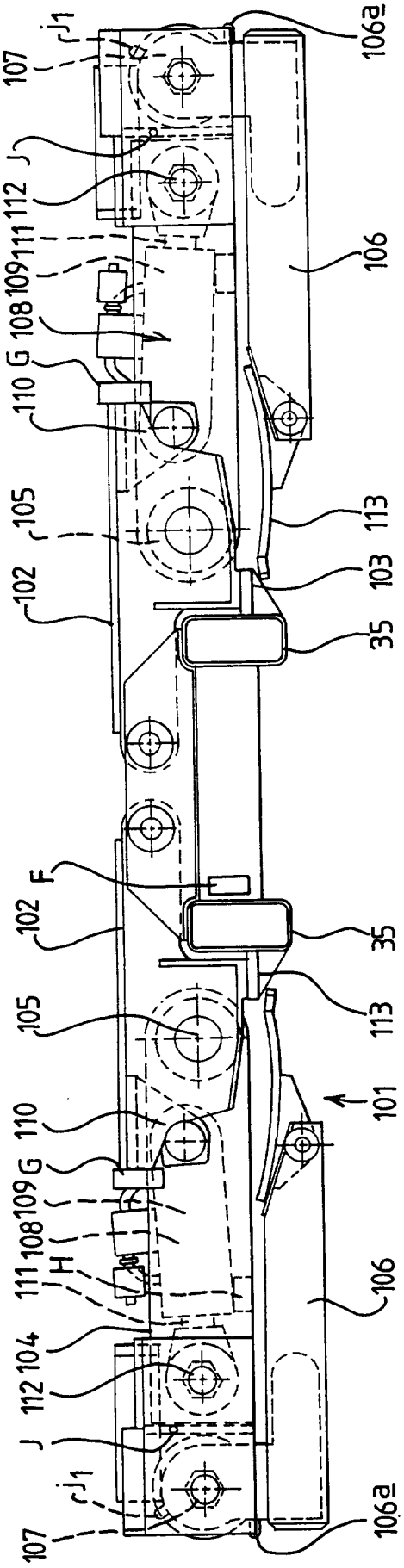


FIG 8


106a
J1
107
J
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111
109
108
G
110
105
102
F
H
104
106
113
103
35
101

FIG 9

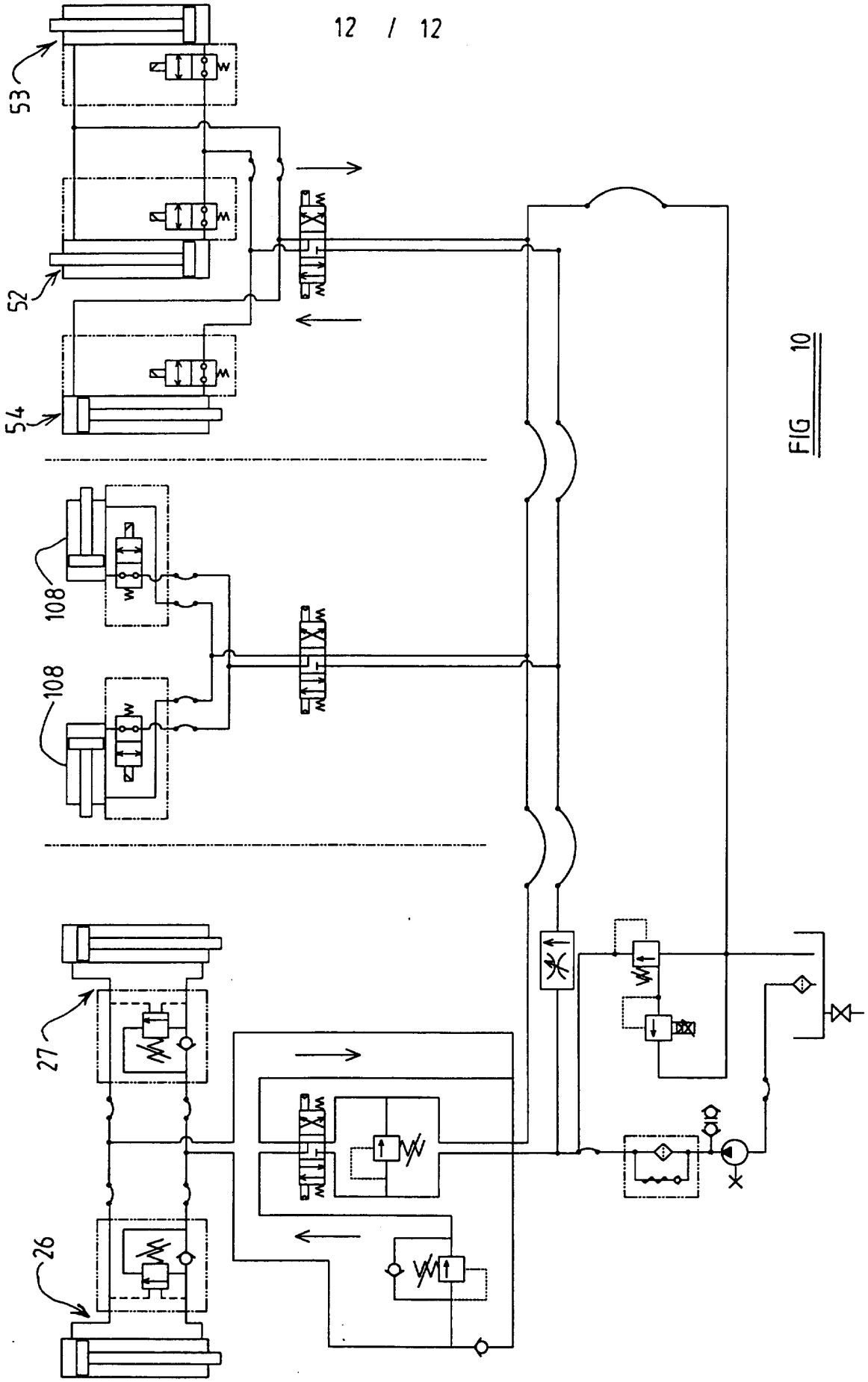

FIG 10

PATENTS ACT 1977

JNL/A8965GB

Title: HOIST FOR REFUSE CONTAINERS

Description of Invention

This invention relates to a hoist for refuse containers, intended to be provided on a refuse collection vehicle, or a static refuse compactor or the like, for lifting refuse containers and tipping them to empty their contents into the vehicle, or static compactor or the like.

Refuse containers, which herein will for the sake of convenience be referred to as bins, are of various types. There are bins usually used at domestic premises which are of relatively small capacity and which typically are tall and thin, being near square in plan view and having a hinged cover at the top and, usually, a pair of wheels at the bottom and will be referred to herein as first type bins.

There are larger bins which typically have a capacity of two to five times that of the first type but which are similar in construction, and may have four wheels as they might not be able to be handled by a single person on two wheels only and will be referred to herein as second type bins.

These types of bins might be of plastics material. Characteristically such bins have a peripheral flange extending outwardly from the upper edge of a wall of the bin, and a downturned lip at the free end of the flange, such flange and lip enabling the bin to be engaged and lifted by a hoist and held whilst being tipped thereby to empty the contents.

A further, third, type of bin is commonly used in premises such as blocks of flats to receive refuse from a refuse chute and is generally of cylindrical form, being much larger than the bins first referred to above and will be referred to herein as third type bins.

Such bins, which are commonly referred to as Paladin bins, are usually of metal.

To lift and tip such bins, hoists have been provided with capturing members arranged partially to embrace such a bin at a position partway up the bin, and to capture the bin to hold it to the hoist.

It is an object of the present invention to provide improvements in a hoist suitable for handling bins of one or more of the types referred to.

Particular aspects of the invention and the improvements they represent are more particularly described hereafter.

According to one aspect of the invention, we provide a bin hoist comprising bin-holding means and means for moving the bin-holding means to lift and tip a bin held thereby, wherein there is provided means for constraining the bin when lifted and tipped against movement relative to the bin-holding means, the restraining means comprising buffer means including fluid pressure shock absorbing means.

Preferably the buffer means is arranged to contact a surface of the bin in the course of part of the movement thereof to and from a fully-tipped position.

Preferably the buffer means comprises at least one buffer element of deformable material and defining a closed space containing fluid under pressure.

Preferably the or each buffer element is of flexible plastics material, and contains a fluid under pressure. A valve may be provided, for example a tyre inflation valve to enable the pressure of gas within the member to be adjusted as required.

Preferably each buffer member is of generally spherical configuration, and is rotatable about a transverse axis so as to be able to roll along the surface of the bin in the course of tipping thereof.

Alternatively, each buffer member may comprise a static buffer or a single buffer of suitable shape may be provided.

Preferably the buffer means is itself displaceable so as to accommodate tipping movement of a bin whilst maintaining a suitable constraining pressure on the bin.

Preferably there is spring means to resist such movement of the buffer means.

To this end, the buffer means may comprise a pivoted frame means which carries at least one buffer element and pivotally depends from an upper part of a fixed frame structure of the hoist.

According to another aspect of the invention we provide a bin hoist comprising capturing means including a first capturing means engageable beneath a bin top flange and a second capturing means engageable with an upper surface of the bin top flange whereby the flange may be captured between the first and second capturing means; a means for lifting the first capturing means towards the second capturing member to achieve said capturing, said lifting means comprising a first lifting means for lifting the first capturing means from a first, lowered, position to a second, intermediate, position; and second lifting means for lifting the first capturing means from said intermediate position to a third, capturing position wherein the bin top flange can be captured between the first and second capturing means.

Preferably the first position of the first capturing means is one in which it is able to engage beneath the top flange of a bin of the size and top which characteristically is used for domestic rubbish, whilst the second position of the first capturing means is one in which it is able to engage beneath the top flange of the larger type of flanged bin as herein referred to. Preferably each of the first and second lifting means comprises fluid pressure, e.g. hydraulically operable piston cylinder means. Alternatively, a screw threaded means which may be powered by an hydraulic motor or in any other desired manner, may be provided.

It is to be appreciated that when we refer to "lifting" the first capturing means towards the second capturing means, this refers to a starting operative position of the bin hoist in which a bin or bins can be engaged by the capturing means, prior to the operation of lifting and tipping the bin to deposit the contents thereof in the refuse collection vehicle or the like.

Preferably there is provided first guide means which guides the first capturing means for movement under control of the first lifting means relative to an intermediate support means, and a second guide means which guides the

intermediate support means, under the control of the second lifting means, for movement relative to a main supporting means.

Preferably each of said first and second guide means comprises roller means co-operating with and relatively movable lengthwise of elongate track means. If the desired the guide means may be provided in any other suitable manner for example by means of cylindrical pillars in engagement with bushes or linear ball bearings of the capturing means.

Conveniently the track means of each of the first and second guide means is associated with the intermediate support means, and the roller means co-operating therewith associated with the main support means and the first capturing member.

Conveniently the track means of each of the first and second guide means is provided on opposite sides of at least one track member provided on the intermediate support means. Preferably there are two such track members extending parallel to one another and arranged so as to be spaced laterally of a vehicle on which the hoist is provided.

Preferably the track members are constituted by I-beams.

Alternatively if desired, the track members may be provided in any other desired way such as by two separate channel shaped members in place of each I-beam.

This arrangement of the guide means provides for a relatively large motion of the first capturing means relative to the second capturing means whilst remaining within a small space envelope in the direction of such movement.

Further, the use of roller means and track means provides guidance in a manner which is not relatively deranged if rubbish should become spilled about or in the guide means. The fluid pressure operable means for effecting the relative movement may be disposed at convenient position where they are not vulnerable to damage.

Preferably the main supporting means and the elements carried thereby are pivotally mounted relative to a main frame means of the hoist, such

pivotal movement being effective to cause lifting and tipping of a bin after the bin has been held by the capturing means operating as above described. When a bin has been

captured, its movement will thus follow an arcuate path until the bin is held in an inverted inclined orientation for rubbish tipping.

Preferably a hoist comprises both aspects of the invention as above defined, and the buffer means is arranged to constrain the bin when lifted and tipped, against movement relative to the bin holding means.

The first capturing means preferably comprises comb bar means, including upwardly extending tine formations engageable beneath a bin top flange.

The main supporting means may comprise means for holding a bin of the third type as above referred to. Such means may comprise capturing members arranged partially to embrace such a bin at a position part-way up the bin, and to clamp the bin thereby, to hold it to the hoist.

Preferably such capturing members are supported by the main supporting means of the hoist, and deployment thereof for use may require operation of the first and/or second lifting means to cause at least the first capturing means to be moved clear of the envelope in which the further capturing members operate.

The first capturing means may include a tine or tines movable by engagement with such a third type of bin, out of the way of such a bin so as not to hinder holding thereof.

The tipping means for a hoist according to the invention is preferably operated by fluid pressure operable piston and cylinder means which conveniently, as for the first and second lifting means, is hydraulic. One or more of the cylinders may be provided with transducers to indicate the position of the pistons in such cylinder or cylinders, such indicated positions being used to control at least part of the operation of the hoist.

If desired other tipping means may be provided such as a rotary actuator or a hydraulic motor and gearbox to drive the hoist.

The control system may include switch means settable for the type of bin which is to be lifted and tipped, to set the first and second lifting means in appropriate positions to cooperate with such a bin.

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

Figure 1 is a diagrammatic rear elevation of a hoist in accordance with the invention, in a first operative position;

Figure 2 is a view as Figure 1 but in a further operative position;

Figure 3 is a view as Figures 1 and 2, in yet a further operative position;

Figure 3a is a diagrammatic fragmentary view similar to that of Figures 1 to 3, but in a yet further operative position;

Figures 4 and 5 are respectively a rear elevation and a plan view of part of the hoist;

Figure 6 is a side view of the hoist in use to lift and tip a first type of bin;

Figure 6a is a side view of the hoist in a lowered position ready to receive a first type of bin.

Figure 6b is a side view, to an enlarged scale, of a side barrier of the hoist of Figure 1.

Figure 7 is a view as Figure 6, but showing the hoist in use to lift and tip a further type of bin;

Figure 8 is a fragmentary and diagrammatic rear view of a girdle clamp means,

Figure 9 is a fragmentary and diagrammatic plan view of the girdle clamp means of Figure 8, and

Figure 10 is a diagrammatic view of an hydraulic circuit which may be provided for controlling operation of the hoist.

Referring firstly to Figures 1 to 5 of the drawings, these show a hoist for lifting refuse bins and tipping them to empty their contents into a refuse collection vehicle. The hoist is intended to be fitted to such a vehicle at the rear thereof, and comprises a main frame structure indicated generally at 10 which is constructed and arranged so as to be fastened to the rear of such a vehicle. In this example the hoist is described as emptying the contents into a refuse collection, although the hoist may be used in any

other desired suitable application for example, to empty the contents of the bins into a static compactor. The frame structure comprises upper and lower laterally extending frame members 11, 12, extending between spaced upright frame parts indicated generally at 13, 14 each of which respectively comprises laterally spaced frame members as indicated at 15, 16 for the frame member 13, such frame members being connected to one another by transverse bracing members. Rearwardly of the lower parts of the frame elements 13, 14 there extend respective further frame elements 17 as shown in Figures 6 and 7, such further frame elements together with the frame elements 13, 14 defining an envelope space in which the bin lifting and tipping means described hereafter lie.

Sheet metal triangular brackets 18, 19 extend rearwardly from the frame members 15, 16 in spaced parallel relation to one another. These carry by a pivot bearing assembly 20 triangular support plates 21, 22. The frame members constituting the frame element 14 are similarly provided with brackets and a pivot bearing assembly which carry like triangular support plates indicated at 23, 24. A tubular support member 25 extends laterally between the plates 21, 22, 23, 24 to which it is welded, and the support tube 25 carries the bin lifting and holding means described hereafter. Fluid pressure operable piston-cylinder devices in the form of hydraulic rams 26, 27 are connected between the plates 21, 22 and the frame element 13 at an upper mounting 28, and the plates 23, 24 and the frame element 14 at an upper mounting 29, respectively. The rams 26, 27 are arranged so that when they are actuated the support tube 25 is caused to move in an arcuate path of movement about the pivot bearings as 20, between a lowered position in which it is shown in Figures 1 to 3 and a raised position in which it is shown in Figures 6 and 7.

The support tube 25 carries a bin capturing means which is shown in greater detail in Figures 4 and 5 (in which the pivotable tines 49 have been omitted for clarity) as well as being shown in Figures 1 to 3. A main support means comprising a spine 35, having a pair of spaced parallel box section members 35a, is rigidly fixed to the support tube 25, and the spine extends downwardly to a horizontal laterally extending abutment bar 37. At each side of the spine 35 there are provided a number of

roller elements 38, spaced from one another rearwardly of the spine and fastened by brackets 35b to the members 35a.

The roller elements 38 at each side of the spine 35 engage in respective tracks provided on corresponding inwardly facing sides of I-section track members 39, 40 of the spine 35.. The track members 39, 40 extend upwardly from an intermediate support means indicated at 41.

The I-section track members 39, 40 have tracks defined at their corresponding outwardly-facing sides engaged by roller elements 42 provided on a first bin-capturing means indicated generally at 43. The first bin-capturing means comprises a fabrication 44, having two sides which are mirror images of one another and which carry respective comb bar assemblies 46, 47 and on which the roller elements 42 are mounted.

The comb bar assembly 46 comprises three upwardly projecting tines 48 which are in line with one another and a fourth tine 49 which is pivotally connected at 50 to the fabrication 44, for pivotal movement about an upright (with reference to the position of the hoist shown in Figures 1-5) axis 51. The tine 49 is movable between a position in which it is in line with the tines 48 to one in which it is displaced rearwardly from the plane of Figures 1-4. It is spring biassed to the former position. The comb bar assembly 47 likewise comprises three fixed tines and a pivotally movable tine, in mirror image of the comb bar assembly 46.

Two hydraulic rams 52, 53 are operatively connected between the intermediate support means 41 and the fabrication 44, carrying comb bar assemblies 46, 47, respectively. When operated, they cause relative movement between the intermediate support means 41 and the comb bars 46, 47, with the roller elements 42 moving lengthwise of the track members 39, 40.

An hydraulic ram 54 is operatively connected between the top of spine 35 and the intermediate support means 41. Operation of ram 54 causes movement between these components 35, 41, with the track members 39, 40 being guided by the roller elements 38 for such movement.

At the upper end of the spine 35 there is a second bin-capturing means in the form of a transversely extending member 55. This member and the comb bar assemblies 46, 47 are able to engage respectively above and beneath the top flange of the first and second types of bin herein first referred to, for holding such bins for lifting and tipping as will be described hereafter.

Towards its lower end the spine 35 is provided with a plurality of apertures 100 whereby a girdle clamp assembly 101 is bolted thereto. This bolted connection enables the girdle clamp assembly 101 to be retro fitted or easily removed as desired.

The girdle clamp assembly comprises two parts disposed on opposite sides of the hoist. Each part comprises a bracket 102 which is bolted, as shown at 103 to the spine 35. An inner arm 104 is pivotally connected to the bracket 102 by a bearing means 105 and an outer arm 106 is pivotally connected to the inner arm 104 by a bearing means 107. A hydraulic ram 108 has a cylinder 109 thereof pivotally connected to a trunnion 110 fixed to the bracket 102 whilst a piston rod 111 of the cylinder 108 is pivotally connected as shown at 112 to the inner arm 104. The outer arm 106 has a gripping plate 113 pivotally connected thereto at its outer end. Alternatively, if desired, the plates 113 may be fixed to the outer arms 106.

When the girdle clamp is to be used the outer arms 106 are pivotally moved manually from the position illustrated in Figure 8 (in which the intermediate support means 41 have been omitted for clarity) to a position at right angle thereto and then the rams 108 are operated to cause the inner arms 104 to pivot in a direction towards each other so as to clamp a third type of bin therebetween.

A pair of "bin presented" sensors A,B are provided in association with the comb bar assemblies 46, 47. In the present example each "bin presented" sensor comprises a finger pivotally connected, as desired, at a lower end or at an upper end to the associated comb bar assembly 46, 47 and spring loaded outwardly at its upper end or lower end respectively for engagement with a bin. When a bin is presented so as to be supported on the associated comb bar assembly 46, 47 the fingers A,B are pressed inwardly towards the associated comb bar assembly and thus a signal is sent to a control

unit.

A pair of "bin correctly loaded" sensors are provided at C,D again in association with each comb bar assembly 46, 47. Each sensor C,D comprises a headed member which is slidably received in a member associated with the comb bar assembly 46, 47. When a bin is correctly loaded this is detected by depression of the sensors C and D against upward spring bias, by the flange of the bin.

A single sensor, comprising a lever E, pivotable about a vertical axis and spring biased to project rearwardly, is provided to sense the presence of a single bin on the centre line of the machine.

A linear transducer is provided as desired on the outside of or within one or each of the rams 26 or 27 to enable the extent of extension of the piston thereof to be determined.

Alternatively a cam device can be provided on the shaft. A sensor to sense the positioning of the cam is provided and thereby determines the extent of rotation of the shaft and hence of the bin

A pressure switch is provided at F to allow tipping to take place if adequate pressure to provide full clamping occurs. Alternatively a pressure transducer may be provided. Pressure transducers give a continuously varying output and so can provided a conventional closed loop control.

A pair of sensors is provided at G to determine when the inner arms 104 are in a parked condition ie in a position transverse to the longitudinal axis of the machine as shown in Figure 9.

H shows a pair of interlocks which determine whether or not the girdle clamp outer arms 106 are in an inoperative position in which they are in a fully transverse position as shown in Figure 9.

At J a soft clamp sensor switch is provided to determine when the outer arms 106 have moved from an open position to a soft clamp position. Each sensor switch J detects the presence of a target J1 which is pivotable with the outer arm 106 so that the sensor switch J is actuated when the arms 106 are completely in their soft clamping condition. Actuation of a control as described hereafter, causes the arms to move to a

fully clamped position.

From the upper laterally extending frame member 11 of the frame structure 10 there depend two pivotable buffer assemblies 60, 61, which are identical to one another. The buffer assembly 60 comprises two spaced parallel members 62, 63 which are pivotally mounted at 64, 65 to brackets 66, 67 secured to the frame member 11. Between the ends of the members 62, 63 remote from the pivots 64, 65 there is supported a buffer element 68 which is rotatable about a transverse axis 69 by way of two stub shafts which are fixed to the members 62, 63 and are rotatably received in the buffer element 68. The buffer element 68 is a sphere of flexible plastics material containing a gas, e.g. air under pressure or other pressurised fluid such as a liquid/gas combination

Preferably it has a valve such as a tyre inflation valve to enable the gas pressure inside the sphere to be adjusted as required.

The buffer assemblies 60, 61 are spring biased by means of a pair of rams 60a, 61b connected between frame members 16 and a pivot member 60b 61b, cantilevered transversely from cranked parts 60c of the members 62, 63. Thus the buffer assemblies 60, 61 are resiliently biased by an air spring facility of the rams 60a 61a to pivot to a position in which they depend forwardly and downwardly relative to the vehicle from the frame element 11. Above the pivots 64, 65 the cranked parts 60c of members 62, 63 extend upwardly and are joined by a stop member 69 which is arranged to abut the frame member 11 to prevent pivoting of the buffer assembly anticlockwise (with reference to Figures 6 and 7) beyond such downwardly depending position.

The rams 60a, 61a can also be varied in length by feeding hydraulic fluid thereto whereby the buffers can be pivoted clockwise (with reference to Figure 6 and 7 as described hereafter). The buffers 60, 61 provides a means which can absorb kinetic energy of a bin if their is any tendency for a bin to leave the comb bar assemblies 46, 47.

In addition to the buffer assemblies 60, 61 a back stop 160 is provided attached to the frame member 11 to stop/restrain a bin if it becomes separated from the lower bin support on frame 41 despite the buffer assemblies 60, 61. The back stop 160 comprises

a downwardly depending arm 161 pivoted to the frame member 11 by a trunnion 162. The arm 161 is provided with a rubber or like buffer 163 and is prevented from clockwise movement (with reference to Figures 6 and 7). The arm 161 can be pivoted anti clockwise if it is necessary to do so to free a trapped object.

The hoist in the present example is provided with a pair of side barriers 150 which are best shown in Figures 6 and 6a. Each side barrier 150 comprises an arm having a tubular frame having an outer part 151, which is horizontal when the barrier is in an operative position as shown in full line in Figures 6 and 6a, and an inner part 152 which is inclined downwardly and rearwardly of the hoist towards the junction with the part 151. The tubes which provide the part 152 are linked at one end by plates 153 which carry a boss connected by a pivot pin 154 which is carried in trunnions 155 fixed to a frame element 17. Fixed to the pivot pin 154 is a cam 156 which is engaged with a sensor 157 so that the sensor can detect whether the barrier arm is in the operative position in full line in Figures 6, 6a and 6b or a raised, inoperative, position, shown in dotted line in Figures 6 and 6a. A coil tension spring 158 is provided between the barrier 150 and the trunnions 155 to provide an over-dead-centre action to retain the arm in a selected operative or inoperative position.

When the side barriers are provided, the hoist may be programmed so that if the barriers are operative an automatic cycle is provided for a two wheel bin whilst which if the barriers are inoperative a manual cycle is provided for a four wheel bin. Thus if the barriers are simply moved between their operative and inoperative positions the mode is changed.

The use of the apparatus above described to lift and tip bins will now be set forth.

It will be assumed initially that the apparatus is pre-set by operation of a suitable control button so that the controller is set to perform a lift of the first type.

In this case a pair of rams 52, 53 which move the comb bar assemblies 46, 47 relative to the intermediate support means 41 to provide a first lift and the ram 54 which moves the intermediate support means 41 relative to the main support means 25, 35 to

provide a second lift are in their lowermost positions such that the comb bar assemblies 46, 47 are in their lowermost positions as shown in Figures 1 and 6a. In this position the height of the tines 48, 49 is such as to be able to engage beneath the upper peripheral flange of a bin of a two wheel domestic or first type as referred to herein. Two such bins are normally, as in this example, disposed alongside one another and can be engaged, one by the tines of each comb bar 46, 47.

In use, a pair of such bins are offered up to the comb bar assembly so that the bin engages the fingers of the respective "bin presented" sensor A,B as a result the rams 52, 53, may be raised up to the "bin correctly loaded" sensor C, D which are depressed on raising of the comb assembly 46, 47 and on engagement of the sensors C, D with the underside of the lip of the bin. The first lift continues by operation of the rams 52, 53 until the bins are lifted to an intermediate position shown in Figure 2 and then the lift operation continues in a second lift by the operation of ram 54 to the position shown in Figure 3 in which the bin upper flanges are captured between the comb bar assemblies and the member 55, so as to be prevented from displacement away from the comb bar although they are not clamped therebetween, provided that the bin is correctly positioned on the combs as detected by the correct actuation of the sensors C and D. If the bin is not correctly positioned it is returned to the ground.

By operation of rams 26, 27, the support tube 25 is moved to further tip the bins as shown in Figure 6. One of the bins is indicated at 75 and it will be noted that when tipped the lids 76 of the bins fall open and the rear walls 77 or wheel of the bins abut the buffer elements as 68 of the buffer assembly 60 or 61, to constrain the bins.

The bins are returned to the ground by reversal of the above sequence of operations.

In this mode the control system may be automatic or manual, that is to say in automatic mode once the bins have been presented to the hoist to actuate the sensors A, B the remainder of the sequence of operations may be performed automatically by the control means as long as the bins are in their correct positions and so long as the side barriers 150 are in an operative position.

In manual mode then once the bins have been presented correctly to actuate the sensors A, B an initial movement takes place to engage the flange to lift the bins from the ground, by operation of the rams 52, 53 until the bins are lifted to an intermediate position shown in Figure 2. The lift operation continues in a second lift by operation of ram 54 to a position shown in Figure 3 in which the bin upper flanges are captured between the comb bar assemblies and the member 55, the correct location of the bin being detected by the sensors C and D. At this point the operating cycle stops with the bin in the raised position. Continued movement depends upon operation of an "up" push button or the like to fully raise and empty the bins, followed by operation of a "down" push button control to lower the bins to the ground.

In a modification of the method of use of the hoist with bins of the first type the hoist may be used to lift a single bin. This may be done in one of two ways. In one way, the bin is offered up as described previously to one of the comb bar assemblies 46 or 47 and the relevant "bin presented" sensor A or B is actuated, followed by the operation of an "up" control which causes the bin to be lifted to the captured position as described hereinbefore. On achieving the captured position, the hoist automatically raised the bin to maximum tip and lowers the bin to the floor, providing the barriers are in the automatic position.

Alternatively, a single bin may be disposed centrally so as to be disposed on a part of each of the comb bar assemblies 46, 47. In this case the single bin sensor E is operated and in this case operation is as described herein before and either manual or automatic operation may be provided as desired.

Alternatively, if desired, the hoist may be adapted for use with a bin of a 4-wheel (plastic or metal) or second type. In this case the control means pre-sets the hoist for use with such bins and accordingly the rams 52, 53 are operated until they are at a suitable position adjacent their uppermost position. That is to say, the first lift operation is partly or fully undertaken prior to offering up a bin to the hoist and so the comb bar assemblies 46, 47 are at an intermediate position thereof shown in Figure 2. Thus the starting position for lifting and tipping such a bin is the Figure 2 position, with

the first lifting means constituted by rams 52, 53 raised or part raised and the second lifting means (ram 54) lowered. Accordingly when a bin of the second type is offered up to the hoist, initially the bin presented sensors A and B are actuated. Accordingly the rams 52, 53 and then 54 are actuated to raise the comb bar assemblies 46, 47 so that they engage with the flange of the bin and in consequence the "bin correctly loaded" sensors C and D are also actuated. Operation of the ram 54 continues until it reaches the top of its movement. The control system then looks to see if the sensors C and D have been correctly actuated by the time that it reaches the top of its movement and if it has, the system permits manual tipping. If it has not, operation of the rams 54 53 and 52 are reversed and the bin is returned to the ground.

The lifting operation of ram 54 engages the tines beneath the upper flange of the bin and lifts the bin until its flange is captured between the tines and the member 55.

Then, operation of rams 26, 27 causes the bin to be tipped in an arcuate path of movement to the position shown in Figure 7. Here the bin is indicated at 85 and its lid, pivoted to the bin at a position 86 mid-way up the bin, at 87. Formations 88 on the lid have been engaged by lid-opening ramp members 89 which are mounted in an inclined orientation from the frame member 11 on the inner frame members 16 of the spaced frame parts 13, 14 by members 16a. The lid of the bin is engaged by the buffer assemblies 60, 61 to constrain the bin, the buffer assemblies being pivotally displaced, by contact with the bin lid, against their spring biasing. After the contents of the bin have been emptied, the bin is returned to the ground by reversal of the above sequence of operations reverse rotation being manual and the lowering automatic.

It will be noted from Figure 3 of the drawings that when the rams 52, 53, 54 have been operated to hold a bin or bins of the first type or a bin of the second type, the rams and associated components are clear of the abutment bar 37 and the lower part of the spine 35 where the girdle clamping means is provided.

To enable a bin of a cylindrical paladin or third type to be lifted and tipped, the hoist is pre-set to a third bin type mode in which the rams 52, 53, 54 are brought to the Figure 3 position, in which the rams 52, 53 which provide the first lift are fully up and

the ram 54 which provides the second lift is fully up, whereupon the clamping members can be deployed to engage the bin which can then be emptied by operation of the rams 26, 27.

When such a bin is held by the apparatus, the tines as 49 of the comb bar assemblies 46, 47 are engaged by the bin to pivot clear of the bin.

When this type of bin is selected the buffers 60, 61 are retracted to a position clockwise beyond that shown in Figure 7 by actuation of the rams 60a, 61a.

In this case the controller may again be automatic or manual as described herein before. The single bin sensor senses the presence of the bin and engages the cycle of the third bin type mode to be performed.

In this mode the control system operates as follows. When the girdle outer arms 106 are in their inoperative folded position the interlocks H prevent operation of the girdle clamp even when the third type bin mode has been selected. The outer arms 106 have to be moved in to their operative position in which they are generally perpendicular to the inner arms and hence the interlocks H thus sense this.

If only one of the outer arms 106 is in its operative position although the sensor E will activate the relevant ram 108, if the device is in automatic mode, the inner arm 104 will return to its initial position as soon as the central sensor E is released.

Assuming that both outer arms 106 have been moved to their operative position and a bin of third type has been offered up in to position. In this case the central sensor E will detect that the bin has been presented to the hoist and the rams 108 will be actuated to cause the inner arms to pivot inwardly until the plates 113 engage the bin in what is known as a "soft clamp" mode. In this case the outer arms 106 are provided with a spring loaded plunger 106a which is moved into engagement with an end part of the inner arm 108 and provides a soft clamp between the bin and the plates 113 depending upon the strength of the spring loaded plunger.

If a person's arm or leg or anything else is trapped between the bin and the plates 113 the person is not damaged because the clamp is of the above mentioned soft nature.

Also, because of the presence of a foreign body will cause the arms 106 to pivot against a spring plunger allowing the target J1 in to sensing position relative to the proximity device J and so the system is prevented from further clamping action.

Assuming that there is no foreign body in position the target J1 will not be moved into sensing position relative to the sensor J.

An operator then has manually to operate a hard clamp button or the like which causes the pressure in the rams 108 to increase so that a full load is applied to the bin. When the appropriate pressure has been applied to the rams 108 the pressure sensor F detects this and so the system is signalled that it can proceed to a lift stage when an operator presses a relevant manual control such as the "up" button.

When the hoist is set in the third type of bin mode the attitude of the hoist is adjusted. In the third bin mode the spine 35 of the hoist is initially set to be vertical. However this attitude can be adjusted manually by operating the up and down buttons of the hoist to operate the rams 26, 27. Thus if a bin of the third type is on ground which is not perpendicular to the ground on which the vehicle is positioned so that the spine is not perpendicular to the ground on which the bin is resting or if for any other reason the bin is not parallel to the vertical hoist the rams 26, 27 are adjusted to adjust the attitude angle then the above described sequence of operation is performed.

However the system notes as a result of the transducer associated with the ram 26 or 27 the position of the rams 26 and 27 and hence the initial position at the start of the hard clamping operation.

Accordingly as the hoist returns the bin to the ground by operation of the rams 26, 27, when the initial attitude is reached operation of the rams 26, 27 ceases and the clamps are released.

As explained previously because of the presence of the interlocks H operation of the hoist in a first or second type bin mode is not possible until the dead arms 106 have been folded inwardly to provide space for the bins of this type.

In all three modes the pressure and flow rates of fluid for the rams is set to be commensurate with the bin load. That is to say, there is an increase of fluid pressure

and a decrease of fluid flow with an increase in bin load.

Herein all the rams described have double acting cylinders.

Where reference is made to an "up" or "down" push button or control, it will be appreciated that these push buttons or controls may be replaced by or comprise a joystick or any suitable control means as desired.

In this specification, any reference to capturing of the bin top flange between the first and second caption means is intended to cover not only the case where the upper and lower surfaces of the flange are engaged by the capturing means so as to be clamped therebetween, but also the case where the lower surface of the flange is engaged by the first capturing means whilst the second capturing means is spaced from the upper surface of the flange by a small distance not greater than that necessary to prevent disengagement of the flange from the first capturing means.

The first and/or second capturing means may be arranged so as to co-operate with any desired configuration of the upper or lower surfaces of the top flange, for example, the lower surface of the flange my be provided with a plurality of pockets.

The features disclosed in the foregoing description, or the following claims, or the accompanying drawings, expressed in their specific forms or in terms of a means for performing the disclosed function, or a method or process for attaining the disclosed result, as appropriate, may, separately or in any combination of such features, be utilised for realising the invention in diverse forms thereof.

CLAIMS:

1. A bin hoist comprising bin-holding means and means for moving the bin-holding means to lift and tip a bin held thereby, wherein there is provided means for constraining the bin when lifted and tipped against movement relative to the bin-holding means, the restraining means comprising buffer means including fluid pressure shock absorbing means.

2. A bin hoist according to Claim 1 wherein the buffer means is arranged to contact a surface of the bin in the course of part of the movement thereof to and from a fully-tipped position.

3. A bin hoist according to Claim 1 or Claim 2 wherein the buffer means comprises at least one buffer element of deformable material and defining a closed space containing fluid under pressure.

4. A bin hoist according to Claim 3 wherein the or each buffer element is of flexible plastics material, and contains a fluid under pressure.

5. A bin hoist according to Claim 4 wherein a valve is provided to enable the pressure of fluid within the member to be adjusted as required.

6. A bin hoist according to any one of claims 3 to 5 wherein each buffer element is of generally spherical configuration, and is rotatable about a transverse axis so as to be able to roll along the surface of the bin in the course of tipping thereof.

7. A bin hoist according to any one of Claims 3 to 5 wherein each buffer member comprises a static buffer or a single buffer of suitable shape may be provided.

8. A bin hoist according to any one of the preceding claims wherein the buffer means is itself displaceable so as to accommodate tipping movement of a bin whilst maintaining a suitable constraining pressure on the bin.

9. A bin hoist according to Claim 8 wherein spring means is provided to resist such movement of the buffer means.

10. A bin hoist according to Claim 8 or Claim 9 wherein the buffer means comprises a pivoted frame means which carries at least one buffer element and pivotally depends from an upper part of a fixed frame structure of the hoist.

11. A bin hoist comprising capturing means including a first capturing means engageable beneath a bin top flange and a second capturing means engageable with an upper surface of the bin top flange whereby the flange may be captured between the first and second capturing means; a means for lifting the first capturing means towards the second capturing member to achieve said capturing, said lifting means comprising a first lifting means for lifting the first capturing means from a first, lowered, position to a second, intermediate, position; and second lifting means for lifting the first capturing means from said intermediate position to a third, capturing position wherein the bin top flange can be captured between the first and second capturing means.

12. A bin hoist according to Claim 11 wherein the first position of the first capturing means is one in which it is able to engage beneath the top flange of a bin of the size and type which characteristically is used for domestic rubbish.

13. A bin hoist according to Claim 11 or Claim 12 wherein the second position of the first capturing means is one in which it is able to engage beneath the top flange of

the larger type of flanged bin as herein referred to.

14. A bin hoist according to any one of Claims 11 to 13 wherein the first and second lifting means comprise fluid pressure piston cylinder means.

15. A bin hoist according to any one of Claims 11 to 13 wherein the first and second lifting means comprise a screw threaded means.

16. A bin hoist according to any one of Claims 11 to 15 wherein there is provided first guide means which guides the first capturing means for movement under control of the first lifting means relative to an intermediate support means, and a second guide means which guides the intermediate support means, under the control of the second lifting means, for movement relative to a main supporting means.

17. A bin hoist according to Claim 16 wherein each of said first and second guide means comprises roller means co-operating with and relatively movable lengthwise of elongate track means.

18. A bin hoist according to Claim 16 or Claim 17 wherein the track means of each of the first and second guide means is associated with the intermediate support means, and the roller means co-operating therewith is associated with the main support means and the first capturing member.

19. A bin hoist according to Claim 17 or Claim 18 wherein the track means of each of the first and second guide means is provided on opposite sides of at least one track member provided on the intermediate support means.

20. A bin hoist according to Claim 19 wherein there are two such track members extending parallel to one another and arranged so as to be spaced laterally of a vehicle on which the hoist is provided.

21. A bin hoist according to any one of Claims 17 to 20 wherein the track members are constituted by I-beams.

22. A bin hoist according to any one of Claims 17 to 20 wherein the track members are provided by two separate channel shaped members.

23. A bin hoist according to Claim 16 or any one of Claims 17 to 22 where dependent directly or indirectly on Claim 16 wherein the main supporting means and the elements carried thereby are pivotally mounted relative to a main frame means of the hoist, such pivotal movement being effective to cause lifting and tipping of a bin after the bin has been held by the capturing means operating as above described.

24. A bin hoist according to any one of Claims 1 to 10 further being a bin hoist according to any one of Claims 11 to 25.

25. A bin hoist according to Claim 24 wherein the buffer means is arranged to constrain the bin when lifted and tipped, against movement relative to the bin holding means.

26. A bin hoist according to any one of Claims 11 to 25 wherein the first capturing means comprises comb bar means, including upwardly extending tine formations engageable beneath a bin top flange.

27. A bin hoist according to Claim 16 or any one of Claims 17 to 26 where dependent directly or indirectly on Claim 16 wherein the main supporting means comprises means for holding a bin of the third type as above referred to.

28. A bin hoist according to Claim 27 wherein said means comprise capturing members arranged partially to embrace such a bin at a position part-way up the bin, and to clamp the bin thereby, to hold it to the hoist.

29. A bin hoist according to Claim 28 wherein said capturing members are supported by the main supporting means of the hoist, and deployment thereof for use may require operation of the first and/or second lifting means to cause at least the first capturing means to be moved clear of the envelope in which the further capturing members operate.

30. A bin hoist according to any one of Claims 11 to 29 wherein the first capturing means includes a tine or tines movable by engagement with such a third type of bin, out of the way of such a bin so as not to hinder holding thereof.

31. A bin hoist according to any one of Claims 1 to 10 or any one of Claims 24 to 30 where dependent directly or indirectly on Claim 1 wherein the tipping means is operated by fluid pressure operable piston and cylinder means.

32. A bin hoist according to Claim 31 wherein said fluid pressure operable piston and cylinder means is hydraulic.

33. A bin hoist according to Claim 31 or Claim 32 wherein one or more of the cylinders is provided with transducers to indicate the position of the pistons in such cylinder or cylinders, such indicated positions being used to control at least part of the operation of the hoist.

34. A bin hoist substantially as hereinbefore described with reference to the accompanying drawings.

35. Any novel feature or novel combination of features described herein and/or in the accompanying drawings.

The Patent Office

25.

Application No: GB 9802463.1 **Examiner:** Dr Steven Chadwell
Claims searched: 1-10,24,25,31-34 **Date of search:** 7 April 1998

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.P): B8E

Int Cl (Ed.6): B65F 3/00 3/04 3/06 3/08 3/10

Other: Online: WPI, EDOC

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
Y	GB 2119344 A	(ZOLLER-KIPPER) see figure 4 and page 3 line 122 to page 4 line 40	1-4,7, 31,32
Y	GB 820471	(ZOLLER) see figures 1 and 2, and page 2 lines 30-41 and lines 47-52	1-4,7, 31,32
A	EP 0671347 A1	(SEMAT)	

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

The Patent Office

26

Application No: GB 9802463.1
Claims searched: 11-34

Examiner: Dr Steve Chadwell
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Further Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.P): B8E

Int Cl (Ed.6): B65F 3/00 3/02 3/04 3/06 3/08 3/10

Other: Online: WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
A	US 4722656	(ZOLLER-KIPPER) Family equivalents: WO 85/03689 A2 and EP 0156445 A2	
A	US 4613271	(ZOLLER-KIPPER)	

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.